

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: V [Full Time]

Civil Engineering

18CE504 – DESIGN OF REINFORCED CONCRETE ELEMENTS

(Regulations 2018/2018A)

(IS 456, & Charts and tables from SP16 may be permitted during the examination)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. What are the demerits of working stress method of design?	2	K1	1
2. Why does IS: 456 limit the design compressive strength in structural concrete to $0.67f_{ck}$?	2	K2	1
3. State the minimum amounts of reinforcing bars to be provided in slabs.	2	K1	2
4. Under what circumstances are doubly reinforced beams used in practice?	2	K1	2
5. Draw sketches for different types of shear reinforcement.	2	K2	3
6. Write down the value of design bond stress for M 30 grade concrete.	2	K1	3
7. What is meant by slenderness ratio in compression members?	2	K1	4
8. Distinguish between braced and unbraced columns.	2	K2	4
9. List different types of staircases and sketch a layout of dog logged staircase.	2	K1	5
10. Compare one way and two-way shear in footing.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) i) Discuss the different limit states considered in the design.	8	K2	1
ii) Explain working stress method and limit state method of design of R.C structures.	8	K2	1
(OR)			
b) i) Discuss in detail (i) characteristic strength of material, (ii) characteristic load and (iii) Partial safety factors.	8	K2	1
ii) Explain Stress-Strain curve for concrete and steel.	8	K2	1

Q. No	M	BTL	CO
12. a) A Tee beam has an effective flange width of 1600 mm, flange thickness of 100 mm, web width of 300 mm and total depth of 550 mm. Design the reinforcement required for the beam if it is subjected to an ultimate bending moment of 630 kNm. Use M 25 grade concrete and Fe 415 grade steel.	16	K3	2
(OR)			
b) A simply supported slab for a room of size 4 m x 4 m is resting on 230 mm thick masonry walls on all four sides. Design the slab by limit state method. Assume the live load on the slab as 4 kN/m ² and finish load as 1.5 kN/m ² . Concrete of grade M20 and steel of grade Fe 415 are used.	16	K3	2
13. a) Find the reinforcement required for a rectangular beam section for the following data. Size of the beam 300 mm X 600 mm, factored moment = 115 kNm, Factored torsion = 45 kNm, Factored shear = 95 kN. Use M 20 concrete and Fe 415 steel.	16	K3	3
(OR)			
b) A simply supported RC beam of size 300 x 500 mm effective is reinforced with 4 bars of 16mm diameter HYSD steel of grade Fe 415. Determine the anchorage length of the bars at the simply supported end if it is subjected to a factored force of 350 kN at the Centre of 300 mm wide masonry supports. The concrete mix of grade M 25 is to be used. Draw the reinforcement details.	16	K3	3
14. a) Explain the function of the traverse reinforcements in reinforced concrete column and also determine the ultimate load carrying capacity of circular column of section 500 mm diameter reinforced with 8 nos of 25 mm diameter bars adequately tied with lateral ties. Use M 25 and Fe 415 steel.	16	K3	4
(OR)			
b) Design the longitudinal reinforcement in a short column 400 mm x 600 mm subjected to an ultimate axial load of 1600 kN together with ultimate moments of 120 kNm and 90 kNm about the major and minor axis respectively. The reinforcements are distributed equally on all four sides. Adopt M 20 grade concrete and Fe 415 steel bars.	16	K3	4

Q. No

15. a) A rectangular column of size 300 x 450 mm transmits a limit state load of 600 kN at an eccentricity of 150 mm about the major axis. Design a suitable isolated footing for the column by the limit state concept. Safe bearing capacity of soil is 200 kN/m². Use M30 grade of concrete and Fe 415 grade of steel.

M	BTL	CO
16	K3	5

(OR)

- b) Design a dog-legged staircase for an office building for the following details:

16	K3	5

Space available for stairs = 3.0 m x 6 m.

The vertical distance between the floors = 3 m.

Live load = 3.50 kN/m².

Use M20 concrete and Fe 415 steel.

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B.E. Degree Examinations - April/May 2025

Semester: II [Full Time]

Computer Science and Engineering

22MA202 - LINEAR ALGEBRA AND LINEAR PROGRAMMING PROBLEMS
(Regulations 2022)

Time: 3 Hours

Maximum Marks: 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. In $\mathbb{R}^3$, determine whether $(1, 7, -4)$ is expressed as a linear combination of $u = (1, -3, 2)$ and $v = (2, -1, 1)$ in $\mathbb{R}^3$.	2	K2	1
2. Let $W = \left\{ \begin{pmatrix} a & 0 \\ 0 & b \end{pmatrix} : a, b \in \mathbb{R} \right\}$. Prove that W is a subspace of $M_2(\mathbb{R})$.	2	K2	1
3. Find the kernel of T for $T: P_n(\mathbb{R}) \rightarrow P_{n-1}(\mathbb{R})$ by $T(f(x)) = f'(x)$, where $f'(x)$ denotes derivative of $f(x)$.	2	K2	2
4. Define range of a linear transformation.			
5. Define norm.	2	K1	2
6. Find Adjoint of A^* of $A = \begin{pmatrix} i & 1+2i \\ 2 & 3+4i \end{pmatrix}$	2	K1	3
7. What is basic solution?	2	K1	3
8. What is slack variable?	2	K1	4
9. Give the meaning of unbalanced transportation problem.	2	K1	4
10. What is an assignment problem?	2	K2	5
	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) i) Prove: Any set containing a linearly dependent set is also linearly dependent.	8	K2	1
ii) Let $S = \{v_1, v_2, v_3\}$ where $v_1 = (1, -3, -2)$, $v_2 = (-3, 1, 3)$, $v_3 = (-2, -10, -2)$. Verify whether S forms a basis or not.	8	K3	1
(OR)			
b) i) Let $\{v_1, v_2, \dots, v_n\}$ be a linearly independent set of vectors in a vector space V over a field F . Then prove that every element of $L(S)$ can be uniquely written in the form $\alpha_1 v_1 + \alpha_2 v_2 + \dots + \alpha_n v_n$, where $v_i \in S$ and $\alpha_i \in F$.	8	K2	1

Q. No		M	BTL	CO
	ii) Let V be a finite dimensional vector space. If G is a finite spanning set of V and if $I \subset G$ is linearly independent, then prove that there is a basis B of V such that $I \subset B \subset G$.	8	K3	1
12. a)	Let $T: R^3 \rightarrow R^3$ be the linear mapping defined by $T(x, y, z) = (x + 2y - z, y + z, x + y - 2z)$. Verify whether it is linear or not. If it is linear verify Dimension theorem.	16	K3	2
	(OR)	16	K3	2
b)	Test for diagonalizability of the matrix $A = \begin{bmatrix} 7 & -4 & 0 \\ 8 & -5 & 0 \\ 6 & -6 & 3 \end{bmatrix}$	8	K3	3
13. a) i)	Let T be a linear operator on a finite dimensional inner product space then there exists a unique linear operator T^* on V such that $\langle T(x), y \rangle = \langle x, T^*(y) \rangle$ for every $x, y \in V$.	8	K3	3
ii)	Find the orthogonal basis containing vector $(1, 3, 4)$ for R^3 with standard inner product.	8	K3	3
	(OR)	8	K3	3
b) i)	Let R^3 have the Euclidean inner product. Use Gram-Schmidt process to transform the basis u_1, u_2, u_3 into an orthonormal basis, where $u_1 = (1, 1, 1), u_2 = (0, 1, 1)$ and $u_3 = (0, 0, 1)$.	8	K3	3
ii)	Using Least square approximation determines the best linear fit for the data points $(1, 2), (2, 3), (3, 5)$ and $(4, 7)$.	8	K3	3
14. a)	Solve the following Linear programming problem by graphical method Minimise $z = 5x_1 + 6x_2$ Subject to $2x_1 + 5x_2 \geq 1500$ $3x_1 + x_2 \geq 1200$ $x_1, x_2 \geq 0$	16	K3	4
	(OR)	16	K3	4
b)	Solve the following Linear programming problem by Simplex method. Max $z = 45x_1 + 80x_2$ Subject to $5x_1 + 20x_2 \leq 400$ $10x_1 + 15x_2 \leq 450$ $x_1, x_2 \geq 0$.			

Q. No

15. a)

Find the minimum cost of transportation problem

M BTL CO

16 K2 5

		Origins				
Destination		W_1	W_2	W_3	W_4	Demand
	1	7	4	3	4	15
	2	3	2	7	5	25
	3	4	4	3	7	20
	4	9	7	5	3	40
Capacity		12	8	35	25	

(OR)

- b) Five lathes are to be allotted to five operators (one for each).
The following table gives weekly output figures (in pieces):

16 K2 5

Operator	Weekly output in lathe				
	L_1	L_2	L_3	L_4	L_5
P	20	22	27	32	36
Q	19	23	29	34	40
R	23	28	35	39	34
S	21	24	31	37	42
T	24	28	31	36	41

Find the assignment for the maximum output.

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B.E. Degree Examinations – April/May 2025

Semester: II [Full Time]

Electronics and Communication Engineering

22MA203 – LINEAR ALGEBRA, PARTIAL DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

(Regulations 2022)

Time: 3 Hours

Maximum Marks: 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define null space of a linear transformation.	2	K1	1
2. If $V_3(R)$ is a vector space over the field R , then show that $W = \{(x, 2y, 3z) : x, y, z \in R\}$ is a sub space of $V_3(R)$.	2	K2	1
3. If V be an inner product space and $u, v \in V$ be arbitrary and ' a ' be a scalar, then prove that $\ au\ = a \ u\ $.	2	K3	2
4. Find the least square solution of the system of equations $2x + y = 6$, $x + y = 8$, $-2x + y = 11$, $-x + y = 4$.	2	K2	2
5. Form the partial differential equation from $z = (2x^2 + a)(3y - b)$.	2	K3	3
6. Classify the PDE $(1 + x^2)u_{xx} + (5 + 2x^2)u_{xy} + (4 + x^2)u_{yy} = 0$.	2	K3	3
7. Find the Laplace transform of $f(t) = \sinh \omega t, t \geq 0$.	2	K2	4
8. Find the value of $L[t^2 u_3(t)]$, where $u_3(t)$ is unit step function.	2	K2	4
9. Find the directional derivative of $\phi = x^2 yz + 4xz^2$ at $(1, -2, -1)$ in the direction of $2\vec{i} - \vec{j} - 2\vec{k}$.	2	K2	5
10. If $\vec{F} = (x + 3y)\vec{i} + (y - 2z)\vec{j} + (x + mz)\vec{k}$ is solenoidal, then find the value of m .	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Prove that the vectors $(1,1,1), (0,1,1)$ and $(0,1,-1)$ generate $R^3(R)$.	6	K3	1
ii) Find the matrix representation $T: V_3 \rightarrow V_3$ given by $T(a, b, c) = \{3a + c, -2a + b, a + 2b + 4c\}$ with respect to the basis $(1,0,1), (-1,2,1)$ and $(2,1,1)$.	10	K2	1

(OR)

Q. No	M	BTL	CO
b) i) Show that the mapping $T: V_3(R) \rightarrow V_2(R)$ defined as $8T(x, y, z) = (3x - 2y + z, x - 3y - 2z)$ is a linear transformation from $V_3(R)$ into $V_2(R)$.	8	K3	1
ii) Suppose V is the vector space of all 2×2 matrices over R . Let $T: V \rightarrow V$ be a linear map such that $TX = AX$, where $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$. Find the matrix of T with respect to the ordered basis $B = \{\alpha_1, \alpha_2, \alpha_3, \alpha_4\}$ for V , where $\alpha_1 = \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}, \alpha_2 = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}, \alpha_3 = \begin{bmatrix} 0 & 0 \\ 1 & 0 \end{bmatrix}, \alpha_4 = \begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}$.	8	K2	1
12. a) i) If u and v are vectors in an inner product space then show that $\ u + v\ ^2 + \ u - v\ ^2 = 2(\ u\ ^2 + \ v\ ^2)$.	8	K2	2
ii) If $V(R)$ be a vector space of polynomials with inner product defined by $\langle f, g \rangle = \int_0^1 f(t)g(t)dt$. If $f(x) = x^2 + x - 4$ and $g(x) = x - 1$, then find the value of $\langle f, g \rangle$ and $\ g\ $.	8	K2	2
(OR)			
b) If P_2 be a family of polynomials of degree less than or equal 2, it is define an inner product on $\langle f(x), g(x) \rangle = \int_0^1 f(x)g(x) dx$ and $\{1, x, x^2\}$ be a basis of the inner product space P_2 . Find out an orthonormal basis from this basis.	16	K2	2
13. a) i) Solve $2x^4p^2 - yzq - 3z^2 = 0$.	8	K3	3
ii) Solve $x(y^2 + z)p - y(x^2 + z)q = z(x^2 - y^2)$.	8	K3	3
(OR)			
b) i) Find the complete and singular solution of $z = px + qy + p^2 - q^2$.	8	K3	3
ii) Solve $(D^2 - 5DD' + 6D'^2)z = \sin 4x \cos 3y$.	8	K3	3
14. a) i) Verify the initial and final value theorem for the function $f(t) = 1 + e^{-t}(\sin t + \cos t)$, by Laplace transformation.	8	K3	4
ii) Find the inverse Laplace transform of the function $\frac{1}{(s^2 + a^2)^2}$, using convolution.	8	K2	4
(OR)			
b) i) Find $L^{-1}\left[\frac{1}{s^2(s^2 + 4)}\right]$.	8	K2	4
ii) Solve the initial value problem $y'' + 2y' - 3y = 3$, $y(0) = 4, y'(0) = -7$, by Laplace transform.	8	K3	4

Q. No		M	BTL	CO
15. a)	Verify the Gauss divergence theorem for $\vec{F} = 4xz\vec{i} - y^2\vec{j} + yz\vec{k}$ over the cube bounded by $x = 0, x = 1, y = 0, y = 1, z = 0, z = 1$.	16	K4	5
	(OR)			
b)	Verify Stoke's theorem for a vector field defined by $\vec{F} = (x^2 - y^2)\vec{i} + 2xy\vec{j}$, in the rectangular region in the XOY plane bounded by the lines $x = 0, x = a, y = 0$ and $y = b$.	16	K4	5

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B.E. Degree Examinations - April/May 2025

Semester: II [Full Time]

Electrical and Electronics Engineering

22MA204 - FOURIER SERIES AND TRANSFORMS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. Find the constant term in the expansion of $\cos^2 x$ as a Fourier series in the interval $(-\pi, \pi)$.	2	K1	1
2. Define periodic function with an example.	2	K1	1
3. Classify the Partial differential equation $U_{xy} = U_x U_y + U_x - xy$.	2	K2	2
4. An insulated rod of length $l = 60 \text{ cm}$ has its ends at A and B maintained at 30°C and 40°C respectively. Find the steady state solution.	2	K1	2
5. Find $L[t \sin at]$.	2	K1	3
6. Find the inverse Laplace transform of $\frac{s^2 - 3s + 2}{s^3}$.	2	K1	3
7. State and Prove a Change of scale property in Fourier transforms.	2	K2	4
8. Find the Fourier sine transform of e^{-x} .	2	K1	4
9. Prove that $Z[a^n] = \frac{z}{z-a}$.	2	K2	5
10. Form a difference equation by eliminating the arbitrary constant 'a' from $y_n = a \cdot 3^n$.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) i) Find the Fourier series expansion of $f(x) = \begin{cases} x, & 0 < x \leq \pi \\ 2\pi - x, & \pi \leq x < 2\pi \end{cases}$	8	K1	1
ii) Obtain the half-range cosine series for $f(x) = x$ in $(0, \pi)$	8	K2	1

(OR)

Q. No		M	BTL	CO
b) i)	Find the Fourier series of the periodic function defined by $f(x) = \begin{cases} -\pi, & -\pi < x < 0 \\ x, & 0 < x < \pi \end{cases}$	8	K1	1
ii)	Find the half range sine series of $f(x) = \begin{cases} x, & 0 < x \leq \frac{\pi}{2} \\ \pi - x, & \frac{\pi}{2} \leq x < \pi \end{cases}$	8	K2	1
12. a)	Tightly stretched flexible string has its ends fixed at $x = 0$ and $x = l$ apart. Motion is started by displacing the string in to the form $y = k(lx - x^2)$ from which it is released at time $t = 0$. Find the displacement of any point of the string at a distance of x from one end at time t .	16	K3	2
b)	(OR) An infinitely long rectangular plate with insulated surface is 10 cm wide. The two long edges and one short edge are kept at zero temperature, while the other short edge $x = 0$ is kept at temperature given by $u = \begin{cases} 20y, & 0 \leq y \leq 5 \\ 20(10 - y), & 5 \leq y \leq 10 \end{cases}$, find the steady state temperature distribution in the plate.	16	K3	2
13. a) i)	Find the Laplace transform of periodic function $f(t) = \begin{cases} 1, & 0 < t < 1 \\ 0, & 1 < t < 2 \end{cases}$ and $f(t + 2) = f(t)$ for all t .	8	K2	3
ii)	Find $\int_0^\infty e^{-t} \left(\frac{\cos at - \cos bt}{t} \right) dt$ by using Laplace transform.	8	K3	3
b) i)	(OR) Using convolution theorem, find the inverse Laplace transform of $\left[\frac{s}{(s^2 + 4)(s^2 + 9)} \right]$.	8	K2	3
ii)	Verify Initial and Final value theorem for $f(t) = t^2 e^{-3t}$ in Laplace transform.	8	K3	3
14. a)	Find the Fourier Transform of $f(x) = \begin{cases} a - x , & \text{for } x < a \\ 0, & \text{for } x > a \end{cases}$, hence deduce that $\int_0^\infty \left(\frac{\sin t}{t} \right)^2 dt = \frac{\pi}{2}$ and $\int_0^\infty \left(\frac{\sin t}{t} \right)^4 dt = \frac{\pi}{3}$	16	K3	4
b)	(OR) Find the Fourier cosine transform of $f(x) = e^{-a^2 x^2}$ and hence find the Fourier cosine transform of $e^{-x^2/2}$ and Fourier sine transform of $x e^{-x^2/2}$.	16	K3	4

Q. No

		M	BTL	CO
15. a)	i) Find the Z-transforms of $r^n \cos n\theta$ and $r^n \sin n\theta$.	8	K3	5
	ii) Using convolution theorem, find the inverse Z-transform of $\frac{14z^2}{(7z-1)(2z-1)}$.	8	K3	5
(OR)				
b)	i) Find the Z- transform of $\frac{1}{(n+1)(n+2)}$.	8	K3	5
	ii) Using the Z-transforms solve the difference equation $y_{n+2} - 3y_{n+1} + 2y_n = 2^n$, given that $y_0 = y_1 = 0$.	8	K3	5

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B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time] / II [Part Time]

Electrical and Electronics Engineering

18EE402/22PTEE202/23PTEE202 – SYNCHRONOUS AND INDUCTION MACHINES
(Regulations 2018/2018A/2022/2023)

Time : 3 Hours

PART A (10 x 2 = 20 Marks)

Maximum Marks : 100

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. Write the EMF equation of an alternator.	2	K2	1
2. Name the types of rotors used in alternators.	2	K1	1
3. Write the equation for torque developed in a synchronous motor.	2	K2	2
4. What are the probable reasons for the hunting effect to occur in synchronous motor operation?	2	K2	2
5. Why the squirrel cage rotor slots are usually not quite parallel to the shaft but are purposely given a slight skew in induction motor construction?	2	K2	3
6. List few applications of three phase induction motor.	2	K1	4
7. Write the condition for maximum torque under running condition in a three phase induction motor.	2	K2	4
8. Define slip of an induction motor.	2	K1	4
9. Why single phase induction motors are not self-starting?	2	K2	5
10. Write the drawbacks of Split phase induction motor.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) Explain the determination of direct (d) and quadrature (q) axis synchronous reactance using slip test.	16	K4	1
(OR)			
b) i) Derive the EMF equation of alternator.	8	K4	1
ii) The stator of a 3-phase, 16-pole alternator has 144 slots and there are 4 conductors per slot connected in two layers and the conductors of each phase are connected in series. If the speed of the alternator is 375 RPM, calculate the EMF induced per phase. Resultant flux in the air-gap is 5×10^{-2} webers per pole sinusoidally distributed. Assume the coil span as 150° electrical.	8	K4	1

Q. No		M	BTL	CO
12. a)	Describe in detail the construction and working of Synchronous motor.	16	K2	2
	(OR)			
b) i)	Explain briefly the starting methods of synchronous motor.	8	K2	2
ii)	Discuss in brief the hunting effect and the methods of preventing it in synchronous motor operation.	8	K2	2
13. a)	Explain in detail the construction and working of three phase induction motor.	16	K2	3
	(OR)			
b) i)	Describe the working of auto transformer starter with neat sketch.	8	K2	3
ii)	A 3-phase, 6-pole, 50-Hz induction motor when fully-loaded, runs with a slip of 3 %. Find the value of the resistance necessary in series per phase of the rotor to reduce the speed by 10 %. Assume that the resistance of the rotor per phase is 0.2 ohm.	8	K2	6
14. a)	Explain in detail about the blocked rotor test conducted in the three phase induction motor.	16	K4	4
	(OR)			
b) i)	Draw and explain the Torque-Slip characteristics of three phase induction motor.	8	K4	4
ii)	An 8-pole induction motor is operated at a supply frequency of 50-Hz and the shaft speed of 735 RPM. Determine (a) synchronous speed (b) speed of slip (c) per unit slip (d) percentage slip.	8	K4	6
15. a) i)	Explain the double field revolving theory of single phase induction motor.	8	K2	5
ii)	Obtain the simplified equivalent circuit of single phase induction motor.	8	K2	5
	(OR)			
b) i)	Discuss in brief the working of Capacitor start and Capacitor run induction motor.	8	K2	5
ii)	Explain the working of shaded pole induction motor. Point out the advantages and disadvantages of shaded pole induction motor.	8	K2	5

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B.E. Degree Examinations - April/May 2025

Semester: IV [Full Time]

Mechanical Engineering

18ME405 - MATERIALS ENGINEERING

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. State Gibbs phase rule.	2	K1	1
2. Distinguish between hypo-eutectoid steels and hyper-eutectoid steels.	2	K2	1
3. List the various stages of a heat treatment process.	2	K1	2
4. Mention few applications of induction hardening system.	2	K2	2
5. How does plasma spraying differ from other coating methods like electroplating?	2	K2	3
6. What is the primary function of the particles in a particulate-reinforced composite?	2	K1	3
7. Draw a typical creep curve for ductile metal and explain the regions.	2	K2	4
8. Draw a typical load versus percentage elongation curve for ductile material and explain the tensile properties.	2	K2	4
9. Differentiate film and filmless techniques in radiography	2	K2	5
10. Enlist the main advantage of using diffusion techniques for surface treatments.	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Draw Iron-iron carbide equilibrium diagram and mark on it all salient temperatures, composition fields and invariant reactions with reference to a phase diagram.	16	K2	1
(OR)			
b) Classify different types of steel and cast iron and explain the microstructure, properties and applications in detail.	16	K2	1

Q. No		M	BTL	CO
12. a)	Explain your understanding on various phases and the cooling curves superimposed on I.T. diagram. Why it is important?	16	K3	2
	(OR)			
b)	With a diagram, explain the principle and procedure of Jominy end quench test and also sketch the graph hardness Vs distance from quenched end. Justify its reliability.	16	K3	2
13. a)	List and explain the properties and applications of any four types of ceramics.	16	K2	3
	(OR)			
b)	Explain the working principle of Chemical Vapor Deposition (CVD). Discuss the factors affecting the deposition rate and quality of films produced by CVD.	16	K2	3
14. a)	What is meant by Plastic deformation? Discuss the role of slip and twinning in plastic deformation of materials in detail with a neat sketches.	16	K2	4
	(OR)			
b)	Sketch and describe the following hardness tests: i) Brinell ii) Vickers.	16	K2	4
15. a)	Describe the procedure for Magnetic particle testing with suitable case study.	16	K3	5
	(OR)			
b)	Discuss the principles of liquid penetrant testing with a neat sketch and how LPT is used to detect the defects in welded component? -Discuss.	16	K3	5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Metallurgical Engineering

22MTPE63 – POWDER METALLURGY

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What are the major characteristics of metal powders?	2	K2	1
2. List two methods commonly used to determine the size of powder particles.	2	K1	1
3. What is the difference between mixing and blending of powders?	2	K2	2
4. Classify different powder production methods.	2	K1	2
5. List any three desired characteristics of binders used in powder compaction.	2	K2	3
6. List any two advantages of double ended compaction methods.	2	K1	3
7. List the driving force and material transport mechanisms for various types of sintering.	2	K3	4
8. Differentiate between sizing and coining.	2	K2	4
9. What are the factors to be considered while designing the powder metallurgy components?	2	K2	5
10. Write any two advantages of powder metallurgy processes.	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Define the terms green density and sintered compact density. Also mention their significance.	8	K3	1
ii) Explain the principle involved in sieve analysis.	8	K4	1
(OR)			
b) i) Briefly explain any two methods used for determining the particle size of powders.	8	K4	1
ii) Describe the importance and purpose of powder characterization.	8	K3	1

Q. No		M	BTL	CO
12. a)	Explain the following processes in detail. (i) Carbonyl reduction and (ii) Electro deposition process in detail (OR)	16	K4	2
b)	With sketches, explain the mechanism and process parameters involved in atomization technique. Give the characteristics of powders produced by the above technique with examples.	16	K4	2
13. a)	Explain the process and stages of pressure less compaction in which powder particles are consolidated using a plaster of Paris mould. (OR)	16	K3	3
b)	Explain with neat sketches the steps involved in cold isostatic compaction. Also list their advantages and applications.	16	K3	3
14. a)	Describe the hot Isostatic pressing process with neat sketch. (OR)	16	K2	4 ○
b)	Discuss the various stages in solid state sintering. Give the thermodynamic relationship between surface energy and surface area during sintering.	16	K2	4
15. a)	i) Explain the various types of self lubricating bearings with their constituents in detail.	8	K1	5
	ii) With a flow chart, explain the various constituents and steps in the production cemented carbide tool tips. (OR)	8	K1	5
b)	i) Discuss the significance of powder metallurgy components in nuclear and automobile industries.	8	K1	5
	ii) With a neat flow chart, explain the typical composition and production of tungsten carbide tool tips	8	K1	5 ○

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations - April/May 2025

Semester: I [Part Time]

Electronics and Communication Engineering

23PTEC101 - SEMICONDUCTOR DEVICES AND CIRCUITS
(Regulations 2023)

Time : 3 Hours

PART A (10 x 2 = 20 Marks)

Maximum Marks : 100

Answer **ALL** Questions

Q. No

1. Draw the energy band diagram for a PN junction.
2. Write the working principle and uses of photo diode.
3. What is the need for filters in power supplies?
4. Determine V_o for the network of Fig.1 for which the Input waveform given in Fig.2. Assume the diode is ideal.

M	BTL	CO
2	K1	1
2	K2	1
2	K2	2
2	K3	2

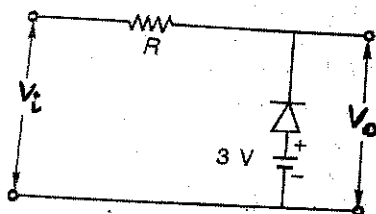


Fig.1

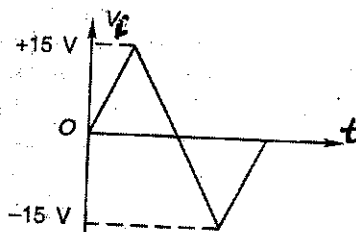


Fig.2

5. Find the values of β that correspond to α values of 0.5 and 0.95.
6. Define forward current gain.
7. Mention the reasons why a hybrid parameter model is used in small signal analysis.
8. Draw the general shape of frequency response of amplifiers.
9. What is crossover distortion and how to eliminate it in power amplifiers?
10. An amplifier has a midband gain of 125 and a bandwidth of 250 kHz. If 4 % negative feedback is introduced, find the new bandwidth and gain.

2	K3	3
2	K1	3
2	K2	4
2	K1	4
2	K2	5
2	K3	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
11. a)	i) Outline the charge carrier diffusion phenomenon across a PN junction. Explain the effect of forward and reverse biasing on the depletion region.	10	K3	1
	ii) Write about avalanche and Zener breakdown.	6	K1	1
	(OR)			
b) i)	With neat sketches, explain in detail how the negative resistance characteristics occur in the Tunnel diode.	10	K3	1
	ii) Give an account on diffusion capacitance in a PN junction Diode.	6	K1	1
12. a)	With neat sketches, explain the operation of a Half-wave rectifier circuit and also derive the expressions for ripple factor, efficiency, Transformer Utilization Factor (TUF) and Peak Inverse Voltage (PIV).	16	K3	2
	(OR)			
b)	Design and draw a Zener diode regulator circuit to meet the following specifications. Load voltage = 8 V Input voltage = 30 V Load current = 0 – 50 mA $I_{Zmin} = 5 \text{ mA}$ $P_Z = 1 \text{ watt}$	16	K3	2
13. a)	i) Explain the device structure and operation of NPN transistor and also derive for various currents and gains associated with it.	10	K2	3
	ii) Discuss the input and output characteristics of a transistor in CE configuration.	6	K1	3
	(OR)			
b) i)	Explain the device structure and physical operation of MOSFET.	10	K2	3
	ii) Write short notes on the biasing schemes for MOSFET.	6	K1	3
14. a)	i) Derive the low frequency response of common source amplifier.	10	K2	4

Q. No		M	BTL	CO
	ii) Discuss the effect of coupling, bypass and internal capacitance on the frequency response of amplifiers.	6	K4	4
	(OR)			
b) i)	How will you calculate the overall upper and lower cutoff frequencies of a multistage amplifier?	10	K2	4
	ii) Analyze the low and high frequency model of BJT and MOSFET.	6	K4	4
15. a) i)	Draw the circuit of class B push-pull power amplifier and explain its operation with suitable waveforms. Compare its performance with class A power amplifier.	10	K3	5
	ii) Derive the expression for maximum efficiency of class B power amplifier.	6	K3	5
	(OR)			
b) i)	With proper mathematical derivations, prove that bandwidth increases and voltage gain decreases in a negative feedback amplifier. Assume a series shunt feedback scheme.	10	K3	5
	ii) With block diagram of voltage series feedback, derive the expression for Rif.	6	K3	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Mechanical Engineering

12ME605 – DESIGN OF TRANSMISSION SYSTEMS

(Regulations 2012)

(Use Of Psg Design Data Books Is Permitted)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

1. While designing a wire rope drive, always, a larger sleeve diameter is preferred justify the statement?
2. What type of belt would you prefer if the center distance between the pulleys is small?
3. In a pair of spur gears, the module is 6 mm. Determine the circular pitch and the diametral pitch.
4. Why is the crossed helical gear drive mostly not used for power transmission?
5. Differentiate a straight bevel gear and spiral bevel gear.
6. Why is the non-ferrous material used for worm wheel?
7. List out the possible arrangement to achieve 16 speed gear box.
8. State any three basic rules to be followed while designing a gear box.
9. Clutches are usually designed on the basic of uniform wear, why?
10. What do you mean by self-energizing brakes?

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

11. a) A crane is lifting a load of 18 kN through a wire rope and a hook. The weight of the hook is 10 kN. The load is to be lifted with an acceleration of 1 m/sec². Calculate the diameter of the wire rope. The rope diameter may be taken as 30 times the diameter of the rope. Take a factor of safety of 6 and Young's modulus for the wire rope 0.8×10^5 N/mm². The ultimate stress may be taken as 1800 N/mm². The cross-sectional area of the wire rope may be taken as 0.38 times the square of the wire rope diameter.

M

(16)

(OR)

Q. No

- b) Design a belt drive to transmit 20 kW at 720 rpm aluminum rolling machine, the speed ratio being 3. The distance between the pulleys is 3 m. Diameter of rolling machine pulley is 1.2 m. (16)

12. a) Design a spur gear drive required to transmit 45 kW at pinion speed of 800 rpm. The velocity ratio 3.5:1. The teeth are 20 full depths involute with 18 teeth on the pinion. Both the pinion gear is made of steel with a maximum safe static stress of 180 N/mm^2 . (16)

(OR)

- b) A helical gear drive with the helix angle of 30 degree required to transmit 15 kW at pinion speed of 10000 rpm. The velocity ratio 4:1. The teeth are 20 degree full depth involute with 25 teeth on the pinion. Both the pinion gear is made of hardened steel with a maximum safe static stress of 100 N/mm^2 . The face width may be taken as 14 times the module. Find the module and face width. (16)

13. a) Design a worm gear drive with a standard centre distance to transmit 7.5 kW from a worm rotating at 1440 rpm to a worm wheel at 20 rpm. (16)

(OR)

- b) Design a bevel gear drive to transmit 3.5 kW with the following specifications: speed ratio = 4; driving shaft speed = 200 r.p.m.; drive is non-reversible; material for pinion is steel; material for wheel is cast iron; and life 25000 hours. (16)

14. a) A gearbox is to be designed to provide 12 output speeds ranging from 160 to 200 rpm. The input speed of motor is 1600 rpm. Choosing a standard speed ratio construct the speed diagram and the kinematic arrangement and calculate the number of teeth of all gears. (16)

(OR)

- b) A machine tool gear box is to have 9 speeds. The gear box is driven by an electric motor whose shaft rotational speed is 1400 r.p.m. The gear box is connected to the motor by a belt drive. The maximum and minimum speeds required at the gear box output are 1000 r.p.m. and 200 r.p.m. respectively. Suitable speed reduction can also be provided in the belt drive. What is the step ratio and what are the values of 9 speeds? Sketch the arrangement. Obtain the number of teeth on each gear and also the actual output speeds. (16)

Q. No

M

15. a) A multi - disk clutch has 3 disks on the driving shaft and two on the driven shaft. The inner and outer diameters of friction disks are 120 mm and 240 mm respectively. The coefficient of friction is 0.3 and find the maximum axial intensity of pressure between the discs for transmitting 25 kW at 1575 rpm .Assuming the uniform wear theory. (16)

(OR)

- b) In a band and block brake, the band is lined with 14 blocks, each of which subtends an angle of 20 degrees at the drum centre. One end of band is attached to the function of the brake lever and the other to a pin 150 mm from the fulcrum. Find the force required at the end of the lever 1 m long from the fulcrum to give a torque of 4 kN-m. The diameter of the brake drum is 1m and the co-efficient of friction between the blocks and the drum is 0.25. (16)

Registration Number:

Government College of Engineering, Salem
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B.E. Degree Examinations - April/May 2025

Semester: III [Full Time]

Civil Engineering

22EN301 - TECHNICAL ENGLISH

(Regulations 2022)

Time: 3 Hours

Maximum Marks: 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. Write short note on minutes of meeting.	2	K1	1
2. Outline the structure of report writing.	2	K2	1
3. What is the difference between coherence and cohesion in writing?	2	K2	2
4. Complete the following conditional clauses: a) _____, I would have given it to him. b) If they performed well in interview, _____.	2	K3	2
5. How is self-development and assessment important for goal attainment?	2	K1	3
6. What is career planning?	2	K1	3
7. Why is vote of thanks important in a function?	2	K1	4
8. Write any two telephone etiquette.	2	K3	4
9. Suggest any two body language expressions in an oral presentation.	2	K3	5
10. Write short note on Group Discussion.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) i) What are the barriers to effective communication? Explain in detail.	8	K1	2
ii) Mention the various characteristic features of business letters.	8	K1	1
(OR)			
b) i) What is report writing? Write a progress report on your current project in a company.	8	K1	1
ii) Explain the steps involved in the process of communication in detail.	8	K1	2

Q. No	M	BTL	CO
12. a) i)	8	K3	2

12. a) i) Fill in the blanks with appropriate verb forms given in brackets.

- 1) He _____ that quality is important in his restaurants.
(is believing / believes / was believing)
- 2) We _____ on a big project at the moment.
(work / are working / have been working)
- 3) They _____ for a new sales executive at present.
(advertise / have advertised / are advertising)
- 4) I _____ that the new software is a big mistake.
(thought / think / am thinking)
- 5) Google _____ as a research project by two students at Stanford University, California.
(begin / began / begun)
- 6) I _____ the news about the merger of the company yesterday.
(hear / was hearing / heard)
- 7) The answer came to his mind when he _____ rest.
(was taking / took / is taking)
- 8) The refreshments _____ while he was taking seminar.
(have arrived / were arrived / arrived).

8 K3 2

ii) Fill in the blanks with suitable articles.

Inter Globe Aviation Limited, doing business as IndiGo, is _____ Indian low-cost airline headquartered in Haryana, India. It is _____ largest airline in India by passengers carried and fleet size. It is the largest individual Asian airline, and one of _____ largest in _____ world in terms of passengers carried, with more than 100 million passengers carried in 2023. It has its primary hub at Indira Gandhi International Airport, Delhi. The airline operates _____ single type of aircraft in similar seating configuration which simplifies crew training and maintenance. The airline was founded as _____ private company by Rahul Bhatia of Inter Globe Enterprises and Rakesh Gangwal in 2006. It took delivery of its first aircraft in July 2006 and commenced operations _____ month later. _____ company went public in November 2015.

(OR)

Q. No

M	BTL	CO
8	K3	2

- b) i) Fill in the blanks with suitable prepositions.

Larsen & Toubro is an Indian multinational engaged _____ EPC Projects, Hi-Tech Manufacturing and Services. A strong, customer-focused approach and the constant quest _____ top-class quality have enabled L&T _____ attain and sustain leadership in its major lines of business for over eight decades. Every aspect _____ L&T's businesses is characterized _____ professionalism and high standards _____ corporate governance. The company's manufacturing footprint extends across eight countries _____ addition to India. L & T has several international offices and a supply chain that extends _____ the globe.

- ii) Fill in the blanks with appropriate phrasal verbs given in brackets.

8	K3	2

- 1) Parents have a bigger role to _____ their children.

(bring about / bring up / bring down)

- 2) The Prime Minister of Indian _____ Tamil Nadu yesterday.

(called off / called in / called on)

- 3) His eldest son Ramu _____ his father's traditions.

(carries on / carries away / carries off)

- 4) It is not possible to _____ any exam without hard work.

(get away / get over / get through)

- 5) They lit a fire to _____ wild animals.

(keep off / keep on / keep up)

- 6) A committee was set up to _____ the issue of child labour.

(look for / look into / look up)

- 7) The meeting has to be _____ because the manager can't attend.

put off / put on / put out)

- 8) His name has been _____ from the selection list.

(struck down / struck off / struck on)

Q. No		M	BTL	CO
13. a)	i) What are the best strategies for accomplishing goals?	8	K3	3
	ii) Mention the dos and don'ts in email writing.	8	K3	1
	(OR)			
b) i)	What are the elements of career planning? Explain them briefly.	8	K3	3
	ii) Explain good work habits and ethical behavior in the workplace.	8	K3	3
14. a) i)	Suggest any eight ways to improve your speaking skill.	8	K4	4
	ii) State the essential rules of telephone etiquette.	8	K4	4
	(OR)			
b) i)	Discuss the significance of non-verbal communication.	8	K4	2
	ii) Prepare script to propose welcome address for a national seminar in your college.	8	K4	3
15. a) i)	How to prepare for a job interview? Discuss in detail.	8	K4	5
	ii) How do you adapt your presentation style for different types of audiences?	8	K4	3
	(OR)			
b) i)	State the dos and don'ts of a PowerPoint presentation.	8	K4	3
	ii) Imagine you are participating in a group discussion on "Artificial Intelligence and Job Displacement". State any eight points to contribute in the group discussion with suitable phrases.	8	K4	5

Registration Number:

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: V [Full Time]/VI [Part Time]

Civil Engineering

**22CE505 – WASTE WATER ENGINEERING/
22PTCE601– ENVIRONMENTAL ENGINEERING - II**
(Regulations 2022)

Time: 3 Hours

PART A (10 x 2 = 20 Marks)

Maximum Marks: 100

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. Define: self-cleansing velocities.	2	K1	1
2. List out the sewer appurtenances.	2	K1	1
3. Compare BOD and COD.	2	K2	2
4. What is the function of primary settling?	2	K1	2
5. What is hydraulic loading rate of a trickling filter?	2	K1	3
6. Recall which phenomenon takes place in oxidation ditch.	2	K1	3
7. What is sludge digestion?	2	K1	4
8. Summarize the objectives of sludge thickening and its method.	2	K2	4
9. What is sewage farming?	2	K1	5
10. List the various reclamation techniques.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) i) Write down the procedure for laying and testing of sewer lines with neat diagram.	8	K1	1
ii) Illustrate the various types of pumps.	8	K2	1
(OR)			
b) i) Recall the systems of sewerage with its merits and demerits.	8	K1	1
ii) Outline the various joints used for sewer.	8	K2	1

Q. No		M	BTL	CO
12. a)	Elaborate various physic-chemical characteristics of sewage and state their environmental significance.	16	K4	2
	(OR)			
b)	Design a suitable rectangular sedimentation tank (provided with mechanical cleaning equipment) for treating the sewage from a city, provided with an assured public water supply system with a maximum daily demand of 14 million litres per day. Detention period is 1 hour and velocity of flow in the tank is 0.6 m per minute. Assume suitable values wherever need.	16	K4	2
13. a)	i) Explain the working principle of oxidation ditch and draw the typical process flow diagram.	8	K2	3
	ii) Summarize lagoons.	8	K2	3
	(OR)			
b) i)	Summarize the working condition of Oxidation Pond with reference to their principle, efficiency, advantages and disadvantages.	8	K2	3
	ii) Illustrate Septic tank in detail.	8	K2	3
14. a)	i) Show sludge drying beds with neat sketch and write its functions.	8	K1	4
	ii) What are waste stabilization ponds? Explain the working principle of aerobic stabilization pond.	8	K1	4
	(OR)			
b) i)	Write about working mechanism in sludge digestion tank with sketches.	8	K1	4
	ii) How do use the sanitary fixtures and fitting in sludge management?	8	K1	4
15. a)	i) What is sewage farming? List the methods and state its advantages over the method of disposal of sewage dilution.	8	K1	5
	ii) Outline wastewater reclamation techniques.	8	K2	5
	(OR)			
b) i)	Illustrate oxygen sag curve and its importance.	8	K1	5
	ii) How can recycle and reuse of wastewater?	8	K2	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VII [Full Time]

Civil Engineering

18CE602 – FOUNDATION ENGINEERING

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. Compare disturbed and un-disturbed samples.	2	K2	1
2. List the limitations of Static Cone Penetration Test.	2	K1	1
3. Identify the causes of differential settlement.	2	K2	2
4. Compare safe bearing capacity and allowable bearing capacity.	2	K2	2
5. State the methods of pile driving.	2	K2	3
6. Write about group action of piles.	2	K1	3
7. State the causes for failure of slope.	2	K2	4
8. List the method of analysis for stability of a finite slope.	2	K1	4
9. outline the assumptions made in Rankine's theory.	2	K2	5
10. How the stability conditions to be checked for the Retaining Wall.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) i) Outline the various types of boring with neat sketches.	8	K2	1
ii) Explain the various factors affecting quality of samples.	8	K2	1
(OR)			
b) i) Explain the selection of Foundation based on soil condition.	8	K2	1
ii) Interpret the floating foundation different from a traditional shallow foundation.	8	K2	1
12. a) i) A square footing 2.5 m X 2.5 m is built in a homogeneous bed of sand of unit weight 20 kN/m ³ and having an angle of shearing resistance of 36°. The depth of the base of footing is 1.5 m below the ground surface. Determine the safe load that can be carried by a footing with a factor of safety of 3 against complete shear failure. Use Terzaghi's analysis.	8	K4	2

Q. No		M	BTL	CO
	ii) Explain in detail the load settlement curves obtained by Plate Load Test for various types of soil. (OR)	8	K2	2
b) i)	Explain in detail the characteristics of immediate settlement and consolidation settlement.	8	K2	2
	ii) An RCC foundation of size 18 m x 36 m has a uniform pressure of 180 kN/m ² on a soil mass with modulus of elasticity 45 kN/m ² . Determine the immediate settlement of the foundation. Assume poisson's ratio as 0.5.	8	K4	2
13. a) i)	A wooden pile is being driven with a drop hammer weighing 20 kN having a free fall of 1 m. The penetration in the last blow is 5 mm. Determine the load carrying capacity using Engineering News formula.	8	K2	3
	ii) Explain the type of Pile and their functions. (OR)	8	K2	3
b) i)	Explain the estimation of the magnitude of negative skin friction in both clayey and sandy soils.	8	K2	3
	ii) Explain the construction of Under-Reamed Piles.	8	K2	3
14. a) i)	Explain the Swedish slip Circle method of Analysis of slopes.	8	K2	4
	ii) Illustrate the friction Circle method of analysis of stability of slopes. (OR)	8	K2	4
b) i)	Explain with a neat sketch the slope failure mechanisms.	8	K2	4
	ii) Describe the methods of slope protection measures.	8	K2	4
15. a)	A smooth rigid retaining wall of 6 m high carries a uniform surcharge load of 12 kN/m ² . The backfill is clayey sand possessing the following properties. $\gamma = 16.0 \text{ kN/m}^3$, $\phi = 25^\circ$, and $c = 6.5 \text{ kN/m}^2$ for a retaining wall system, the following data were available: (i) Height of wall = 7 m. (ii) Properties of backfill: $\gamma_d = 16 \text{ kN/m}^3$, $\phi = 35^\circ$ (iii) Angle of wall friction, $\delta = 20^\circ$ (iv) Back of wall is inclined at 20° to the vertical (positive batter) (v) Backfill surface is sloping at 1:10. Determine the (i) Active earth pressure (ii) Passive earth pressure. (OR)	16	K3	5
b) i)	Construct a sketch and explain Coulomb's Wedge Theory for soil pressure distribution.	8	K3	5
	ii) Interpret the plastic equilibrium of soils.	8	K3	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations - April/May 2025

Semester: III [Full Time]

Electronics and Communication Engineering

22EC305 - ANALOG COMMUNICATION

(Regulations 2022)

Time : 3 Hours

PART A (10 x 2 = 20 Marks)

Maximum Marks : 100

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. How can you obtain a DSB-SC signal?	2	K1	1
2. Determine depth of modulation of the carrier amplitude after AM varies between 4 volts and 1 volt.	2	K3	1
3. What is carson's rule?	2	K1	2
4. Distinguish between wideband FM and Narrow band FM.	2	K3	2
5. An amplifier has a bandwidth of 4 MHz with input resistance of 10 K Ω . Calculate noise voltage of an amplifier if room temperature is 25°C.	2	K3	3
6. Determine the overall noise figure of a two stage cascaded amplifier if each stage has a gain of 10 dB and noise figure of 10 dB.	2	K3	3
7. Recall the FM threshold effect.	2	K1	4
8. Compare the AM and FM noise receivers.	2	K3	4
9. Determine the amount of information if it is given that $P(X_i) = \frac{1}{4}$.	2	K3	5
10. Tell about the Shannon's theorem. How is it achieved?	2	K3	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) i) Explain how the ring modulator for generation of DSB-SC wave acts as a demodulator.	8	K2	1
ii) Draw the block diagram of phase cancellation of SSB generation and explain how the carrier and the unwanted sidebands are suppressed?	8	K3	1
(OR)			
b) i) Explain in details about frequency translation and mixing.	8	K2	1
ii) Write short notes on principle of VSB transmission and application with relative frequency spectrum.	8	K3	1

Q. No	M	BTL	CO																
12. a) i) Construct the circuit diagram of varactor diode modulator and its working.	8	K1	2																
ii) Explain the operation of wideband FM transmitter based on Armstrong method.	8	K2	2																
(OR)																			
b) i) Draw and explain the block diagram of balance frequency discriminator for demodulation of FM signal.	8	K1	2																
ii) Explain the concepts of PLL-FM demodulator.	8	K2	2																
13. a) i) Write short notes on Thermal noise and Shot noise.	8	K1	3																
ii) Evaluate the overall noise figure of the two individual stages of amplifier is 2.16 and 1.58 respectively. The available power gain of first stage is 62.	8	K3	3																
(OR)																			
b) i) Derive the expression for figure of merit for the DSB-SC receiver.	8	K1	3																
ii) Derive the expression for SNR_o , SNR_c and figure of merit for the SSB receiver. Compare it with receiver PSB-SC.	8	K3	3																
14. a) Develop Pre-emphasis and De-emphasis circuit in FM in detail.	16	K1	4																
(OR)																			
b) Explain the concepts of analysis of noise performance in AM receiver.	16	K1	4																
15. a) i) A discrete memory less source has an alphabet of seven symbols whose probabilities occurrence are as under:	10	K4	5																
<table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>Symbol</th> <th>S_0</th> <th>S_1</th> <th>S_2</th> <th>S_3</th> <th>S_4</th> <th>S_5</th> <th>S_6</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>0.25</td> <td>0.25</td> <td>0.125</td> <td>0.125</td> <td>0.125</td> <td>0.0625</td> <td>0.0625</td> </tr> </tbody> </table>				Symbol	S_0	S_1	S_2	S_3	S_4	S_5	S_6	Probability	0.25	0.25	0.125	0.125	0.125	0.0625	0.0625
Symbol	S_0	S_1	S_2	S_3	S_4	S_5	S_6												
Probability	0.25	0.25	0.125	0.125	0.125	0.0625	0.0625												
Determine the Huffman code for the above source.																			
ii) Develop Shannon - Fano code for five messages given by probabilities $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}, \frac{1}{16}$. Calculate the average number of bits/message.	6	K4	5																
(OR)																			
b) i) An event has six possible outcomes with probabilities $P_1=\frac{1}{2}, P_2=\frac{1}{4}, P_3=\frac{1}{8}, P_4=\frac{1}{16}, P_5=\frac{1}{32}$ and $P_6=\frac{1}{32}$. Find the entropy of the system. Also find the rate of information if there are 16 outcomes per second.	10	K4	5																
ii) A channel has a bandwidth of 8KHz, what is channel capacity if SNR being 31. For same channel capacity, if SNR is increased to 61, then what will be the new channel bandwidth?	6	K4	5																

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: III & IV [Full Time]

Electrical and Electronics Engineering

22EE305/18EE401 – SIGNALS AND SYSTEMS

(Regulations 2022/2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. Define systems.	2	K1	1
2. Distinguish between energy and power signals.	2	K2	1
3. What is meant by state of a system?	2	K1	2
4. Give the condition for stable LTI system.	2	K2	2
5. State Parseval's theorem.	2	K3	3
6. What are poles and zeros?	2	K1	3
7. What is convolution?	2	K1	4
8. Give the formula for inverse of Z transform.	2	K2	5
9. State sampling theorem.	2	K3	6
10. How aliasing could be prevented?	2	K2	6

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) Discuss on the properties: Additivity and Homogeneity, shift invariance and realizability of a system. (OR)	16	K2	1
b) Elaborate with examples on the 4 basic signals.	16	K3	1
12. a) How do you represent a system using difference equations and differential equations? (OR)	16	K2	2
b) Elaborate on state transition matrix and its role.	16	K3	2
13. a) Discuss the fourier series representation using symmetry of signal. (OR)	16	K2	3
b) Derive the relation between Laplace transform and fourier transform.	16	K3	3

Q. No		M	BTL	CO
14. a)	Find the Z transform of $y(n) = 2^n u(n-1)$.	16	K3	4
	(OR)			
b)	Explain the properties of Z transform with examples.	16	K3	4
15. a)	Elaborate on zero order hold sampling.	16	K2	5
	(OR)			
b)	What is reconstruction? Explain on ideal interpolator.	16	K2	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: II [Full Time]

Metallurgical Engineering

18EE203 – BASIC ELECTRICAL ENGINEERING FOR METALLURGY

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. Define ideal voltage and current sources.	2	K1	1
2. Define time constant in RL circuit.	2	K1	1
3. Given an electrical system with an apparent power of 1200 VA and a real power of 900 W, calculate the reactive power.	2	K3	2
4. Mention the condition for resonance of a RLC circuit.	2	K2	2
5. List the characteristics of ideal transformer.	2	K1	3
6. What are the advantages of autotransformer?	2	K2	3
7. Why dc shunt motor is called as constant speed motor?	2	K2	4
8. Classify single phase induction motor.	2	K1	4
9. Define earthing and give its importance.	2	K1	5
10. What is the function of a Miniature Circuit Breaker (MCB)?	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) i) Twenty lamps are connected in series, each having a resistance of 25 Ω . Determine the total resistance of the set of lamps and the current drawn from a 230 V supply.	4	K3	1
ii) Use Krichhoff's law to find the current through the 5 Ω resistor in Fig.1.	12	K3	1

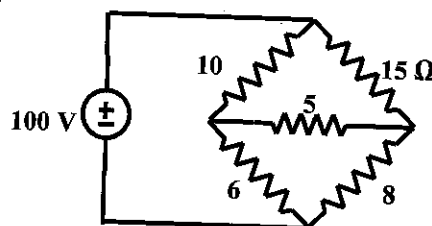


Fig.1

Q. No

M BTL CO

(OR)

- b) i) Find the current I flowing through the circuit shown in Fig.2.

8 K3 1

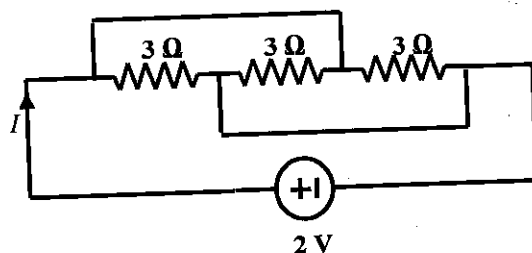


Fig.2

- ii) Using Superposition theorem, find the current through $0.1\ \Omega$ resistor in Fig.3.

8 K3 1

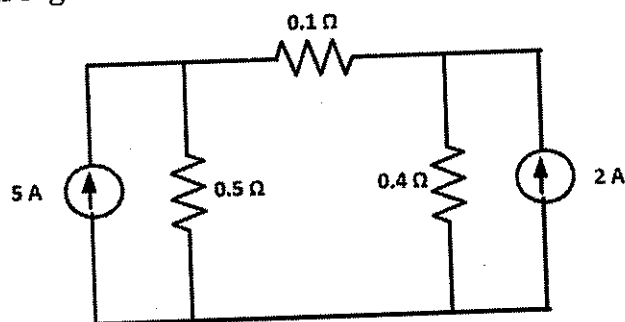


Fig.3

12. a) i) Analyze a single-phase AC circuit consisting of R and L in series. Obtain the expression to find the impedance, phase angle, and power factor.

8 K2 2

- ii) Two impedances $(15 - j10)\ \Omega$ and $(10 + j15)\ \Omega$ are connected in parallel. The supply voltage is 200 V , 50 Hz . Calculate the total impedance and admittance of the circuit. Also find the current and power dissipated.

8 K3 2

(OR)

- b) i) Deduce the expression for voltage and current relationships in a three-phase star connected system phasor diagram.

8 K3 2

- ii) Derive the expression for the average and RMS value of a sinusoidal AC waveform.

8 K2 2

13. a) i) Derive the approximate equivalent circuit of a single phase transformer.

10 K2 3

- ii) Discuss the various losses occurred in transformers and explain how they affect efficiency.

6 K2 3

(OR)

Q. No		M	BTL	CO
b) i)	With suitable phasor diagrams, derive the expression of regulation of a transformer of (a) UPF load and (b) lagging PF load.	10	K2	3
ii)	Derive the expression for the condition of maximum efficiency in a transformer.	6	K2	3
14. a)	Explain the construction and working principle of a three-phase induction motor.	16	K2	4
	(OR)			
b)	Explain the working and speed control of DC shunt motor.	16	K2	4
15. a)	Discuss the different types of wires and cables used in electrical installations and their applications.	16	K3	5
	(OR)			
b)	Perform elementary calculations for energy consumption in a residential setup and suggest methods for power factor improvement.	16	K3	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: III [Part Time]

Electrical and Electronics Engineering

22PTEE302 – LINEAR INTEGRATED CIRCUITS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What are the limitations of integrated circuits?	2	K2	1
2. Write the different IC package configurations.	2	K1	1
3. Define slew rate.	2	K1	2
4. List the applications of differentiator.	2	K1	2
5. What is the need for an instrumentation amplifier?	2	K2	3
6. List the advantages of dual slope ADC.	2	K2	3
7. What is a function of reset pin 4 in 555 timer?	2	K2	4
8. Mention the applications of analog multiplier IC.	2	K1	4
9. List four major components of the switching regulator.	2	K1	5
10. Mention the features of opto coupler ICs.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Explain how silicon wafers are prepared in IC fabrication process.	8	K1	1
ii) Discuss the photolithography process with neat diagram.	8	K1	1
(OR)			
b) i) Explain the various isolation techniques used in ICs.	8	K1	1
ii) Explain the fabrication of PN junction diode with neat diagram.	8	K1	1
12. a) i) List and explain the DC characteristics of op-amp.	8	K3	2
ii) Discuss voltage shunt and series feedback amplifier.	8	K3	2
(OR)			
b) i) Discuss External frequency compensation in op-amp.	8	K3	2
ii) Explain in detail about basic applications of op-amp.	8	K3	2

Q. No		M	BTL	CO
13. a)	i) Design a second order active high pass filter for a cut-off frequency of 1.5 KHz.	8	K4	3
	ii) Explain with suitable example how the op-amp acts as a comparator.	8	K4	3
	(OR)			
b) i)	Explain in detail about how an op-amp samples and holds the signal.	8	K4	3
	ii) With the neat diagram, explain the operation of dual slope A/D converter.	8	K4	3
14. a)	i) Design and draw the waveforms of 1 KHz square waveform generator using 555 timer for duty cycle (i) D = 25 % (ii) D = 50 %	10	K3	4
	ii) For the 566 -VCO circuit, assume $R_2 = 2.2 K\Omega$, $R_1 = R_3 = 15 K\Omega$ and $C_1 = 0.001\mu F$. Assume $V_{CC} = 12 V$. Determine the output frequency, the change in output frequency if modulating input V_C is varied from 7 V to 8 V.	6	K3	4
	(OR)			
b) i)	Draw the block diagram of basic 565 - PLL and explain the function of each block.	10	K3	4
	ii) Discuss in detail about an Analog multiplier IC.	6	K3	4
15. a)	i) Design an adjustable voltage regulator (5 V to 15 V) with a short circuit current limit of 50 mA using a 723 regulator.	10	K4	5
	ii) Explain in detail about the operation of switching regulator.	6	K4	5
	(OR)			
b) i)	Discuss in detail about LM380 power amplifier.	8	K4	5
	ii) Explain in detail about isolation amplifiers.	8	K4	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time]

Electrical and Electronics Engineering

18ME408 – ENGINEERING MECHANICS

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. What do you mean by the resolution of a force?	2	K1	1
2. State the principle of transmissibility.	2	K1	1
3. Differentiate between moment of a force and couple.	2	K2	2
4. The resultant of a system of parallel forces is zero, what does it signify?	2	K2	2
5. Distinguish between the centre of gravity and the centroid.	2	K2	3
6. State the theorem of the perpendicular axis.	2	K1	3
7. How will you distinguish between static friction and dynamic friction?	2	K2	4
8. What do you mean by 'angle of repose'?	2	K1	4
9. Distinguish clearly between 'mass' and 'weight'.	2	K2	5
10. State the law of conservation of momentum.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) The resultant of four forces which are acting at a point O as shown in Fig.1, is along Y-axis. The magnitude of forces F_1 , F_3 and F_4 are 10 kN, 20 kN and 40 kN respectively. The angles made by 10 kN, 20 kN and 40 kN with X-axis are 30° , 90° and 120° respectively. Find the magnitude and direction of force F_2 if resultant is 72 kN.	16	K3	1

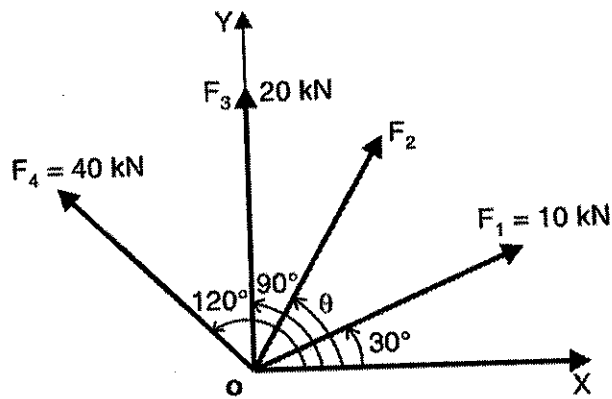


Fig.1

(OR)

- b) A horizontal line PQRS is 12 m long, where $PQ = QR = RS = 4$ m. Forces of 1000 N, 1500 N, 1000 N and 500 N act at P, Q, R and S respectively with downward direction. The lines of action of these forces make angles of 90° , 60° , 45° and 30° respectively with PS. Find the magnitude, direction and position of the resultant force.

16 K3 1

12. a) The lever ABC of a component of a machine is hinged at B, and is subjected to a system of coplanar forces as shown in Fig.2. Neglecting friction, find the magnitude of the force (P) to keep the lever in equilibrium. Also determine the magnitude and direction of the reaction at B.

16 K3 1

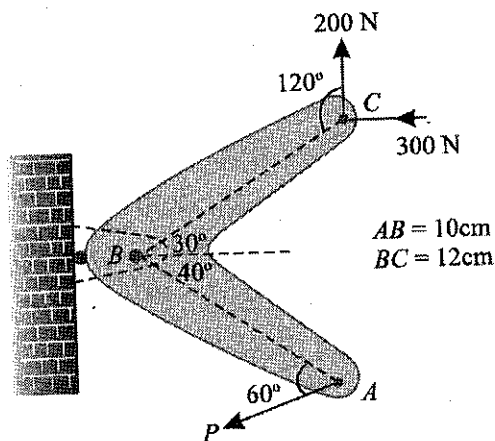


Fig.2

(OR)

- b) Two identical rollers, each of weight 50 N, are supported by an inclined plane and a vertical wall as shown in Fig.3. Find the reactions at the points of supports A, B and C. Assume all the surfaces to be smooth.

16 K3 2

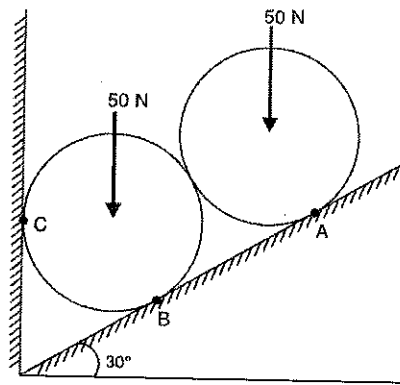


Fig.3

13. a) Find the moment of inertia of ISA $100 \times 75 \times 6$ about the centroidal XX and YY-axis, shown in Fig. 4.

16 K3 3

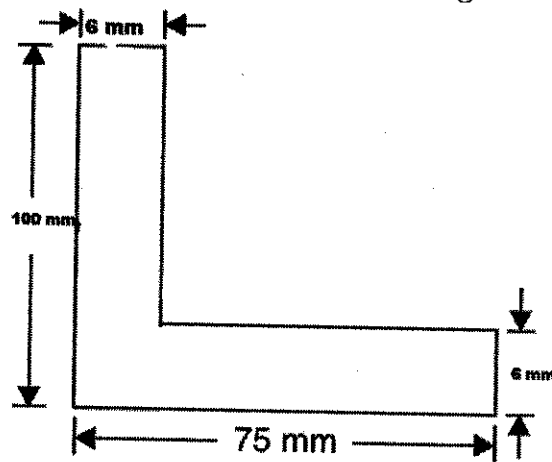


Fig.4

(OR)

- b) An I-section is made up of three rectangles as shown in Fig.5. Find the moment of inertia of the section about the horizontal axis passing through the centre of gravity of the section.

16 K3 3

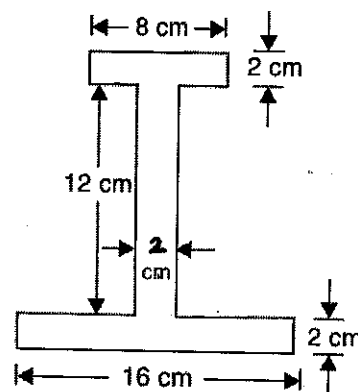


Fig.5

Q. No

M BTL CO

14. a) A block (A) of weight 5 kN is to be raised using a 20° wedge (B) by the application of a horizontal force (P) as shown in Fig.6. The block A is constrained to move vertically by the application of a horizontal force (S). Find the magnitude of the frictional forces F_1 & F_2 and P analytically, when the coefficient of friction at the contact surfaces is 0.25.

16 K3 4

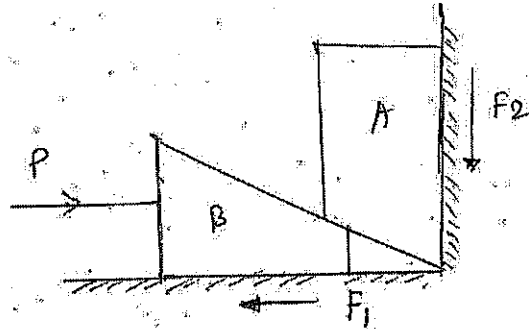


Fig.6

(OR)

- b) A screw jack has a square thread of 75 mm mean diameter and 15 mm pitch. The load on the jack revolves around the screws. The coefficient of friction at the screw thread is 0.05. (i) Find the tangential force to be applied to the jack at 360 mm radius, to lift a load of 6 kN weight. (ii) State whether the jack is self-locking. If it is, find the torque necessary to lower the load. If not, find the torque which must be applied to keep the load from descending.

16 K3 4

15. a) A ball of mass 2 kg, moving with a velocity of 3 m/sec, impinges on a ball of mass 4 kg moving with a velocity of 1 m/sec. The velocities of the two balls are parallel and inclined at 30° to the line joining their centres at the instant of impact. If the coefficient of restitution is 0.5, find
- direction, in which the 4 kg ball will move after impact
 - velocity of the 4 kg ball after impact
 - direction, in which the 2 kg ball will move after impact and
 - velocity of the 2 kg ball after impact.

16 K3 5

(OR)

- b) Two rough planes inclined at 30° and 15° to the horizontal and of the same height are placed back to back. Two bodies of masses of 15 kg and 5 kg are placed on the faces and connected by a string over the top of the planes. If the coefficient of friction is 0.3 find from fundamentals the resulting acceleration.

16 K3 5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: I & II [Full Time]

(Common to **Civil and Metallurgical Engineering**)

18PH101 – PHYSICS - MECHANICS

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. Define hodograph.	2	K1	1
2. Two particles A and B are moving along the same straight line. Write down the expression for the relative position coordinate and relative velocity of B with respect to A.	2	K3	1
3. Distinguish between inertial frame of reference and non-inertial frame of reference.	2	K2	2
4. Identify the role of generalized coordinates in reducing the degrees of freedom of constrained systems.	2	K3	2
5. Explain the principle of conservation of linear momentum of a particle.	2	K2	3
6. Calculate the orbital period of a planet that is located 4 astronomical units away from the sun by using Kepler's third law.	2	K3	3
7. Express the equation of motion of a rigid body in uniform rotation and uniformly accelerated rotation.	2	K3	4
8. A fly wheel has initial angular velocity of 10 rad s^{-1} and a constant angular acceleration of 3 rad s^{-2} . Determine the number of revolutions it must undergo to attain an angular velocity of 18 rad s^{-1} . Also find the time required.	2	K3	4
9. Define simple harmonic motion and write down its equation.	2	K1	5
10. Illustrate the concept of damped free vibration with an example.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
11. a)	Build the concepts of uniform rectilinear motion and uniformly accelerated rectilinear motion, along with their equations of motion. Report their applications and differences.	16	K3	1
	(OR)			
b)	Discuss the transformation of position and displacement vectors by translation and rotation of coordinate system.	16	K3	1
12. a)	Derive an expression for acceleration when a mass m moves down an inclined plane with coefficient of friction μ .	16	K3	2
	(OR)			
b)	Describe the forces acting on a block placed on an inclined plane with friction and establish the equations of motion for the block.	16	K3	2
13. a)	Discuss the principle of work and energy. Hence mention the importance of work energy theorem.	16	K3	3
	(OR)			
b)	Construct the Kepler's laws of planetary motion in detail.	16	K3	3
14. a)	Obtain an expression for moment of inertia of a hollow sphere about its diameter.	16	K3	4
	(OR)			
b)	Identify Coriolis acceleration and analyze the plane motion of a particle in relation to a rotating frame.	16	K3	4
15. a)	Deduce an expression for the period of a simple pendulum by considering it as an approximated simple harmonic motion.	16	K4	5
	(OR)			
b)	Derive the equation for damped forced vibration and discuss the resonance.	16	K4	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time]

Civil Engineering

18CE405 – APPLIED HYDRAULICS AND FLUID MACHINERY

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks: 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. List the factors affecting Manning's roughness coefficient.	2	K1	1
2. Compute the hydraulic mean depth of a small channel 1m wide, 0.5m deep with water flowing at 2m/s.	2	K3	1
3. Write down the dynamic equation of Gradually Varied flow.	2	K1	2
4. Identify the location of forming hydraulic jumps and why it is causing them.	2	K2	2
5. Write the application of the linear momentum principle.	2	K1	3
6. Summarize the importance of jet propulsion.	2	K2	3
7. How would you classify turbines based on the runner's flow direction?	2	K2	4
8. Show the purpose of providing a casing in turbines.	2	K2	4
9. Outline the priming of pumps and give their importance.	2	K1	5
10. Differentiate pumps and turbines based on the working principles.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) i) What are the different types of flow in open channel?	6	K2	1
ii) Calculate the specific energy, critical depth and velocity for the flow of 10 m ³ /s in a cement-lined rectangular channel 2.5 m wide with 2 m water depth. Is the given flow subcritical or supercritical?	10	K3	1
(OR)			
b) i) Explain the salient features of specific Energy curve.	6	K2	1

Q. No	M	BTL	CO
ii) A trapezoidal channel has a bottom width of 6.1 m and side slopes of 2 H: 1 V. When the flow depth is 1.07 m, the flow is 10.47 m ³ /s. What is the specific energy of flow? Is the flow tranquil or rapid?	10	K3	1
12. a) i) A 100 m wide and 3 m deep river has an average bed slope of 0.0005. Estimate the length of the GVF profile produced by a low weir, which raises the water surface just upstream of it by 1.5 m. Assume $n = 0.035$. Use the direct step method with three steps.	12	K3	2
ii) What is the backwater curve in a gradually varied flow profile? Give a practical example for getting this type of profile.	4	K2	2
(OR)			
b) i) At the bottom of a spillway, the flow velocity and depth are 12 m/s and 1.5 m, respectively. If the tailwater depth is 5.5 m, find the jump location with respect to the toe of the spillway. What should be the length of the apron to contain this jump? Assume the apron to be horizontal and Manning's $n = 0.015$.	12	K3	2
ii) Explain the classification of hydraulic jumps.	4	K2	2
13. a) Water flows through a pipe at the end of a nozzle. The diameter of the nozzle is 100 mm and the head of water at the center nozzle is 100 m. is fitted. Find the force exerted by the water jet on a fixed vertical plate. The coefficient of velocity is given as 0.95.	16	K3	3
(OR)			
b) A jet of water with a diameter of 7.5 cm strikes a curved plate at its center with a velocity of 20 m/s. The curved plate is moving with a velocity of 8 m/s in the direction of the jet. The jet is deflected through an angle of 165°. Assuming the plate smooth find:	16	K3	3
(i) Force exerted on the plate in the direction of the jet			
(ii) The power of the jet and			
(iii) Efficiency of the jet			

Q. No**M BTL CO**

14. a) A Pelton wheel is required to develop 8825 KW when working under the head of 300 mm. The speed of the pelton wheel is 540 r.p.m. The coefficient of velocity is 0.98 and the speed ratio is 0.46. Assuming jet ratio as 10 and overall efficiency as 84 %, Determine

16 K4 4

1. The number of jets
2. The diameter of the wheel
3. The quantity of water required.

(OR)

b) A Francis turbine is to be designed to develop 360 KW under a head of 70 m and a speed of 750 r.p.m. The ratio of the width of the runner to the diameter of runner 'n' is 0.1. The inner diameter of the runner is half the outer diameter. The flow ratio is 0.15. The hydraulic efficiency is 95 % and the mechanical efficiency is 84 %. Four percent of the circumferential area of the runner is to be occupied by the thickness of the vanes. The velocity of flow is constant and the discharge is radial at exit. Determine:

16 K4 4

1. The diameter of the wheel
2. The quantity of water supplied
3. The guide vane angle at the inlet and
4. Runner vane angles at the inlet and exit.

15. a) i) Outline the mechanical efficiency and overall efficiency of the centrifugal pump.

4 K2 5

ii) The impeller of a centrifugal pump has an external diameter of 450 mm and an internal diameter of 200 mm. The speed of the pump is 1440 r.p.m. Assuming a constant radial flow through the impeller at 2.5 m/s and that the vanes at the exit are set back at an angle of 25° , Determine:

12 K3 5

- a. The inlet vane angle
- b. The angle, the absolute velocity of water at exit makes with the tangent and
- c. The work done per unit weight

(OR)

Q.No		M	BTL	CO
b) i)	Brief the working principles of a double-acting reciprocating pump.	4	K2	5
ii)	A single-acting reciprocating pump has a plunger diameter of 250 mm and a stroke length of 350 mm. The speed of the pump is 60 r.p.m and the discharge is 0.02 cumecs of water. Determine:	12	K3	5
	1. Theoretical discharge			
	2. Coefficient of discharge Percentage of slip.			

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: II [Full Time]

Computer Science and Engineering

18MA202 – DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA

(Regulations 2018/2018 A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. Determine the particular integral for $(D^2 + 9)y = \cos 3x$.	2	K2	1
2. Reduce the equation $(x + 1)^2 \frac{d^2y}{dx^2} - (x + 1) \frac{dy}{dx} + y = 4$ into the linear differential equation with constant coefficient.	2	K2	1
3. Form the partial differential equation by eliminating arbitrary constants a & b from $z = (x + a)(y + b)$.	2	K1	1
4. Write the auxiliary equation of Lagrange's linear equation.	2	K1	1
5. Find the solution of $(D^2 + 2DD' + D'^2) = 0$.	2	K2	2
6. List the all possible solutions of one dimensional wave equation.	2	K1	2
7. Write the basic principle in Gauss-Elimination method.	2	K1	3
8. Mention the order of convergence and criterion of Newton's method.	2	K1	3
9. State Rank-Nullity theorem.	2	K1	3
10. Define Basis.	2	K1	3

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) i) Solve : $x^2y'' + 3xy' + 5y = \cos(\log x)$.	8	K2	1
ii) Solve : $(D^2 - 4D + 4)y = e^{2x}$ by use method of variation of parameters.	8	K2	1
(OR)			
b) Find the solutions of x and y from the simultaneous equations $\frac{dx}{dt} + 2x - 3y = 5t$ and $\frac{dy}{dt} - 3x + 2y = 0$.	16	K2	1

Q. No		M	BTL	CO
12. a)	i) Form the PDE by eliminating arbitrary functions f and g from the equation $z = f(2x + 3y) + g(2x + y)$.	8	K2	1
	ii) Solve : $z = px + qy + p^2q^2$.	8	K3	1
	(OR)	8	K2	1
b) i)	Solve : $(mz - ny)p + (nx - lz)q = ly - mx$.	8	K3	1
	ii) Solve : $p + q = p q$.	16	K3	2
13. a)	Solve : $(D^2 - 2DD' + D'^2)y = e^{x+y} + 3 + \cos(x - 3y)$.	16	K3	2
	(OR)	16	K3	2
b)	Find the solution of one dimensional wave equation.	8	K2	3
14. a)	i) Solve the system of equations using Gauss-Elimination method: $x + y + z = 9, 2x - 3y + 4z = 13, 3x + 4y + 5z = 40$.	8	K3	3
	ii) Using Gauss -Jordan method find the inverse of the matrix	8	K2	3
	$A = \begin{pmatrix} 1 & 2 & 6 \\ 2 & 5 & 15 \\ 6 & 15 & 46 \end{pmatrix}$			
	(OR)	8	K2	3
b) i)	Solve the system of equations using Gauss-Jordon method: $10x + y + z = 12, 2x + 10y + z = 13, x + y + 5z = 7$.	8	K3	3
	ii) Find a root of $x^3 = 6x - 4$ by Newton's Raphson method.	8	K2	3
15. a)	i) Prove that $S = \{(1,0,0), (0, 1, 0) \text{ and } (1, 1, 1)\}$ is a basis for $V_3(R)$.	8	K3	3
	ii) Any two bases of a finite dimensional vector space have the same dimension.	8	K2	3
	(OR)	8	K2	3
b) i)	Under what conditions on scalar 'a' are the vectors (a, 1, 0), (1, a, 1) and (0, 1, a) in $V_3(R)$ linearly dependent.	8	K3	3
	ii) Let $T : V_2(R) \rightarrow V_3(R)$ be a linear map defined by $T(x_1, x_2) = (x_1 - x_2, 0, 0)$. Find null space $N(T)$ and range of T and hence find nullity of T and rank of T.	8	K3	3

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Computer Science and Engineering

22CSPE502 – DATA SCIENCE

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
1.	Evaluate how Hadoop contributes to solving big data problems in the data science ecosystem.	2	K5	1
2.	Differentiate between structured and unstructured data.	2	K4	1
3.	Analyze the effectiveness of parallel computing in handling large data for machine learning applications.	2	K4	2
4.	Differentiate between supervised and unsupervised learning.	2	K4	2
5.	Analyze the advantages of using Hadoop over traditional data processing methods.	2	K4	3
6.	List the benefits of distributed data processing.	2	K1	3
7.	Mention two differences between ACID and BASE properties.	2	K4	4
8.	How does the CAP theorem apply to NoSQL database design?	2	K2	4
9.	State the applications of text mining in the real world.	2	K1	5
10.	Give an example of stemming from natural language text.	2	K3	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
11. a)	i) Explain the role of data preparation and exploratory data analysis in building effective data models.	8	K2	1
	ii) Describe the architecture of the Hadoop ecosystem and explain how it supports data science applications.	8	K2	1
	(OR)			
b) i)	Describe the various facets of data and discuss their importance in a data-driven environment.	8	K2	1
	ii) Explain the data science process in detail, covering each stage with examples.	8	K2	1

Q. No		M	BTL	CO
12. a)	i) Analyze role of machine learning in the data science process and its impact on decision-making.	8	K4	2
	ii) Explain the modeling process in data science and how it integrates with machine learning algorithms.	8	K2	2
	(OR)			
b) i)	Analyze the challenges encountered while handling large data and suggest some techniques to address them.	8	K4	2
	ii) Discuss various programming tips and tools for efficiently handling large-scale data.	8	K2	2
13. a)	Demonstrate how Apache Spark can be used for distributed data processing with example.	16	K3	3
	(OR)			
b)	Illustrate a distributed data processing solution using Hadoop or Spark for financial risk assessment.	16	K3	3
14. a)	Apply the BASE principles to model a distributed NoSQL system for a high-availability application	16	K3	4
	(OR)			
b)	Explain how a graph database can help identifying diseases through symptom relationships.	16	K3	4
15. a)	Explain how a decision tree classifier can be applied to classify Reddit posts using text data.	16	K3	5
	(OR)			
b)	Demonstrate the application of stemming and lemmatization to clean text data from Reddit posts. Show how these preprocessing techniques improve text classification using a Decision Tree Classifier.	16	K3	5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Electrical and Electronics Engineering

22EEPE51- UTILIZATION OF ELECTRICAL ENERGY

(Regulations 2022)

Time : 3 Hours

PART A (10 x 2 = 20 Marks)

Maximum Marks : 100

Q. No

Answer **ALL** Questions

	M	BTL	CO
1. What is the significance of the daily load curve?	2	K2	1
2. How does the battery energy storage system contribute to electrical energy conservation?	2	K2	1
3. State the inverse square law of illumination.	2	K1	2
4. What are the methods employed for lighting calculations?	2	K1	2
5. What are the fundamental requirements of heating elements?	2	K2	3
6. What is the fundamental difference between the electric arc welding and the resistance welding?	2	K2	3
7. What are the requirements of ideal traction system?	2	K2	4
8. What is the need for electric braking?	2	K2	4
9. What are the advantages of group drive?	2	K2	5
10. What is load equalization?	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) It has been desired to install a diesel power station to supply power in a suburban area having the following particulars: (i) 1000 houses with an average connected load of 1.5 kW in each house. The demand factor and diversity factor being 0.4 and 2.5 respectively. (ii) 10 factories have overall maximum demand of 90 kW. (iii) 7 tubewells of 7 kW each and operate together in the morning. The diversity factor among the above three types of consumers is 1.2. What should be the minimum capacity of power station?	16	K4	1

(OR)

Q. No	M	BTL	CO
b) Two systems of tariff are available for a factory working 8 hours a day for 300 working days in a year. (i) High-voltage supply at 5 paise per unit plus Rs 4.50 per month per kVA of maximum demand. (ii) Low-voltage supply at Rs 5 per month per kVA of maximum demand plus 5.5 paise per unit. The factory has an average load of 200 kW at 0.8 p.f. and a maximum demand of 250 kW at the same p.f. The high voltage equipment costs Rs 50 per kVA and the losses can be taken as 4%. Interest and depreciation charges are 12%. Calculate the difference in the annual costs between the two systems.	16	K4	1
12. a) In a street lighting, two lamps are having luminous intensity of 300 candela, which are mounted at a height of 6 and 10 m. The distance between lamp posts is 12 m. Find the illumination, just below the two lamps.	16	K4	2
(OR)			
b) An illumination on the working plane of 100 lux is required in a room 45 × 25 m in size. The lamps are required to be hung 3 m above the plane. Assuming a suitable space-height ratio, a utilization factor of 0.8, a lamp efficiency of 18 lumens/W, and a candle power depreciation of 30%, estimate the number, rating, and disposition of lamps.	16	K4	2
13. a) Explain different methods of induction heating. Detail some applications for induction heating.	16	K3	3
(OR)			
b) Elaborate on the principle of electric spot welding and seam welding. Detail some applications for the same.	16	K3	3
14. a) Describe one method of speed control for induction motors used in electric traction systems. Discuss the speed range obtainable by this method.	16	K3	4
(OR)			
b) Explain any one of the braking systems employed in electric traction with proper illustration.	16	K3	4
15. a) i) Examine the various factors influencing the selection of an appropriate motor for industrial applications.	8	K2	5
ii) Discuss in detail about load equalization.	8	K3	5
(OR)			
b) i) Explain the various types of loads. What are the components of load torque?	8	K2	5
ii) Discuss the modern methods of speed control of DC drives for industrial applications.	8	K3	5

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Government College of Engineering, Salem
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B.E. Degree Examinations - April/May 2025

Semester: VI [Full Time]

Mechanical Engineering

18MEPE23 - POWER PLANT ENGINEERING

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. What is the function of a boiler chimney?	2	K1	1
2. Give the classification of mechanical stokers.	2	K2	1
3. Why safety precaution is very much needed in boilers?	2	K2	2
4. What is meant by fixed cost and variable cost?	2	K2	2
5. What are the requirements of site selection of a hydro power plant?	2	K2	3
6. List the applications of pumped storage power plant.	2	K2	3
7. Compare diesel power plant with coal power plant.	2	K1	4
8. Explain the working principle of gas turbine power plant.	2	K1	4
9. Write the equation of nuclear fission process.	2	K2	5
10. Give the advantages and disadvantages of gas cooled reactor.	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) i) Draw the neat layout of a thermal power plant and explain the functioning of its four circuits.	12	K2	1
ii) Compare thermal power plant with hydro power plant.	4	K2	1
(OR)			
b) i) What is the function of a cooling tower? Explain any two types of cooling tower with neat sketch.	12	K2	1
ii) Write short notes on waste heat recovery.	4	K2	1
12. a) Analyze the feed water treatment of boiler with neat diagram.	16	K4	2
(OR)			

Q. No

M BTL CO

- b) The maximum demand of a power station is 96000 kW and daily load curve is described as follows:

Time (hrs)	0-6	6-8	8-12	12-14	14-18	18-22	22-24
Load (MW)	48	60	72	60	84	96	48

(i) Determine the load factor of power station.

(ii) What is the load factor of standby equipment rated at 30 MW that takes up all load in excess of 72 MW? Also calculate its use factor.

13. a) i) Draw and explain how a pumped storage power plant works and produces electricity. 12 K2 3
- ii) Write the advantages and disadvantages of a hydroelectric power plant. 4 K2 3
- (OR)
- b) i) Explain the working of a central tower solar thermal power plant with neat diagram. 12 K2 3
- ii) Classify the solar power plants on the basis of temperature ranges. 4 K2 3
14. a) Draw and explain the types of gas turbine power plant in detail. 16 K4 4
- (OR)
- b) Explain how the wind power is extracted to produce electricity with neat sketch. 16 K4 4
15. a) i) Describe the working of Boiling Water Reactor (BWR) with neat sketch. 12 K1 5
- ii) Write short note on chain reaction of nuclear fission process. 4 K2 5
- (OR)
- b) i) Briefly explain about MHD power generator, working principle and applications with diagram. 12 K1 5
- ii) Classify the MHD power generation systems. 4 K2 5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Mechanical Engineering

18MEPE15 - METAL CUTTING AND TOOL DESIGN

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. What is metal cutting?	2	K1	1
2. What are the types of chip formation?	2	K1	2
3. Define the term tool life.	2	K1	2
4. What is abrasive wear?	2	K1	1
5. What are the types of tool nomenclature?	2	K2	1
6. What is rake angle?	2	K1	2
7. What are the importance of flute angle?	2	K1	1
8. Classify milling cutters.	2	K2	2
9. What is broaching?	2	K1	1
10. What is reaming?	2	K1	2

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) Illustrate the different types of chip formation with neat diagram.	16	K3	3
(OR)			
b) Illustrate the different types of cutting fluids used in metal cutting.	16	K3	2
12. a) Interpret the wear mechanisms in metal cutting.	16	K3	2
(OR)			
b) The tool life equation for HSS tool is expressed by $VT^{0.15} = C_1$ and the tungsten carbide tool is expressed by $VT^{0.25} = C_2$. If at a speed of 30 m/min the tool life is 120 min, compare the life of the two tools at a speed of 40 m/min.	16	K3	3

Q. No		M	BTL	CO
13. a)	Illustrate the cutting tool nomenclature with neat diagram.	16	K3	2
	(OR)			
b)	Categorize the form tools with neat sketch.	16	K3	3
14. a)	Construct the geometry of cutting edge, explain in detail.	16	K3	2
	(OR)			
b)	Categorize the milling cutter with neat sketch.	16	K3	3
15. a)	Organize the design of broaching tool.	16	K3	2
	(OR)			
b)	Construct the design of thread cutting taps.	16	K3	3

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Government College of Engineering, Salem
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B.E. Degree Examinations - April/May 2025

Semester: II [Part Time]

Mechanical Engineering

23PTEE205 - BASIC ELECTRICAL AND ELECTRONICS ENGINEERING
(Regulations 2023)

Time : 3 Hours

PART A(10 x 2 = 20 Marks)

Maximum Marks : 100

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. State Ohm's law.	2	K1	1
2. State super position theorem.	2	K1	1
3. How do you define real and reactive power?	2	K3	2
4. Write the voltage and current relating in the star connected system?	2	K3	2
5. List out the applications of DC shunt motor.	2	K1	3
6. Define transformation ratio of a single phase transformer.	2	K1	3
7. What are the applications of zener diode?	2	K2	4
8. List the characteristics of ideal operation amplifier?	2	K1	4
9. Write the use of ELCB.	2	K2	5
10. What is meant by UPS?	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) Determine the current through 8 Ω resistor in the circuit show in Fig. 1.	16	K4	1

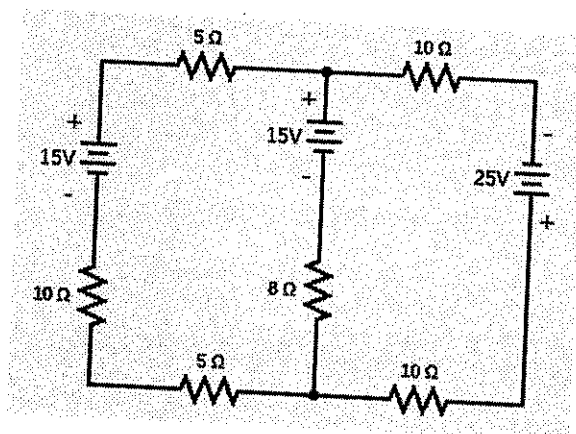


Fig.1

(OR)

Q. No

M BTL CO

- b) Using superposition principle, find the current in each resistor of the given Fig. 2.

16 K4 1

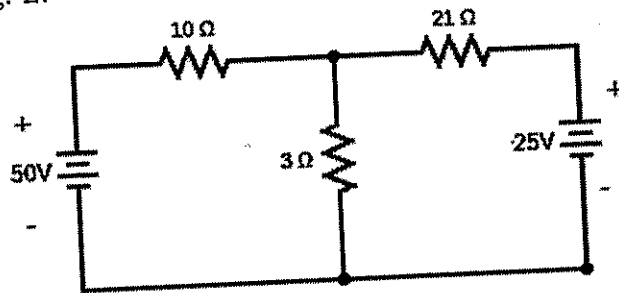


Fig. 2

12. a) Find the average and rms value of the i) fully rectified sine wave
ii) half rectified sine wave.

16 K3 2

(OR)

- b) In a RLC series circuit, $R = 24 \Omega$, $L = 191 \text{ mH}$ and $C = 66.3 \mu\text{F}$ given that the supply voltage is 240 V , 60 Hz . Find inductive reactance, capacitive reactance, equivalent impedance, power factor, current, active power, reactive power, apparent power and voltage across each elements.

16 K3 2

13. a) Explain the construction and working principle of single phase transformer.

16 K3 3

(OR)

- b) Explain the principle of operation of single phase induction motor. Mention its four applications.

16 K3 3

14. a) Explain how PN junction is formed and state its properties under no bias, forward bias and reverse bias condition.

16 K3 4

(OR)

- b) Draw the input and output characteristics of a transistor in Common Emitter configuration.

16 K3 4

15. a) Briefly explain about Earthing and its types.

16 K1 5

(OR)

- b) Discuss about any two types of batteries.

16 K1 5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Part Time]

Civil Engineering

22PTCEE10 – SUBSURFACE INVESTIGATION AND INSTRUMENTATION
(Regulations 2022)

Time: 3 Hours

Maximum Marks: 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. Define scope of exploration in geotechnical engineering.	2	K2	1
2. List the various methods of Geophysical exploration.	2	K1	1
3. What are the different methods of boring?	2	K1	1
4. Write purpose of stabilizing boreholes.	2	K2	1
5. Differentiate disturbed and undisturbed soil sampling.	2	K2	1
6. State advanced sampling techniques.	2	K3	1
7. What is the purpose of field tests in soil exploration?	2	K2	1
8. How do you perform filed vane shear test?	2	K2	1
9. When and where the strain gauges used for?	2	K2	1
10. Give any two application of piezometer.	2	K2	1

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) i) Describe the different methods of exploration used in geotechnical engineering.	8	K2	1
ii) Explain the scope and objectives of exploration in geotechnical engineering.	8	K2	1
(OR)			
b) i) Briefly describe the planning and execution of an exploration program.	8	K2	1
ii) Explain the importance of data presentation in exploration.	8	K2	1
12. a) Elaborate the different methods of boring and drilling.	16	K1	2
(OR)			
b) Write in detail about the importance of bore logs.	16	K1	2

Q. No		M	BTL	CO
13. a)	Enumerate the importance of soil sampling in geotechnical engineering.	16	K3	3
	(OR)			
b)	Description in detail about the different types of soil samplers.	16	K3	3
14. a)	Explain the step by step procedure and method of conducting a Standard Penetration Test (SPT).	16	K2	4
	(OR)			
b)	Explain about the field permeability test with neat sketches.	16	K2	4
15. a)	Explain the different types of instrumentation used in soil engineering.	16	K2	5
	(OR)			
b)	Discuss the importance of data interpretation and monitoring in instrumentation using a case study.	16	K2	5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Mechanical Engineering

12ME604 – INSTRUMENTATION AND SENSORS

(Regulations 2012)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

1. How can environmental error be reduced?
2. Differentiate between accuracy and precision.
3. How will you measure torque?
4. State the primary function of sensor.
5. Define signal conditioning.
6. Give an example for A/D conversion.
7. Draw the block diagram of Digital data acquisition system.
8. List the elements of Digital data acquisition system.
9. List a software using VI.
10. Write the applications of computers in Instrumentation.

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M
11. a) i) Distinguish between (a) Error and correction (b) systematic and random errors.	(10)
ii) What are the static characteristics of instruments?	(6)
(OR)	
b) i) Illustrate with block diagram Generalized measurement system.	(10)
ii) Write in detail about the classification of Transducers.	(6)
12. a) i) Write in detail about electrical resistance thermometer.	(10)
ii) State the different laws of thermocouple.	(6)
(OR)	
b) i) Write in detail about calibration of flow measuring devices.	(10)
ii) How are sensors classified based on their operating principle?	(6)

Q. No		M
13.	a) i) Illustrate neatly Wheatstone bridge.	(10)
	ii) Mention the applications of wheatstone bridge.	(6)
	(OR)	
	b) i) Describe in detail successive approximation method of analog to digital conversion.	(10)
	ii) Write short notes on instrumentation sensor.	(6)
14.	a) i) Write in detail the factors to be considered while interfacing transducers to electronic control and measuring system.	(8)
	ii) Write short notes on data loggers.	(8)
	(OR)	
	b) i) Highlight your views on counters and timers.	(8)
	ii) Enumerate with example Digital Transmission system.	(8)
15.	a) i) List the advantages of VI over conventional instruments.	(8)
	ii) Illustrate with example cluster and graphs.	(8)
	(OR)	
	b) i) Sketch and explain the architecture of virtual instrumentation.	(8)
	ii) Write short notes on local and global variables.	(8)

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: III [Full Time]

Mechanical Engineering

22MT310 – MATERIALS ENGINEERING

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. What is an Isomorphous system? Give one example.	2	K1	1
2. List the ferrite and austenite stabilizers in steels.	2	K2	1
3. Define the term Hardenability.	2	K1	2
4. What is nitriding?	2	K2	2
5. List the various classifications of plain carbon steels.	2	K2	3
6. What is the composition of alpha brass?	2	K2	3
7. Define Fatigue.	2	K1	4
8. List the various types of fracture.	2	K2	4
9. What are the merits and demerits of Radiography testing?	2	K2	5
10. What is surface engineering?	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) Draw a typical Iron-Carbon phase diagram and explain the three invariant reactions. Also analyze the effect of alloying elements on the above diagram.	16	K2	1
(OR)			
b) Explain the various types of solid solutions. Also, explain the Hume-Rothery rules for solid solutions.	16	K2	1
12. a) Discuss the Full annealing, Normalizing, Hardening and Tempering of steels.	16	K2	2
(OR)			
b) Discuss the Flame and Induction hardening processes with neat sketches.	16	K2	2

Q. No		M	BTL	CO
13. a)	Discuss the composition, properties and applications of Grey, SG, Malleable and White cast irons.	16	K2	3
	(OR)			
b)	Discuss the composition, properties and applications of Ferritic, Austenitic, Martensitic and Duplex Stainless steels.	16	K2	3
14. a)	Explain the testing procedures of Brinell and Rockwell hardness tests with neat sketches.	16	K2	4
	(OR)			
b)	Explain the tensile testing of 0.2% carbon steel with it's stress-strain curve.	16	K2	4
15. a)	Describe the principle, testing procedure, advantages and disadvantages of Magnetic Particle Inspection.	16	K2	5
	(OR)			
b)	Describe the principle, testing procedure, advantages and disadvantages of Liquid Penetrant Inspection.	16	K2	5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: V [Part Time]

Civil Engineering

22PTCE503 – DESIGN OF REINFORCED CONCRETE AND MASONRY STRUCTURES
(Regulations 2022)

(Use of IS 456:2000, IS 3370:1967 and IS 1905:1987 to be Permitted)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Under which circumstances mat foundation is adopted?	2	K2	2
2. Enumerate the advantages of combined footing.	2	K1	2
3. List the functions of weep hole in retaining wall construction.	2	K2	2
4. Differentiate cantilever retaining wall and counter fort retaining wall.	2	K2	2
5. State the assumptions of yield line theory.	2	K1	2
6. Compare isotropic and orthotropic slabs.	2	K2	2
7. Specify the purpose of bracings in the staging of elevated water tanks.	2	K2	1
8. What is a ring beam?	2	K1	1
9. Specify the general condition of stability of masonry structures.	2	K2	3
10. List the type of masonry walls used in building construction.	2	K1	3

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Design a rectangular combined footing for two columns having column load of 600 kN and 900 kN. Take the net allowable pressure as 100 kN/m ² .	16	K3	2
(OR)			
b) Explain in detail the step by step procedure of design of raft foundation with neat sketch.	16	K3	2
12. a) Explain the steps involved in the design of counter fort retaining wall.	16	K3	2

(OR)

Q. No	M	BTL	CO
b) Design the stem of a retaining wall to retain earth embankment 3 m high above ground level. The unit weight of earth is 18 kN/m^3 and its angle of repose is 30° . The embankment is horizontal at its top. The safe bearing capacity of soil is 100 kN/m^2 and the coefficient of friction between soil and Concrete is 0.5. Adopt M20 concrete and Fe415 Steel. Take factor of safety against overturning and sliding as 1.40.	16	K3	2
13. a) Design the interior panel of a flat slab with drops for an office floor to suit the following data: Size of office floor = $20 \text{ m} \times 20 \text{ m}$ Size of panels = $5 \text{ m} \times 5 \text{ m}$ Loading class 4 kN/m^2 Materials: M20 grade concrete, Fe 415 HYSD bars (OR)	16	K3	2
b) Using Virtual work method, Obtain the expression for ultimate moment per unit length of the yield line in the case of isotropically reinforced square slab fixed on all edges and subjected to an uniformly distributed.	16	K3	2
14. a) Design an underground tank of dimensions: $12 \text{ m} \times 5 \text{ m} \times 4 \text{ m}$. The angle of repose of soil is 30° and Density of soil is 16 kN/m^3 . The soil is saturated. (OR)	16	K3	1
b) Design a circular tank of diameter 12 m and height 4 m. The tank rests on firm ground. The walls of the tank are restrained at base. Use M20 Grade and Fe415 Steel.	16	K3	1
15. a) A Masonry wall is subjected to an axial load of 180 kN and bending moment of 50 kNm. The height of the wall is 4 m. Design the wall. (OR)	16	K4	3
b) Determine the allowable axial load on column $300 \times 60 \text{ mm}$ constructed with first class brick work in CM 1:6 using modular bricks $200 \text{ mm} \times 100 \text{ mm} \times 100 \text{ mm}$. The height of pier between the footing and top of slab is 5.2 m. The strength of units may be assumed as 10.5 MPa.	16	K4	3

Registration Number :

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B.E. Degree Examinations – April/May 2025

Semester: VII [Full Time] / IV [Part Time]

Mechanical Engineering

18ME701/22PTME402 – MECHATRONICS

(Regulations 2018/2018A/2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. Define the term 'Mechatronics'.	2	K1	1
2. Give some examples of Mechatronics systems.	2	K1	1
3. List the significance of characteristic equation.	2	K1	2
4. Build the Laplace transform of voltage drop across a resistor and an inductor.	2	K2	2
5. Classify the types of stepper motor based on stator windings.	2	K2	3
6. Differentiate between adaptive control optimization and adaptive control constraint.	2	K2	3
7. How digital logic controls improve the utility of the mechatronic system?	2	K2	4
8. Compare ON delay timer and OFF delay timer.	2	K2	4
9. List any four advantages of Electric drive system.	2	K1	5
10. Summarize the drawbacks of traditional design approach.	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) What are the various major fields of applications of mechatronics? Discuss them.	16	K2	1
(OR)			
b) Describe the concept of shaft speed control in mechatronics approach with neat block diagram.	16	K2	1
12. a) A second order control system is subjected to unit ramp input. Draw and explain response curves for underdamped, overdamped and critically damped system.	16	K3	2

(OR)

Q. No

M BTL CO

- b) Develop the transfer function and characteristic equation for the following system. Shown in Fig. 1.

16 K3 2

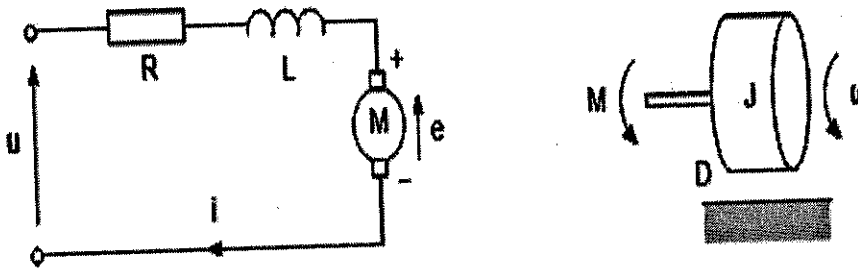


Fig. 1.

13. a) Explain, How DC Servo motor are controlled.

16 K2 3

(OR)

- b) Describe and compare the characteristics of proportional controller and proportional plus integral controller.

16 K2 3

14. a) i) Four pushbutton stations control a fan. Each stations has a start and stop button. Two door interlocks must be closed before the fan may run. Pushing any button will make the fan run, and the fan is sealed on when the start button is released. Pushing any stop button turns the fan off and also prevents the fan from starting or running. Develop PLC ladder program for this application.

10 K3 4

- ii) Write a short notes on Jump control used in PLC using a ladder diagram.

6 K3 4

(OR)

- b) i) What is the necessity of Analog system in PLC's? How to give instructions for analog input modules.

6 K3 4

- ii) Develop PLC ladder program that can be used to start a motor and then after a delay of 100 seconds start a pump when the motor is switched off there should a delay of 10 seconds before the pump is switched off.

10 K3 4

15. a) Discuss the different phases in Mechatronic design process.

16 K3 5

(OR)

- b) Apply the concepts of Mechatronics control to automate manufacturing system.

16 K3 5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: III [Full Time] / I [Part Time]

Electrical and Electronics Engineering

22EE304/23PTEE103 – ELECTRON DEVICES AND CIRCUITS

(Regulations 2022/2023)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Draw the V-I characteristics of PN Junction diode.	2	K2	1
2. Draw the energy band diagram for semiconductor.	2	K2	1
3. Why JFET is called voltage-controlled device?	2	K2	3
4. Assess the role of stability factor in transistor biasing.	2	K2	2
5. Draw a typical CB amplifier circuit.	2	K1	2
6. Define CMRR and mention its significance.	2	K1	4
7. Classify the different types of power amplifier.	2	K1	4
8. Appraise the features of large signal amplifier.	2	K2	4
9. Write the advantages of negative feedback in amplifiers.	2	K1	4
10. State the Barkhausen criterion for oscillation.	2	K1	4

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Derive the expression for transition capacitance of PN junction diode.	8	K2	1
ii) Briefly comment on the effect of temperature on PN junction diode.	8	K2	1
(OR)			
b) i) Explain the working principle of full-wave rectifier with load current and voltage waveforms.	8	K2	1
ii) Describe the operation of Zener diode as a voltage regulator.	8	K2	1
12. a) i) Compare the CB, CE, and CC configuration of transistor.	8	K2	2
ii) Describe the operation of fixed bias circuit in PNP transistor.	8	K2	2

(OR)

Q. No		M	BTL	CO
	b) i) Draw and explain the drain characteristic of n-channel JFET.	8	K2	3
	ii) Explain the working principle of UJT.	8	K2	3
13. a)	Derive the expression for current gain, voltage gain, input resistance and output resistance for CE amplifier circuit using h-parameter model.	16	K4	4
	(OR)			
b)	Draw the circuit of emitter coupled differential amplifier and explain its operation in differential mode and common mode.	16	K4	5
14. a)	Explain the operation of push pull class B power amplifier with neat waveforms.	16	K2	4
	(OR)			
b)	With neat circuit diagram, describe the operation of class C and class D power amplifiers.	16	K2	4
15. a) i)	Explain how the voltage/shunt feedback amplifier works with neat diagram.	8	K2	4
ii)	An amplifier is required with a voltage gain of 100 which does not vary by more than 1%. If it is to use negative feedback with a basic amplifier, the voltage gain of which can vary by 20%, find the minimum voltage gain required and the feedback factor.	8	K4	4
	(OR)			
b) i)	Explain the operation of transistorized Collpitt's oscillator.	8	K2	4
ii)	Design a RC phase shift oscillator to generate 5 kHz sine wave with 20V peak to peak amplitude. Assume $h_{fe} = \beta = 150$, $C = 1.5 \text{ nF}$, $h_{ie} = 1.2 \text{ k}\Omega$.	8	K4	4

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Part Time]

Mechanical Engineering

22PTMEE13 – MAINTENANCE ENGINEERING

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define the term maintainability.	2	K1	1
2. What do you mean by opportunistic maintenance?	2	K1	1
3. What is FSN analysis?	2	K2	2
4. What is meant by capacity utilization?	2	K2	2
5. Explain reliability centered maintenance.	2	K2	3
6. Three identical components each with a reliability of 0.95 are placed in series. Find reliability of the system.	2	K2	3
7. What is meant by codification in maintenance engineering and why it is important?	2	K1	4
8. List out the uses of computers in maintenance management.	2	K3	4
9. Differentiate on-load testing and off-load testing.	2	K3	5
10. What is signature analysis is vibration monitoring?	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) What is availability? Briefly explain different approaches to increase equipment availability.	8	K1	1
ii) What is maintenance policy? Elucidate the various strategies and options in maintenance management.	8	K4	1
(OR)			
b) i) What is maintenance? Explain different types of planned maintenance approaches followed in an automobile industry.	8	K1	1
ii) What do you mean by maintainability design criteria? Bring out various key aspects of it.	8	K4	1

Q. No		M	BTL	CO
12. a)	i) What are the important factors to be considered in maintenance planning?	8	K2	2
	ii) Write down the maintenance practices that are to be followed in a drilling machine.	8	K3	2
	(OR)			
b) i)	Discuss the Maintenance Scheduling in detail.	8	K2	2
	ii) How do you track the spare parts inventory? Explain the role of different practices of spare parts management Inventory?	8	K3	2
13. a)	i) A standby system has three components 1, 2, 3, where component 1 is normally operating and components 2, 3 are standby components. The reliability of component 1 is 0.95. The reliability of component 2 given that component 1 has failed is 0.96 and that of component 3 given that components 1 and 2 have failed is 0.98. Calculate the reliability of the system under the assumption that the switch is perfect.	8	K3	3
	ii) Draw the bath-tub curve and explain different phases of it with a simple case.	8	K1	3
	(OR)			
b) i)	A module of an aircraft has 100 components each with a reliability of 0.995. Find the reliability of the module. If the number of components is reduced to 50, how much is the improvement in reliability.	8	K3	3
	ii) Explain the series, parallel and parallel-series systems of reliability with simple block diagrams.	8	K1	3
14. a)	Explain the various modules present in a typical CMMS software and enumerate different types of reports that are generated from it.	16	K2	4
	(OR)			
b)	What are the key components of CMMS? Explain the general structure of a typical CMMS software in detail.	16	K2	4

Q. No		M	BTL	CO
15. a)	Explain briefly on the following condition monitoring techniques	16	K4	5
	(i) Vibration monitoring			
	(ii) Noise and sound monitoring			
	(iii) Leak deduction			
	(OR)			
b)	Write short notes on	16	K4	5
	(i) Wear monitoring technique			
	(ii) Temperature monitoring technique			
	(iii) Crack monitoring technique			

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B.E. Degree Examinations – April/May 2025

Semester: III [Full Time]

Civil Engineering

22ES301 – MECHANICS OF SOLIDS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. State Hooke's law.	2	K1	1
2. Define proof resilience.	2	K1	1
3. Draw bending moment diagram for a cantilever beam of span 5 m subjected to a point load of 5 kN at free end.	2	K2	2
4. What is point of contra flexure?	2	K2	2
5. Recall the theory of simple bending equation.	2	K1	3
6. Sketch the shear stress distribution across an I section and locate maximum shear stress.	2	K2	3
7. Compare method of joints and method of sections.	2	K2	4
8. Calculate the volumetric strain of a thin cylindrical shell having hoop strain is 0.2×10^{-3} and longitudinal strain is 0.05×10^{-3} .	2	K2	4
9. List the assumptions made in the theory of torsion.	2	K2	5
10. What is meant by principal stress and principal plane?	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) A brass bar having cross sectional area of 1000 mm ² is subjected to axial forces as shown in Fig.1. Find the total elongation of the bar. Take $E = 1.05 \times 10^5$ N/mm ² .	10	K4	1

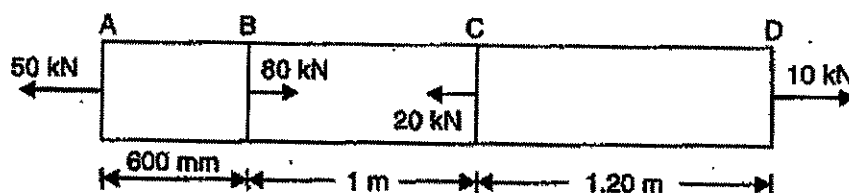


Fig.1.

Q. No

M BTL CO

- ii) A rod is 2 m long at a temperature of 10°C . Find the expansion of the rod, when the temperature is raised to 80°C . If this expansion is prevented, find the stress induced in the rod. Take $E = 1.0 \times 10^5 \text{ N/mm}^2$ and $\alpha = 0.000012 \text{ per } ^{\circ}\text{C}$.

6 K4 1

(OR)

- b) i) A tension bar shown in Fig. 2 is subjected to an axial load of 80 kN is gradually applied. Find the total strain energy produced in the bar and compare this value with that obtained in a uniform bar of the same length and having the same value when under the same load. Take $E = 2 \times 10^5 \text{ N/mm}^2$.

10 K4 1

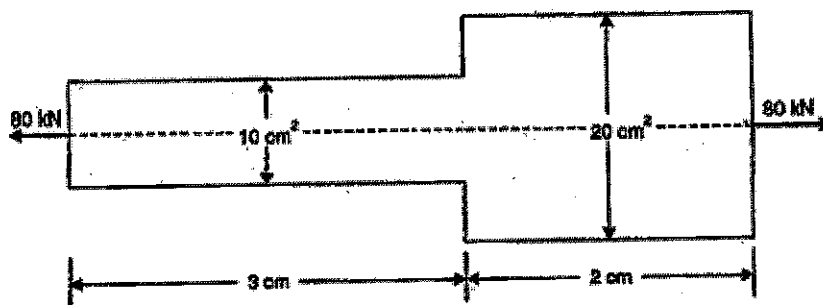


Fig.2.

- ii) A bar 30 mm x 30 mm x 250 mm long is subjected to a pull of 90 kN in the direction of its length. The extension of the bar was found to be 0.125 mm while the decrease in each lateral dimension is found to be 0.00375 mm. Compute young's modulus, Poisson's ratio and Modulus of rigidity.

6 K4 1

12. a) A cantilever beam of length 2 m carries a uniformly distributed load of 1.5 kN/m run over the whole length and a point load of 2 kN at a distance of 0.5 m from the free end. Draw the shear force and bending moment diagram.

16 K3 2

(OR)

- b) A beam ABC having simple supports at A and B which are 6 m apart with an overhang BC of 2 m long carries a uniformly distributed load of 15 kN/m over entire span. Sketch shear force and bending moment diagram.

16 K3 2

Q. No

M BTL CO

13. a) A timber beam of rectangular section of length 8 m is simply supported. The beam carries a U.D.L. of 12 kN/m run over the entire length and a point load of 10 kN at 3 m from the left support. If the depth is two times the width and the bending stress in the timber is not to exceed 8 N/mm², find the suitable dimensions of the section.

16 K3 3

(OR)

- b) Draw the shear stress distribution diagram for a symmetrical I section subjected to a shear force of 40 kN. The dimensions of I section are:

16 K3 3

Top and Bottom flange = 80 mm x 20 mm.

Web = 200 mm x 20 mm

14. a) A truss of span 5 m is loaded as shown in Fig.3. Find the reactions and forces in the members of the truss.

16 K4 4

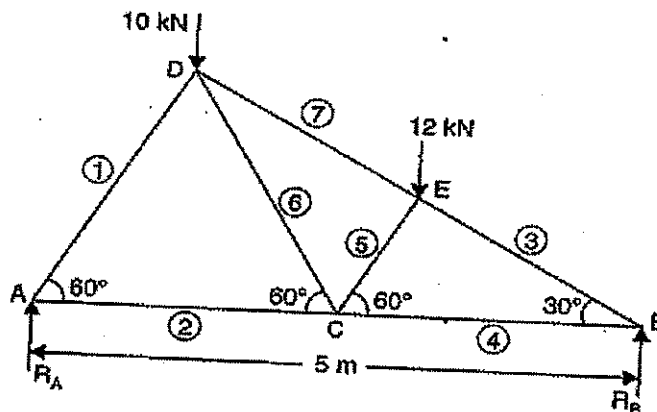


Fig.3.

(OR)

- b) A cylindrical shell 900 mm long 200 mm internal diameter having thickness of metal as 8 mm is filled with fluid at atmospheric pressure. If an additional 20000 mm³ of fluid is pumped into the cylinder. Find i) the pressure exerted by the fluid on the cylinder. ii) The hoop stress induced and iii) the longitudinal stress. Take $E = 2 \times 10^5$ N/mm² and $\mu = 0.3$.

16 K4 4

15. a) A hollow shaft having an internal diameter 40% of its external diameter transmits 562.5 kW of power at 100 r.p.m. Determine the external diameter of the shaft if the shear stress is not to exceed 60 N/mm² and the twist in a length of 2.5 m should not exceed 1.3°. Assume maximum torque = 1.25 mean torque and modulus of rigidity = 9×10^4 N/mm².

16 K4 5

(OR)

Q. No

M BTL CO

- b) Mutually perpendicular faces of a square element of a thin plate are subjected to normal and shear stresses of 63 MN/m^2 (tensile), 47.2 MN/m^2 (compressive) and 39.4 MN/m^2 (shear). Determine the magnitudes and direction of the principal stresses and the greatest shearing stress.

16 K4 5

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B.E. Degree Examinations – April/May 2025

Semester: V [Full Time]

Civil Engineering

18CE501 – BASIC STRUCTURAL ANALYSIS

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. Distinguish between Static and Kinematic Indeterminacy.	2	K2	1
2. What is the Influence Line Diagram?	2	K1	1
3. State Muller-Breslau's principle.	2	K1	2
4. What do you mean by lack of fit in Trusses?	2	K2	2
5. State Eddy's theorem as applicable to arches.	2	K1	3
6. What is a linear arch?	2	K1	3
7. What do you mean by an unstiffened cable?	2	K1	4
8. What is the true shape of cable structures?	2	K1	4
9. State the assumptions made in Plastic Analysis.	2	K1	5
10. State the Upper Bound Theorem.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) A beam has a span of 24 m, draw the influence line diagram for the bending moment and shear force at a section 8 m from the left and also determine maximum bending moment and shear force at this section due to two point loads of 10 kN and 6 kN at a fixed distance of 2 m apart rolling from left to right with 6 kN load leading.	16	K3	1

(OR)

Q. No	M	BTL	CO
b) A system of four loads 80, 160, 160 and 120 kN crosses a simply supported beam of span 25 m with the 120 kN load leading. The loads are equally spaced at 1 m. Determine the values of the following using influence lines.	16	K3	1
i. Maximum bending moment at a section 10m from left support and			
ii. Absolute maximum shear force and bending moment in the beam			

12. a) Draw the influence line for B.M at B for the continuous beam ABC simply supported at A and C and propped at B using Muller Breslau's principle. AB = 3 m, BC = 4 m. EI is constant.	16	K3	2

(OR)

b) Determine the forces in the all members of the frame shown in Fig.1. All the members have the same cross-sectional area.	16	K3	2

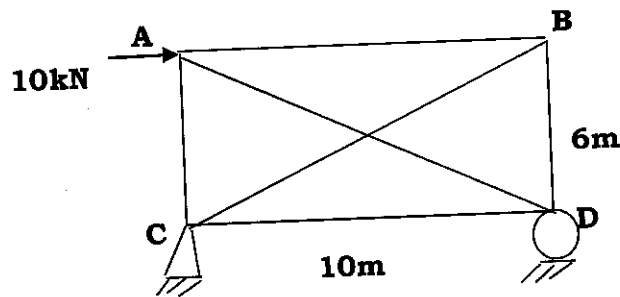


Fig.1

13. a) A three hinged parabolic arch of span 30 m and rise 5 m carries a uniformly distributed load of 40 kN per meter on the whole span and a point load of 200 kN at a distance of 5 m from the right end. Determine the horizontal thrust, resultant reaction, bending moment and normal thrust at a section 5 m from the left end.	16	K4	3
(OR)			
b) A two-hinged parabolic arch of 30 m span and 5 m central rise has a varying second moment of area, which is proportional to the secant of the slope of its neutral axis. It carries a point load of 150 kN at a distance of 10 m from the left end. Determine the horizontal thrust, ending moment, normal thrust and shear force under the load.	16	K4	3

Q. No

M BTL CO

14. a) A suspension bridge has a span 60 m with a 12 m wide runway. It is subjected to a load of 40 kN/m including self-weight. The bridge is supported by a pair of cables having a central dip of 4 m. Determine the cross sectional area of the cable necessary if the maximum permissible stress in the cable materials is not to exceed 600 MPa.

16 K3 4

(OR)

- b) A three hinged stiffening girder of a suspension bridge of 100 m span is subjected to two point loads 10 kN each placed at 20 m and 40 m respectively from the left hand hinge. Determine the bending moment and shear force in the girder at section 30 m from each end. Also determine the maximum tension in the cable which has a central dip of 10 m.

16 K3 4

15. a) A mild steel I- Section 250 mm wide and 450 mm deep has a mean flange thickness of 25 mm and a web thickness of 15 mm. Calculate the shape factor. Determine the fully plastic moment if $f_y = 252 \text{ N/mm}^2$.

16 K3 5

(OR)

- b) Determine the plastic moment capacity of the portal frame of uniform cross-section as shown in Fig.2.

16 K3 5

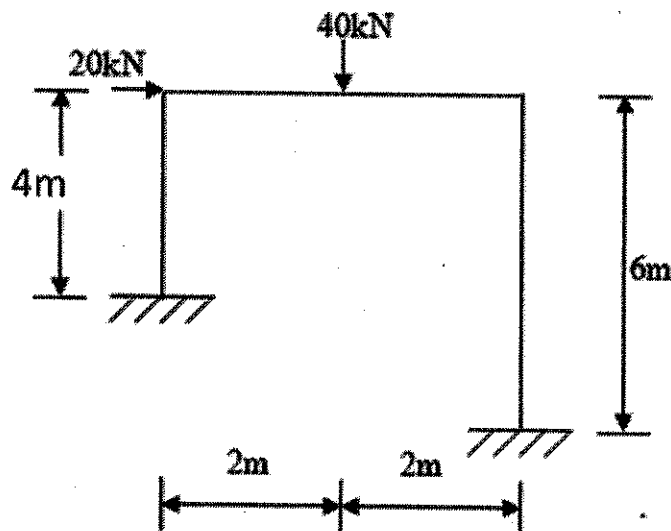


Fig.2

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations - April/May 2025

Semester: III [Full Time]

Computer Science and Engineering

22CS304 - OPERATING SYSTEMS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. How does an interrupt differ from a trap?	2	K1	1
2. Define Kernel.	2	K1	1
3. Distinguish between CPU bounded and I/O bounded processes.	2	K2	1
4. Why a thread is called as light weight process?	2	K1	1
5. What is the concept behind strong semaphore and spinlock?	2	K1	2
6. Write the conditions for occurrence of Dead lock.	2	K2	2
7. What is thrashing?	2	K1	2
8. State the advantage and disadvantage of pre-fetching.	2	K2	2
9. How does DMA increases system concurrency?	2	K1	3
10. A disk has 26310 cylinders, 16 tracks and 63 sectors. The disk spins at 7200 rpm and the Seek time between adjacent track is 1 ms. How long does it take to read the entire disk?	2	K3	3

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) i) Explain different operating system structures with neat sketch.	8	K2	1
ii) Discuss the various types of operating system services.	8	K2	1
(OR)			
b) i) Interpret the advantages and disadvantages of using the same system call interface for both files and devices.	8	K2	1
ii) Compare symmetric and asymmetric multiprocessing. Discuss the advantages and disadvantages of multiprocessor systems.	8	K2	1

Q. No

12. a) i) What is inter-process communication? Discuss message passing and the shared memory concept of IPC.
- ii) Draw the structure of process control block.
- (OR)
- b) i) Consider the following set of processes with the length of the CPU-burst time in given ms

M BTL CO

10 K2 2

6 K2 2

10 K2 2

Process	Burst Time	Arrival Time
P1	8	0
P2	4	1
P3	9	2
P4	5	3
P5	3	4

Draw the Gantt charts illustrating the execution of these processes using FCFS, SJF, priority and RR(quantum=2)scheduling. Calculate the waiting time and turnaround time for each scheduling algorithms.

- ii) Summarize on multilevel queue with an example.

6 K2 2

13. a) i) What is a semaphore? State a Dining Philosopher problem gives a solution using semaphore.

8 K4 2

- ii) Illustrate Peterson's solution for the critical section problem.

8 K4 2

- b) i) Consider the following snapshot of the system:

8 K4 2

	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P ₀	0	0	1	2	0	0	1	2	1	5	2	0
P ₁	1	0	0	0	1	7	5	0				
P ₂	1	3	5	4	2	3	5	6				
P ₃	0	6	3	2	0	6	5	2				
P ₄	0	0	1	4	0	6	5	6				

Answer the following questions using Banker's algorithm:

- What is the content of the need matrix?
- Is the system in a safe state? If yes, mention the safe sequence.
- If a request from process P₁ arrives for (0,4,2,0) can the request be granted immediately?

Q. No

M BTL CO

	ii) Explain different methods to recover from deadlocks.	8	K4	2
14. a)	i) Consider the page reference string: 1, 2, 3, 4, 2, 5, 3, 4, 2, 6, 7, 8, 7, 9, 7, 8, 2, 5, 4 and 9. How many page faults would occur for LRU, FIFO and Optimal page replacement algorithms when the number of frames is three?	10	K3	3
	ii) Compare Internal and External fragmentation.	6	K4	3
	(OR)			
b) i)	Briefly explain the concept of Demand paging.	6	K4	3
	ii) With a neat sketch, translate a logical address into physical address using Paging mechanism.	10	K3	3
15. a)	Discuss file system and its access methods. Also, Explain free space management with an example	16	K4	3
	(OR)			
b)	None of the disc scheduling disciplines, except FCFS are truly fair. Why this assertion is true? Perform FCFS, SSTF, SCAN algorithms for the following set of request 10, 22, 20, 2, 40, 6, 38 and calculate the average seek time. Arm is initially at cylinder 20 and maximum numbers of cylinders are 50.	16	K4	3

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B.E. Degree Examinations – April/May 2025

Semester: III [Full Time]

Electronics and Communication Engineering

22EC304 – TRANSMISSION LINES AND WAVEGUIDES

(Regulations 2022)

(Smith Chart needs to given)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Recall the significance of infinite lines.	2	K1	1
2. Write the expression for secondary constants in terms of primary constants of a transmission line and also recall its significances.	2	K3	1
3. Find the reflection coefficient of a 50Ω transmission line when it is terminated by a load impedance of $60 + j40 \Omega$.	2	K3	2
4. Derive the load reflection coefficient of an open circuited and short-circuited line.	2	K3	2
5. Find the length and width of a rectangular waveguide to operate at 5GHz in TE_{10} mode.	2	K3	3
6. Differentiate TE and TM waves.	2	K2	3
7. Define the quality factor of the cavity resonator.	2	K1	4
8. Write down the expression for the quality factor of the rectangular cavity resonator.	2	K1	4
9. List the different types of planar transmission lines.	2	K1	5
10. How the field distribution occurs in microstrip lines and slot lines?	2	K3	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) An open wire transmission line has $R = 10$ ohms per km, $L = 0.0037$ Henry per km, $G = 0.4 \times 10^{-6}$ mhos per km and $C = 0.0083 \times 10^{-6}$ Farad per km. Determine the characteristic impedance Z_0 and propagation constant. Assume frequency as 1000 Hz.	6	K4	1

Q. No		M	BTL	CO
	ii) Discuss in detail about waveform distortion.	10	K1	1
	(OR)			
b) i)	Interpret the expressions for current and voltage at any point along a line, which is terminated in its Characteristic impedance.	10	K4	1
	ii) Infer the input impedance for a line terminated with	6	K1	1
	A. Open - circuited impedance.			
	B. Short - circuited impedance.			
12. a) i)	A 70Ω lossless line is used at a frequency where wavelength (λ) equals 80 cm terminated by a load of $(140 + j91)\Omega$. Determine the reflection coefficient, VSWR and input admittance using the SMITH chart.	12	K4	2
	ii) Design a quarter wave transformer to match a load of 200Ω to a source resistance of 500Ω . The operating frequency is 200 MHz.	4	K3	2
	(OR)			
b) i)	A 75Ω lossless line is to be matched with a $100 - j80\Omega$ load using a single stub. Calculate the stub length and distance from the load corresponding to the frequency of 30 MHz using the SMITH chart.	12	K4	2
	ii) Interpret the relation between the standing wave ratio and reflection coefficient.	4	K3	2
13. a) i)	Derive the expression for wave impedance of TE and TM wave in a rectangular waveguide.	8	K1	3
	ii) Describe the velocity of propagation of wave between a pair of perfectly conducting plates.	8	K1	3
	(OR)			
b) i)	Develop the expression for electric and magnetic field strengths between a pair of perfectly conducting parallel planes of infinite extent in the X and Z directions. The planes are separated by a 'b' meter in the Y direction. Also derive the field equations for TM modes.	8	K1	3
	ii) Derive the expression for the attenuation constant of TE waves in between two parallel conducting planes.	8	K1	3

Q. No		M	BTL	CO
14. a)	i) Draw the field configurations of different TM and TE modes for a circular wave guide.	10	K3	4
	ii) Interpret and derive the expression of electric and magnetic fields for TE waves in circular waveguides.	6	K1	4
	(OR)			
b)	i) An air-filled circular waveguide with an inner radius of 1 cm is excited in dominant mode at 10GHz. Find 1) The cut-off frequency of the dominant mode is 10GHz. 2) Guide wavelength 3) Wave impedance 4) Bandwidth of operation in dominant mode.	10	K3	4
	ii) Interpret the expression for the resonant frequency of a rectangular cavity resonator.	6	K1	4
15. a)	i) Compare the advantages and disadvantages of using coplanar waveguides (CPW) versus microstrip lines in high-frequency circuits.	6	K4	5
	ii) Analyze the effect of substrate material on the performance of strip lines and microstrip lines.	10	K4	5
	(OR)			
b)	i) Assess the impact of line coupling in coupled microstrip lines on signal transmission in communication systems.	6	K4	5
	ii) Explain how to measure the distributed parameters of a coaxial transmission line.	10	K4	5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: VII [Full Time]

Electrical and Electronics Engineering

18EE601 – POWER SYSTEM ANALYSIS AND STABILITY

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. A generator rated at 100 MVA, 33kV, $X_d' = 10\%$. Determine the per unit reactance to the base values of 200 MVA and 35kV.	2	K3	1
2. What is the purpose of using single line diagram?	2	K2	1
3. Write the analytical expressions for calculating driving point and transfer admittances.	2	K1	2
4. What do you mean by a flat voltage start?	2	K1	2
5. List the various types of faults.	2	K1	3
6. A power system comprises of 10 buses, and a symmetric fault occurs on the 6th bus. What is the current at 7th bus ($I_{7(f)}$)?	2	K3	3
7. Write the equation to convert the unbalanced phase currents into symmetrical currents.	2	K1	4
8. Draw the zero-sequence model of a three phase synchronous generator with neutral is grounded through an impedance (Z_n).	2	K1	4
9. How is the power system stability classified?	2	K1	5
10. Define critical clearing angle.	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Draw the pu reactance diagram for the power system shown in Fig.1. Neglect the resistance and use a base of 50 MVA and 13.8 kV on generator 1. G1: 20 MVA, 13.8 kV, $X'' = 20\%$ G2: 30 MVA, 18 kV, $X'' = 20\%$ G3: 30 MVA, 20 kV, $X'' = 20\%$ T1: 25 MVA, 220 / 13.8 kV, $X = 10\%$	16	K3	1

T₂: 3 single phase unit 10 MVA, 127 / 18 kV, X=10%

T₃: 35 MVA, 220 / 22 kV, X=10%

X_{Line 1} = j80 Ω

X_{Line 2} = j100 Ω

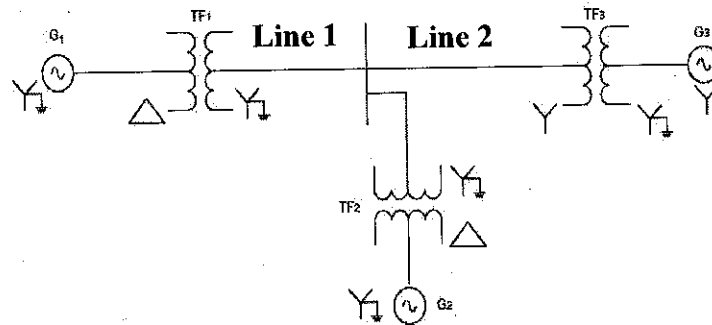


Fig.1

(OR)

Q. No

M BTL CO

- b) The single line diagram of a 3-φ power system is shown in Fig.2. Select a common base of 100 MVA and 13.8 kV on the generator side. Draw the p.u. impedance diagram with new p.u. reactance values.

16 K3 1

G: 90 MVA, 13.8 kV, X= 18%

TF1: 50 MVA, 13.8/220 kV, X=10%

TF2: 50 MVA, 220/11 kV, X=10%

TF3: 50 MVA, 13.8/132 kV, X=10%

TF4: 50 MVA, 132/11 kV, X=10%

M: 80 MVA, 10.45 kV, X= 20%

Load: 57 MVA, 0.8 pf lag, 10.45 kV

Line 1: j50 Ω

Line 2: j70 Ω

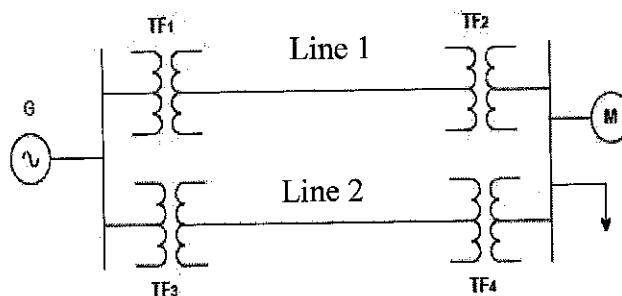


Fig.2

Q. No

M BTL CO

12. a) i) Determine the bus admittance matrix for the given power system by using the singular transformation method.

8 K3 2

Element Number	From Bus	To Bus	Primitive Impedance
1	1	0	0.05
2	3	0	0.10
3	1	2	0.50
4	2	3	0.40
5	1	3	0.25

- ii) Detail the Jacobian matrix formation if polar coordinate representation is used to Newton Raphson load flow analysis.

8 K2 2

(OR)

- b) i) The line data for a power system is given below. Determine the bus admittance matrix by using inspection method.

8 K3 2

Line Number	From Bus	To Bus	Series Impedance	Half Line Charging Admittance
1	1	2	$0.02+j0.06$	$j0.03$
2	1	3	$0.08+j0.025$	$j0.025$
3	2	3	$0.06+j0.18$	$j0.020$

- ii) With suitable flowchart or algorithmic steps detail the computational flow of fast decoupled load flow.

8 K2 2

13. a) i) Discuss the procedure of symmetrical fault calculation using bus impedance matrix.

8 K2 3

- ii) A synchronous generator feeding a motor through transformers and a transmission line. Determine the fault

8 K3 3

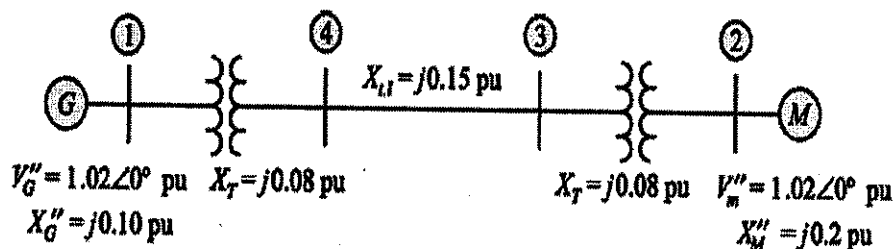


Fig.3

Current for a three-phase fault at bus 1. Compute the current flowing in the transmission line under the fault condition. All reactance, in pu, are shown in the Fig.3. Assume equal constant voltages of $1.02+j0 \text{ pu}$ behind subtransient generator and motor reactance.

Q. No		M	BTL	CO
	(OR)			
b) i)	Explain the formation of $[Z_{bus}]$ by using bus building algorithm.	8	K2	3
ii)	Determine the impedance matrix for the given power system network using Z_{bus} building algorithm (Fig.4).	8	K3	3

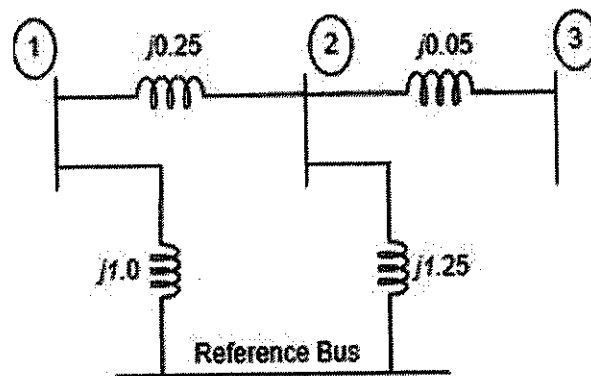


Fig.4

14. a) i)	Elaborate the principle of symmetrical components. Derive the necessary equations to phase quantities into symmetrical quantities.	8	K2	4
ii)	An SLG fault occurs on phase a of a 30-MVA, 11 -kV, star-connected, three-phase generator. The generator is operating on no-load at rated terminal voltage. It has a subtransient reactance of 0.5 pu and negative and zero sequence reactance of 0.30 pu and 0.08 pu respectively. Assume that the generator neutral is grounded through a reactance of 5Ω Calculate the sub-transient fault current and the phase voltages.	8	K3	4
	(OR)			
b) i)	Derive the necessary equations to determine the fault current for a double line to ground fault. Sketch the diagram showing the interconnection of sequence networks.	8	K2	4
ii)	Calculate the symmetrical components of phase voltages, when phase voltages are given as $V_a = 100 \angle 0^\circ$ V, $V_b = 150 \angle 120^\circ$ V, and $V_c = 210 \angle 240^\circ$ V.	8	K3	4
15. a)	Derive the equal area criterion. Interpret equal area criterion graphically for a generator supplying load at its bus.	16	K2	5
	(OR)			
b)	Describe the step by step method and Runge-Kutta method to find solution of swing equation.	16	K2	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations - April/May 2025

Semester: V [Part Time]

Electrical and Electronics Engineering

22PTEEE24 - POWER SYSTEM OPERATION AND CONTROL

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What is spinning reserve and list the various types of reserves?	2	K1	1
2. Define diversity factor.	2	K2	1
3. State the function of a tie-line.	2	K2	2
4. What is area control error?	2	K1	2
5. What is the effect of reactive power on voltage stability?	2	K3	3
6. Compare the Static VAR Compensator and STATCOM.	2	K2	3
7. How to determine the incremental cost?	2	K1	4
8. Compare the economic dispatch and unit commitment problem.	2	K2	4
9. Bring out role of the energy control centre in power system operation.	2	K1	5
10. List out the basic components of a data acquisition system.	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Explain the structure and functions of the national and regional load dispatch centers in the Indian power grid.	6	K2	1
ii) A generating station has the following daily load cycle.	10	K4	1

Time (h)	0-6	6-10	10-12	12-16	16-20	20-24
Load (MW)	40	50	60	50	70	40

Draw the load curve and find

- Maximum demand
- Units generated/per day
- Average load and
- Load Factor.

Q. No		M	BTL	CO
	(OR)			
b) i)	Discuss the necessity of voltage and frequency regulation in a power system. How are they maintained?	10	K4	1
ii)	Discuss the need for tariffs in the power sector. What are the different types of tariffs and their characteristics?	6	K2	1
12. a) i)	Develop the block diagram and explain the transfer function of single-area LFC system.	10	K4	2
ii)	Derive the speed-load characteristics for a governor and explain its significance.	6	K4	2
	(OR)			
b)	Model a two-area LFC system and derive the tie-line power flow equations.	16	K4	2
13. a) i)	Explain the generation and absorption of reactive power in a power system.	6	K2	3
ii)	Describe the working of an automatic voltage regulator (AVR) with the help of a block diagram.	10	K2	3
	(OR)			
b) i)	Explain the principle and operation of a STATCOM employed in distribution systems for the regulation of reactive power and voltage management.	12	K2	3
ii)	Discuss the advantages and disadvantages of using tap-changing transformers for reactive power and voltage control.	4	K2	3
14. a)	Determine the economic generation schedule of three generating units in a power system to meet the system load of 925 MW. The operating limit and cost function is given below:	16	K4	4

Operating limits

$$250MW \leq P_{G1} \leq 450 MW$$

$$200MW \leq P_{G2} \leq 350 MW$$

$$125MW \leq P_{G3} \leq 225 MW$$

Cost function is

$$F1(P_{G1}) = 0.0045 P_{G1}^2 + 5.2 P_{G1} + 580$$

$$F2(P_{G2}) = 0.0056 P_{G2}^2 + 4.5 P_{G2} + 640$$

$$F3(P_{G3}) = 0.0079 P_{G3}^2 + 5.8 P_{G3} + 820$$

(OR)

Q. No		M	BTL	CO
b)	i) Provide a clear flowchart and detailed procedure for solving the unit commitment problem using the forward dynamic programming approach.	10	K4	4
	ii) Analyze the priority-list method for unit commitment problem.	6	K4	4
15. a)	i) Explain the various functions of an energy management system (EMS). How does the EMS help in efficient power system operation and control?	10	K2	5
	ii) Discuss state estimation and security analysis in smart power system.	6	K2	5
	(OR)			
b)	Explain the principle and operation of SCADA system used in power system monitoring and control.	16	K2	5

Registration Number:

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: I & II [Full Time]

Common to all to Branches

22EN101 – COMMUNICATIVE ENGLISH

(Regulations 2022)

Time: 3 Hours

Maximum Marks: 100

PART A (10 x 5 = 50 Marks)

Answer **ALL** Questions

Q. No

M BTL CO

1. Look at the following messages, notices, adverts and choose the option closest in meaning to the given statement.

5 K2 1

1. From: Marketing Department To: All Staff Please submit Your project proposals for the next quarter by the 15th.

- a) The Marketing Department is asking for feedback on project proposals.
- b) The Marketing Department is reminding staff about project proposal deadlines.
- c) Staff must submit their project proposals for the next quarter by the 15th.

2. Google acquired the video-sharing platform YouTube in 2006.

- a) Google has sold its products to YouTube in 2006.
- b) YouTube and Google are new ventures in the tech world.
- c) YouTube has been taken over by Google.

3. School Bulletin: Please submit your science fair projects by Monday. If you fail to do so, you will not be eligible for the competition.

Students who do not submit their projects by Monday,

- a) will be able to participate in the science fair.
- b) will not be able to attend classes.
- c) will have to submit their projects next week.

4. HR Notice: We are looking for part-time employees available on weekends. Send your resume to hr@company.com.

- a) Send your resume to hr@company.com, if you need a job
- b) Send your resume to hr@company.com, if you can work part-time
- c) Send your resume to hr@company.com, if you are available on weekends

5. To register for the webinar, visit the company's website.

- a) You have to visit the company's website to register for the webinar
- b) The company's website will assist in registering for the webinar
- c) To attend the webinar, you need to register on the company's website

2. Choose the Error free statement from the following

5 K2 3

- 6. a. My friend said that "I have left my luggages at the railway station".
b. My friend said that "I have left my luggage at the railway station".
- 7. a. Everyone has to obey the traffic rules to avoid accidents.
b. Everyone have to obey the traffic rules to avoid accidents.
- 8. a. Harry Potter, is one of the bestselling novel of J.K. Rowling.
b. Harry Potter, is one of the bestselling novels of J.K.Rowling.
- 9. a. It's easy to give advice, but it's harder to follow it.
b. It's easy to give advice, yet it's harder to follow it.
- 10. a. Sheela is good at dancing.
b. Sheela is very good in dancing.

3. Add suitable prefix to the following underlined adjectives to form Antonyms and convey opposite meaning.

5 K3 3

- 11. I had happy days and _____ days in my life.
- 12. We pay direct tax and _____ taxes.
- 13. Raja is an efficient worker but Ramu is an _____.
- 14. Understanding each other is good, _____ brings differences.
- 15. There is verbal communication and _____ communication.

4. Choose the appropriate technical term for the following statements given.

5 K2 1

(Program, Machine, Generator, Gadget, Malware, Hardware)

- 16. It is a small electronic device or machine with a particular purpose.
- 17. It is a software that is intended to damage or disable the data on a computer.
- 18. It is a mechanically, electrically, or electronically operated device for performing a task.
- 19. It is a set of instructions that a computer uses to perform a particular operation.
- 20. It is a device which converts mechanical energy to electrical energy.

Q. No	M	BTL	CO
5. Match the Phrasal Verbs with its proper contextual usage.	5	K1	2
21. Put off	- the injured player is removed from the team.		
22. Call off	- some of our customs have been broken into pieces.		
23. Get rid of	- his father is taking care of his family members.		
24. Look after	- the cricket match has been cancelled due to rain.		
25. Fall apart	- the meeting is postponed because of the power shut.		
6. Complete the following Conditional Clauses with correct forms of the verbs.	5	K3	3
26. If I _____ (be) a District Collector, I would help the needy people.			
27. My parents will be very happy, If I _____ (get) placed in a well reputed company.			
28. If Raj had enough money, He _____ (buy) Ferrari.			
29. I would have informed your father, if I _____ (meet) him.			
30. If she had sung the song effectively well, She _____ (award) the first prize.			
7. Fill in the blanks with the suitable conjunctions to make the paragraph meaningful. (so, though, moreover, as long as, still, however)	5	K3	3
There lived a man, named Harichandran. He is an honest man and never tells a lie in his life, _____ (31) he led a very poor life. He is _____ (32) being remembered for his honesty. _____ (33) he has many good qualities and follows moral and ethical values. His life is a lesson for all of us _____ (34) everyone should follow his path. Everyone should possess these good human qualities _____ (35) we live on earth.			
8. Fill up with a suitable Modal verbs given below: (shall, might, would, should, could, can)	5	K3	3
36. I _____ prefer Coffee to Tea.			
37. It _____ rain tomorrow.			
38. We _____ renew our driving license periodically.			
39. He _____ beat you at chess game when you were young.			
40. She _____ speak five languages well.			

Q. No		M	BTL	CO
9.	Choose the appropriate word substitution for the given statements. 41. "Wings of Fire" is a book, by Abdul Kalam which narrates about his life history which is a/an _____ of him. (Auto biography, Biography, Epigraphy). 42. A government is that of the people, by the people and for the people, called _____ (Autocracy Democracy, Bureaucracy). 43. We have a fear of Book which is commonly known as _____ (Hydrophobia, Bibliophobia, Aerophobia). 44. A person who speaks to himself alone, called _____ (Soliloquy, Eloquence, Extempore). 45. Name the study of statistics is called _____ (Topography, Geography, Demography).	5	K2	1
10.	Match the Idioms with its proper meaning from the following. 46. On a cloud nine - Struggling to take a decision 47. Red handed - Feeling very happy 48. Cat on a wall - Murderer was arrested 49. Once in a blue moon - Revealing a secret 50. Let the cat out of the bag - Happening very rarely	5	K1	2

PART B (5 x 10 = 50 Marks)

Answer **ALL** Questions

11. a)	a. Read the following passage and answer the questions below: Automation and Artificial Intelligence Automation and artificial intelligence are the buzz words which have created excitement and commotion in the industry and economy. AI is the simulation of human intelligence processes by machines, especially computer systems. These processes include learning (the machines acquire knowledge of rules for using the information), reasoning (using the rules to reach approximate or definite conclusions), and self-correction. Scientific and technological advancements have led to the invention of sophisticated machines, robots and software which surpass humans in physical and cognitive functions. This means that there is increased profitability which leads to economic growth. However, the downside is loss of traditional jobs and increasing unemployment in varied sectors of the industry which has a ripple effect on, and serious implications for the society.	10	K2	1

As governments, organizations and workforce all over the world grapple with this phenomenon, one recalls the words of the U.S. president, Lyndon B. Johnson in 1964. He had said at that time, "If we understand it, if we plan for it, if we apply it well, automation will not be a job destroyer or have a family displaced. Instead, it can remove dullness from the work of man and provide him with more than man has ever had before." It also brings to fore the words of Isaac Asimov, who had said that, 'there is no way but onwards', in relation to scientific inventions impacting human lives.

The McKinsey Global Institute has published a report on automation and its potential effects on productivity. According to them, activities that involve data collection, data processing, and physical work in factories in sectors such as manufacturing, food services, transportation and warehousing, and retail will be the most affected.

On one hand, AI and automation will open new avenues for individuals, certain sections of the industry and the economy, but on the other hand, they will also lead to loss of millions across the world, creating an unhappy, dissatisfied and disgruntled population. It will also need jobs of millions and action by the state for social welfare. Thus, the need of the hour is to have strategies and policies that could increase the benefits of AI and diminish its negative impact.

Mr. OS, who built the app for a startup idea that we now call UVX, says he thought very little about how the application would impact society, and the large number of drivers who would lose a source of income. "We are all responsible," he said at the Milken Global Conference in Los Angeles. "We are adding technology to a society without thinking about the consequences. I think government, industry and society need to work more together, because it is going to get crazier and crazier." According to him, the technology companies who create AI, must not only participate in the discussions on the effects of the automation, but also take responsibility for them. It is certain that AI-driven automation will influence and change the economy over the coming years and decades. The challenge for all stakeholders and policymakers will be to update, strengthen, and adapt policies to respond to the economic effects of AI. The solution, it seems, lies in identifying

skills required in the job market in the future; re-skilling and retooling workers for the new job scenario; revamping education for jobs of the future; and also support and develop AI for its many benefits.

Though no one can be certain how much and how far the human race will benefit from AI, or what drawbacks and disruptions people across the globe will face because of it, the need to be prepared for its impact on an individual, community, national and international level is vital and necessary in the future.

A. Choose the right option to answer the following questions:

1. What is 'artificial intelligence'?
 - a). Intelligence feigned by some humans.
 - b). Intelligence exhibited by machines and software.
 - c). Intelligence which is based on falsehood.
 - d). Inappropriate intelligence.
2. Mr. OS says, 'We are all responsible'. For what does he hold us responsible?
 - a). For creating new jobs in the industry.
 - b). For developing new software for industry.
 - c). For creating technology leading to loss of jobs.
 - d). For creating new start-ups.
3. The way forward for the tech community is
 - a). To develop more software.
 - b). To create an environment in which employees feel comfortable.
 - c). To participate in discussions.
 - d). To train the existing workforce for tech jobs of the future
4. Which is the closest meaning of a 'start-up' in the context?
 - a). To start something new.
 - b). An insolent person.
 - c). A young company that is just beginning to develop.
 - d). Fresh and modern.
5. Isaac Asimov says, 'There is no way but onwards'. He means that
 - a). We have to move forward quickly.
 - b). Science and technology are bringing rapid changes in our lives.

c). Further development in science and technology will find solutions to problems created by inventions.

d). Moving on with life is the only option available to us in the current scenario.

B. State whether the following statements are true or false

6. Artificial intelligence (AI) involves the simulation of human intelligence processes by machines.

7. AI and automation have only positive effects on the economy and society.

8. According to the passage, AI-driven automation will not affect traditional jobs and employment.

9. The McKinsey Global Institute report suggests that sectors like manufacturing and retail will be most affected by automation.

10. The passage mentions that AI and automation can lead to increased profitability and economic growth.

(OR)

b)	Imagine that you are attending an interview in an international company. Write 10 conversational exchanges, focusing on qualifications, work experience, skill training and etc.... between the interviewer and you.	10	K2	1

12. a)	Assume that you are a manager of a company. Write down some 10 valid recommendations for the growth and development of your company.	10	K3	2

(OR)

b)	Prepare a checklist of 10 items of your own to maintain "Good Health and Well Being".	10	K3	2

13. a)	Write 10 common instructions which everyone should follow during "Flooded rainy seasons"	10	K4	3

(OR)

b)	Write a compare and contrast essay on "Online Purchase" and "Off line Purchase", Enumerate its merits and demerits in 200 words.	10	K4	3

14. a)	You happened to see a road accident. You rescued some injured passengers from a bus. You admitted them in a hospital and you saved their lives. Write a detail report to the district administration about this incident, what was happened, when it happened, why it happened in that place, and ask them take necessary actions to prevent it.	10	K3	3

(OR)

- b) You are a HR Manager of a company. You conducted a training class for your employees. You invited a resource person for giving them the training. When the training was over, you were given very positive feedback about the training program. You wanted to share this with him and appreciate him for the effort. Write an email to the resource person and express your sincere appreciations stating with all important inputs. 10 K3 3
15. a) Read the advertisement given below. Apply for the job advertised with a cover letter and resume. 10 K4 4

Job Advertisement

Position: HR Manager

Company: People Solutions

Location: Hyderabad, Telangana

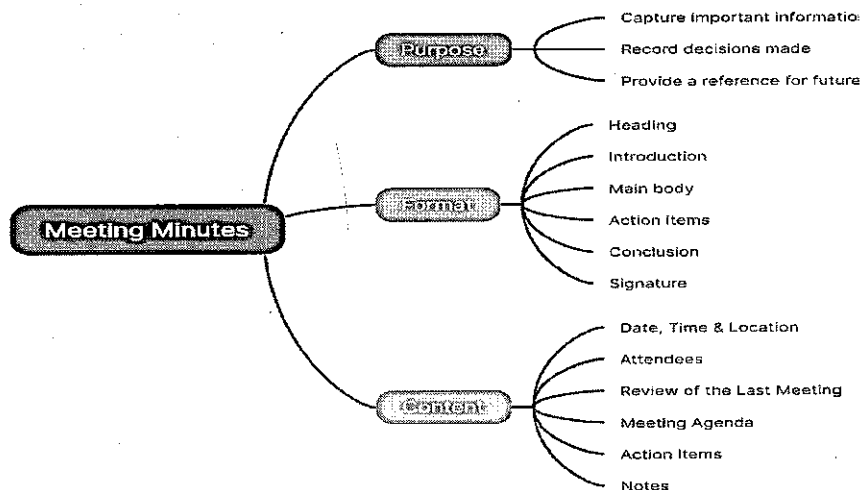
Qualification: Bachelor's degree in Human Resources or related field

Apply by: October 31, 2024

Apply: hr@peoplesolutions.com

(OR)

- b) Read the points given in the mind map and write an essay of 200 words on Meeting minutes. 10 K4 4



Registration Number :

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(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Civil Engineering

22MTOE03 - DESIGN AND SELECTION OF MATERIALS

(Regulations 2022)

Time : 3 Hours

Maximum Marks: 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What are the various stages of a design process?	2	K2	1
2. What is meant by functional requirements of a component?	2	K2	1
3. State the difference between impact toughness and fracture toughness of a material.	2	K2	2
4. For which types of applications, the material property resilience is very important?	2	K3	2
5. List the merits of systematic material selection.	2	K2	3
6. List the demerits of intuitive material selection process.	2	K1	3
7. How is the overall cost of manufacturing process decided?	2	K2	4
8. Justify the selection of investment casting process for making turbine blades with complex shapes.	2	K1	4
9. What are constraints in materials selection?	2	K1	5
10. What are conflicting objectives in materials selection?	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) What is designing process? Explain the three types of design process with suitable examples.	16	K2	1
(OR)			
b) With a neat sketch, explain the interaction between function, material, shape and process.	16	K2	1
12. a) List and explain the design strengths and weaknesses of the following materials while considering them for a suitable application.	16	K3	2
(i) Cast irons			
(ii) Titanium alloys			

(OR)

Q. No	M	BTL	CO
b) List any five properties of material and explain their importance in selecting materials for an application with examples.	16	K3	2
13. a) Explain the various steps involved in the systematic material selection for an application with relevant examples.	16	K2	3
(OR)			
b) Discuss the systematic process of selecting a few right materials for the component "Helical springs for two wheelers" (as shown below Fig.1) by defining the functional requirements of the component and process notes.	16	K2	3

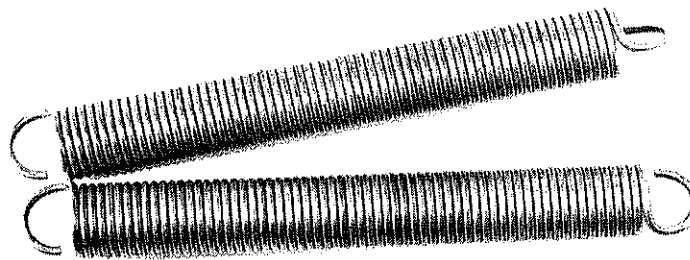


Fig.1

14. a) Diagonize a detailed account on the types, characteristics of various manufacturing process available to make engineering components and structures.	16	K4	4
(OR)			
b) A high speed tool steels blank, as shown in the below Fig.2, has to be converted into a drill bit with a wear resistant coating, as shown in the below Fig.3. Explain the process sequence for this fabrication with proper justifications for the selection of all processes. Consider the hardness of both blank and drill bit is 65HRc.	16	K4	4

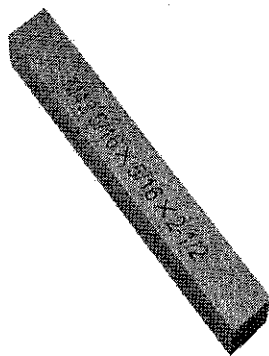


Fig.2

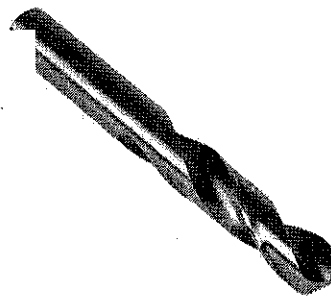


Fig. 3

Q. No		M	BTL	CO
15. a)	List and explain the various factors affecting the selection of materials for an engineering application or for a structural application with appropriate examples.	16	K2	5
	(OR)			
b)	Discuss a few Engineering materials for the component "Connecting rods for high performance engines" by defining its functional requirements, technical constraints, and objectives clearly.	16	K2	5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Civil Engineering

22MTOE01 – FOUNDRY AND WELDING TECHNOLOGY

(Regulations 2022)

Time : 3 Hours

Maximum Marks: 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What is the function of a core in casting?	2	K1	1
2. List the typical allowances given on a casting pattern.	2	K2	1
3. List any two advantages of permanent mould casting.	2	K3	2
4. What is meant by Rheocasting?	2	K1	2
5. What precautions are necessary during the melting of magnesium alloys?	2	K2	3
6. Name any two common casting defects.	2	K1	3
7. Give the application of Brazing.	2	K3	4
8. What is oxy-acetylene welding?	2	K1	4
9. Define Friction Stir Welding.	2	K1	5
10. State two advantages of Electron Beam Welding.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Illustrate different types of cores used in casting. Explain their functions and how cores are produced and supported inside moulds.	16	K2	1
(OR)			
b) Explain the types of moulding sands used in foundry practice. Discuss how sand testing is done for permeability, strength, and refractoriness.	16	K2	1
12. a) Describe centrifugal casting in detail with a neat sketch. Explain the different types of centrifugal casting techniques.	16	K4	2
(OR)			
b) Explain the investment casting process. Compare its advantages and limitations with conventional sand casting.	16	K4	2

Q. No		M	BTL	CO
13. a)	Describe in detail the steps involved in cleaning and repair of castings after solidification.	16	K2	3
	(OR)			
b)	With neat sketches list the common casting defects and explain each defect, causes, effects, and remedial measures.	16	K2	3
14. a)	Explain the working principles and equipment setup for oxy-acetylene welding and manual metal arc welding.	16	K4	4
	(OR)			
b)	Compare Gas Tungsten Arc Welding (GTAW) and Gas Metal Arc Welding (GMAW) processes. Discuss their advantages and industrial applications.	16	K4	4
15. a)	Explain the principle, equipment, process variables, merits, and limitations of Electron Beam Welding.	16	K3	5
	(OR)			
b)	Describe the Friction Stir Welding process with neat sketches. What are its advantages over conventional welding techniques?	16	K3	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Computer Science and Engineering

22CSPE305 – E-COMMERCE

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
1.	Analyze the difference between B2C and B2B e-commerce applications.	2	K2	1
2.	Mention the key components of the anatomy of an e-commerce application.	2	K1	1
3.	List the advantages of using smart cards in payment systems.	2	K1	2
4.	How do digital token-based payments enhance transaction security?	2	K2	2
5.	Analyze a situation where wireless WANs would be more beneficial than LANs.	2	K2	3
6.	Identify a suitable wireless platform for real-time communication in a hospital.	2	K3	3
7.	Analyze the impact of outdated application development methods on enterprise growth.	2	K2	4
8.	Identify a way to improve the business value of an underperforming website.	2	K3	4
9.	Compare outside and inside cyber attacks.	2	K2	5
10.	Analyze the strengths and weaknesses of current e-commerce application security technologies in addressing evolving online threats.	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
11. a)	Describe the features and functionalities of various e-commerce consumer applications.	16	K2	1

(OR)

Q.No		M	BTL	CO
	b) Describe different types of e-commerce organizational applications and how they benefit business operations.	16	K2	1
12. a)	i) Explain the mercantile process model in e-commerce and describe its key components with examples.	8	K2	2
	ii) Analyze the major risks in electronic payment systems and propose techniques to mitigate them.	8	K3	2
	(OR)			
b) i)	Explain the functioning of digital token-based payment systems and discuss their advantages and limitations.	8	K2	2
	ii) Analyze the structure and working of smart card-based payment systems in online transactions.	8	K3	2
13. a)	Describe the different wireless communication platforms used for LANs and their applications in business.	16	K2	3
	(OR)			
b)	Discuss the architecture and features of Wireless WANs and their impact on enterprise connectivity.	16	K2	3
14. a)	Apply application development strategies to design a web-based enterprise solution that meets evolving business needs.	16	K3	4
	(OR)			
b)	Illustrate how to assess the current business value of a website and propose ways to improve it.	16	K3	4
15. a) i)	Analyze the different types of attacks that can target e-commerce applications, and explain how they can compromise the security of the system.	8	K4	5
	ii) Describe the development of cyber crime and explain how its evolution has been influenced by the rise of e-commerce and online transactions.	8	K2	5
	(OR)			
b) i)	Analyze the role of internet security education in preventing cyber crime, and how it helps users and organizations in securing their online activities.	8	K4	5
	ii) Describe the essential security technologies that must be implemented to protect e-commerce applications.	8	K2	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Computer Science and Engineering

22CSPE505 – ETHICAL HACKING

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Analyze how hacktivism differs from traditional hacking.	2	K2	1
2. List any two elements of security.	2	K1	1
3. Compare scanning and enumeration.	2	K2	2
4. Mention the steps involved in the enumeration procedure.	2	K1	2
5. Illustrate how NetBIOS Auditing Tool (NAT) assist in cracking passwords.	2	K3	3
6. Assess the impact of privilege escalation on system security and its potential risks.	2	K2	3
7. Mention the best practices that need to be followed in enhancing Windows system security.	2	K1	4
8. List out the tools for identifying Windows and Linux vulnerabilities.	2	K1	4
9. Point out the limitations of vulnerability assessments.	2	K2	5
10. Analyze the types of vulnerabilities that can be identified by automated vulnerability scanners.	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Describe the various phases of a hacking attack. Provide examples for each phase.	8	K2	1
ii) Illustrate the use of meta search engines in locating the network range of a target.	8	K3	1

(OR)

Q. No		M	BTL	CO
b)	i) Discuss in detail the different types of hacker attacks. How do these attacks affect organizations and individuals?	8	K2	1
	ii) Illustrate the use of WHOIS tools and DNS information tools with example.	8	K3	1
12. a)	Analyze the functionalities of different scanning tools used in vulnerability assessment.	16	K4	2
	(OR)			
b)	Analyze different enumeration techniques and explain how they are used to extract system information.	16	K4	2
13. a)	Explain how key loggers and spyware function in a cyber attack. Analyze their roles in stealing sensitive information and the countermeasures to prevent them.	16	K4	3
	(OR)			
b)	Analyze various tools used for password cracking. Explain different password-cracking techniques with examples.	16	K4	3
14. a)	Explain the role of programming in cyber security. How does understanding programming languages such as C, HTML and Perl help security professionals in vulnerability assessment and exploitation?	16	K2	4
	(OR)			
b)	Discuss the common vulnerabilities found in the Windows and Linux OS. Discuss the countermeasures that can be implemented to reduce the risk.	16	K2	4
15. a)	Analyze the various phases of penetration testing with examples.	16	K4	5
	(OR)			
b)	Analyze various penetration testing tools and explain the criteria for selecting appropriate tools for different testing environments.	16	K4	5

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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

(Common to **EEE/Mechanical** Engineering)

22CSOE04 – PYTHON PROGRAMMING

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q.No

	M	BTL	CO
1. How can we add an element in the list? Write a program to insert 32 to the fourth position in the given list [1, 4, 23, 56, 90].	2	K2	1
2. Why are strings in Python immutable? Support your answer with a suitable code snippet.	2	K1	1
3. Indicate which of the following segment is infinite. Why?	2	K3	1
Segment 1:<pre>j=1 while j <10: print j j = j +1</pre> Segment 2:<pre>a=2 while a !=20: print a a = a * 2</pre>			
4. Compare and contrast the use of break and continue in Python programming.	2	K2	1
5. How can exceptions be handled in Python? Provide a simple example using try and except.	2	K3	2
6. How do you install and import external packages in python using pip?	2	K3	2
7. What is Fruitful Function? Give example.	2	K1	2
8. What is meant by List Comprehension?	2	K1	3
9. How do you define a static method in Python? Give an example.	2	K2	3
10. How are regular expressions handled in Python?	2	K2	3

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q.No

M BTL CO

11. a) i) Suppose $A=x_1$ and $B=x_2$ are two points lying on the real number line. Then the distance between A and B is $d(A,B) = |x_2 - x_1|$. In the plane we can consider the x -axis as a one-dimensional number line, so we can compute the distance between any two points lying on the x -axis as the absolute value of the difference of their x -coordinates. Similarly, the distance between any two points lying on the y -axis is the absolute value of the difference of their y -coordinates. Now, consider the xy -plane suppose $P_1 = (x_1, y_1)$ and $P_2 = (x_2, y_2)$ are two points in it. Then write a python program to find the distance between P_1 and P_2 ?

8 K2 2

$$d(P_1, P_2) = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}.$$

- ii) Momentum is calculated as, $E=MC^2$, where " M " is the mass of the object and " C " is its velocity. Write a python program that accepts an object's mass (M) and velocity(C) and displays its Momentum (E).

8 K3 2

(OR)

- b) i) Write a Python program that prompts the user to enter their first name, middle name, and last name. The program should then display the message in the following format: " Movie Show: FirstName MiddleName LastName".

8 K2 2

Example:

If the user enters: First name: Good; Middle name: Bad; Last name: Ugly.

The output should be:

"Movie Show: Good Bad Ugly"

- ii) Write code snippets in Python to perform the following:

8 K3 2

- 1) Accessing elements of a tuple.
- 2) Modifying elements of a tuple.
- 3) Deleting elements of a tuple.

Q.No

12. a) i) Write a python program to calculate electricity bill based on the following information.

M BTL CO
8 K3 2

Consumption Unit	Rate of Charge
0 – 150	Rs. 3 per unit
151 - 350	Rs. 100 plus Rs. 3.75 per unit exceeding 150 units
351 - 450	Rs. 250 plus Rs. 4 per unit exceeding 350 units
451 - 600	Rs.300 plus Rs. 4.25 per unit exceeding 450 units
Above 600	Rs. 400 plus Rs. 5 per unit exceeding 600 units.

- ii) Write a python program to determine whether a given word is a palindrome.

8 K3 2

(OR)

- b) i) Write a python program that prints the numbers from 20 to 1 (count downwards).

8 K3 2

- ii) Write the syntax of the while loop and use the same to classify if a given number is prime or not.

8 K3 2

13. a) i) Why exceptional handling is significant? Support your answer with a real-world application and try to figure out atleast three exceptions. Write a code to handle those exceptions properly.

8 K2 1

- ii) Demonstrate how to raise and re-raise an exception using a Python program.

8 K1 1

(OR)

- b) i) Write a python program to generate 10 random numbers between 1 to 100.

8 K2 1

- ii) Write a program to display the date and time using the Time module.

8 K1 1

14. a) i) Discuss the different types of arguments in python functions. Provide examples for each.

8 K2 2

- ii) Describe recursion in python. Write a recursive function to calculate factorial of a number and explain how recursion works.

8 K3 2

(OR)

Q.No		M	BTL	CO
	b) i) What are list comprehensions in Python? How are they different from traditional for loops? Write examples to convert the list of numbers into their squares using both methods.	8	K2	2
	ii) Explain generator expressions and how they differ from list comprehensions. Write a python program to generate squares of numbers using a generator expression.	8	K3	2
15. a)	i) Define a class Student with data members as rollno and name. Derive a class Fees from Student that has a data member fees and functions to submit fees and generate receipt. Derive another class Result from Student that displays the marks and grade obtained by the student.	8	K3	3
	ii) Write a python program to overload + operator on a complex object.	8	K4	3
	(OR)			
b) i)	What do you understand by greedy operators? Provide an example. Write a program to read a list of strings from user and do the following using re module	8	K3	3
	1) Print all words beginning with 'S'			
	2) Print all words ending with 'E'			
	3) Print all words beginning with 'M' and ending with 'Y'			
	4) Remove the duplicate words and display the result.			
ii)	A driver tracks fuel efficiency by recording the odometer reading and the amount of fuel added each time they refill the gas tank. The number of miles driven since the last refill is calculated by subtracting the previous odometer reading from the current one. The miles per gallon (MPG) is then determined by dividing the miles travelled by the number of gallons filled. Write a Python program using Object-Oriented Programming (OOP) that continues to read the odometer readings and corresponding gallons used until the driver enters -1 for the odometer reading. After each valid entry, compute and display the MPG for that segment.	8	K4	3

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

(Common to **EEE/Mechanical** Engineering)

22CSOE05 – INTRODUCTION TO PROGRAMMING IN JAVA

18CSOE05 – JAVA PROGRAMMING

(Regulations 2022/2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. How for each is different from for loop in Java?	2	K3	1
2. What is 'JVM'?	2	K1	1
3. Distinguish between class and interface in Java.	2	K2	1
4. States the use of finally block in Java exception handling.	2	K2	1
5. List the states of an applet.	2	K1	2
6. How does an applet differ from a Java application?	2	K2	2
7. Give the advantages of using AWT.	2	K2	2
8. What is the purpose of layout managers?	2	K2	2
9. Draw the hierarchy of input and output stream classes.	2	K3	3
10. List out the types of JDBC drivers.	2	K1	3

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) i) Explain the major principles of object-oriented programming with illustrations and neat diagram.	8	K1	1
ii) Write a program to print name of the day from the given number.	8	K3	1

Input	Output
0	Sunday
1	Monday
2	Tuesday
3	Wednesday
4	Thursday
5	Friday
6	Saturday

(OR)

Q. No

M BTL CO

b) i) Discuss the various types of operators in Java and explain with suitable examples.

8 K1 1

ii) Write a Java program to find Gross salary of the employee from the basic salary.

8 K3 1

	PAY COMPONENT	CALCULATION BASIS / RATE
DATA'S	HRA	50% of Basic Salary
	LEAVE TRAVEL ALLOWANCE	FIXED AMOUNT 3000
	SPECIAL ALLOWANCE	10% of Basic Salary
	PF EMPLOYER CONTRIBUTION	12% of Basic Salary
	GROSS SALARY	Basic + Allowances

12. a) i) Make a class Student. The student class has data members such as roll number, name, and branch. Create a class called Exam that has data members roll number and six subject marks. Derive the result class from Student and Exam and it has its own data members such as total mark, and result. Does the above service support in java, give proper justification.

8 K3 1

ii) What are the applications of Multithreading and explain with suitable example.

8 K3 1

(OR)

b) i) Write a Java program to perform Matrix multiplication and display the output.

8 K3 1

ii) Write a Java program that demonstrates the use of try, catch, and finally blocks to handle a divide-by-zero exception.

8 K3 1

13. a) i) Explain the life cycle of Java Applet with neat sketch.

8 K3 2

ii) Write an Applet program that accepts two input string using <param> tag and concatenate the strings and display it in status window.

8 K3 2

(OR)

b) i) Write applets to draw the following shapes:

8 K3 2

- ✓ Lines and Rectangles
- ✓ Circles and Ellipses
- ✓ Arcs and Polygons

Q.No		M	BTL	CO
	ii) Design an applet GUI that draws a smiley face using circles for the head and eyes, and arcs for the smile. Label each shape with its types and purpose. Explain how combining basic primitives leads to composite shapes.	8	K3	2
14. a)	i) Describe the AWT class hierarchy in Java with a neat diagram. Explain the roles of key classes like Component, Container, Panel, Window and Frame in GUI development.	8	K2	2
	ii) Why layout managers are used in Applets? Discuss different types of Layouts.	8	K3	2
	(OR)			
b)	i) Illustrate with suitable program to handle the following listeners using appropriate event sources: ✓ ActionListener ✓ MouseListener ✓ MouseMotionListener	8	K2	2
	ii) Develop a Java program that takes a three-letter month abbreviation (e.g., 'JAN', 'FEB') as input using a dialog box. Use a switch-case statement to display the full name of the month along with the number of days in a message dialog. If the input does not match any valid month, display an error message dialog. Example: ✓ Input: MAR → Output: March month has 31 days ✓ Input: XXX → Output: No such month"	8	K3	2
15. a)	Explain the steps to follow for writing text into the file and reading text back from the file with suitable example program.	16	K4	3
	(OR)			
b)	Discuss the architecture of JDBC with neat sketch. Illustrate how to establish connectivity using JDBC.	16	K4	3

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)
B.E. Degree Examinations – April/May 2025
Semester: VI [Full Time]
(Common to **Mechanical & Metallurgical** Engineering)
22CEOE02 – DISASTER MITIGATION AND MANAGEMENT
(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define: Disaster and hazard.	2	K1	1
2. List the types of disaster.	2	K1	1
3. Define disaster risk reduction.	2	K1	2
4. What is disaster management cycle?	2	K1	2
5. Define climate change adaptation.	2	K1	3
6. Summarize the term IPCC.	2	K2	3
7. Define the term Risk Assessment.	2	K1	4
8. What are the steps involved in GIS for disaster management?	2	K1	4
9. Define Chernobyl Disaster.	2	K1	5
10. What are the steps to be taken by the residents during an earthquake in a residential building?	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Illustrate the types of disaster with examples.	8	K2	1
ii) Explain in detail about the differential impacts in terms of caste, class, gender, age, location.	8	K2	1
(OR)			
b) i) Interpret the role of non-government organizations during a cyclone with an example.	8	K2	1
ii) Infer with an account on the international assistance required in managing a disaster.	8	K2	1
12. a) Outline and compare the roles and responsibilities of state government, central government, and other stake holders.	16	K2	2
(OR)			
b) Public awareness plays a key role in disaster risk reduction- Explain.	16	K2	2

Q. No		M	BTL	CO
13. a)	i) List and Explain 5 assessment cycles and assessment reports delivered by IPCC.	8	K2	3
	ii) Explain and list the impact of development projects and embankment.	8	K2	3
	(OR)			
b) i)	Interpret the factors affecting vulnerabilities.	8	K2	3
	ii) Explain what happens in climate change adaptation in detail.	8	K2	3
14. a)	i) List the risk assessment types and explain steps involved in it.	8	K1	4
	ii) Explain the roles and functions of National Authority of NDMA and State Authority of SDMA.	8	K2	4
	(OR)			
b) i)	How far the saying of "Prevention is better than cure" suits to pre disaster planning?	8	K1	4
	ii) Explain the application of GIS in emergency planning.	8	K2	4
15. a)	i) Write in detail about the earthquake vulnerability assessment and building and infrastructure?	8	K1	5
	ii) Illustrate the case study of storm surge.	8	K2	5
	(OR)			
b) i)	Recall the methodology used in coastal flooding.	8	K1	5
	ii) Brief about analysis for landslide hazard zonation.	8	K2	5

Registration Number:

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Mechanical Engineering

22MAOE02 – NUMERICAL METHODS

(Regulations 2022)

Time: 3 Hours

Maximum Marks: 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. State the order of convergence and convergence condition for Newton-Raphson method.	2	K1	1
2. Compare Gauss - Jacobi and Gauss - Seidel Methods.	2	K3	1
3. What do you mean by interpolation?	2	K2	2
4. State the Newton's backward difference interpolation formula.	2	K1	2
5. State the Newton's formula to find $f'(x)$ and $f''(x)$ using the forward difference.	2	K1	3
6. When does Simpson's $1/3^{\text{rd}}$ rule give exact result?	2	K2	3
7. Using Euler's method to find $y(0.2)$ from $\frac{dy}{dx} = x + y$; $y(0) = 1$ with $h = 0.2$.	2	K3	4
8. Write Adam's predictor and corrector formula.	2	K1	4
9. Write the finite difference approximations for $y'(x)$ and $y''(x)$.	2	K1	5
10. State the standard five point formula.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Find the smallest positive root of the equation $3x^3 - 9x^2 + 8 = 0$, correct to 4 decimal places, using Newton-Raphson method	8	K2	1
ii) Solve the equations by Gauss-Jacobi method, $8x - 3y + 2z = 20$; $4x + 11y - z = 33$; $6x + 3y + 12z = 35$.	8	K2	1
(OR)			
b) i) Solve the equations by Gauss-Seidal method, $y - x + 10z = 35.61$; $x + z + 10y = 20.08$; $y - z + 10x = 11.19$.	8	K2	1
ii) Solve the equations by Gauss-Jordan method, $x + 2y + z = 3$; $2x + 3y + 3z = 10$; $3x - y + 2z = 13$.	8	K2	1

Q. No		M	BTL	CO																		
12. a)	i) Using Newton's forward interpolation, find the polynomial which takes the values,	8	K3	2																		
	<table><tr><td>x:</td><td>4</td><td>6</td><td>8</td><td>10</td></tr><tr><td>y:</td><td>1</td><td>3</td><td>8</td><td>16</td></tr></table>	x:	4	6	8	10	y:	1	3	8	16											
x:	4	6	8	10																		
y:	1	3	8	16																		
	Also find y(5).																					
	ii) Using Lagrange's formula find y(9.5) given	8	K3	2																		
	<table><tr><td>x:</td><td>7</td><td>8</td><td>9</td><td>10</td></tr><tr><td>y:</td><td>3</td><td>1</td><td>1</td><td>9</td></tr></table>	x:	7	8	9	10	y:	3	1	1	9											
x:	7	8	9	10																		
y:	3	1	1	9																		
	(OR)																					
b) i)	Using Newton's divided difference interpolation find y(3) from the following table values.	8	K3	2																		
	<table><tr><td>x:</td><td>4</td><td>5</td><td>7</td><td>10</td><td>11</td><td>13</td></tr><tr><td>y:</td><td>48</td><td>100</td><td>294</td><td>900</td><td>1210</td><td>2028</td></tr></table>	x:	4	5	7	10	11	13	y:	48	100	294	900	1210	2028							
x:	4	5	7	10	11	13																
y:	48	100	294	900	1210	2028																
	ii) Using Newton's backward interpolation, find y(6.6) from the following data,	8	K3	2																		
	<table><tr><td>x:</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr><tr><td>y:</td><td>1</td><td>2</td><td>4</td><td>7</td><td>11</td><td>16</td><td>22</td><td>29</td></tr></table>	x:	0	1	2	3	4	5	6	7	y:	1	2	4	7	11	16	22	29			
x:	0	1	2	3	4	5	6	7														
y:	1	2	4	7	11	16	22	29														
13. a)	i) Divide the interval into 10 equal parts, find the value of $\int_0^{\pi/2} \sin x \, dx$ by Trapezoidal rule.	8	K3	3																		
	ii) Find the value of $\int_{-1}^1 \frac{dx}{1+x^2}$ by two-point and three-point Gaussian quadrature formulas.	8	K4	3																		
	(OR)																					
b) i)	Compute $f'(0)$ and $f''(4)$ from the data.	8	K3	3																		
	<table><tr><td>x:</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>f(x):</td><td>1</td><td>2.718</td><td>7.381</td><td>20.086</td><td>54.598</td></tr></table>	x:	0	1	2	3	4	f(x):	1	2.718	7.381	20.086	54.598									
x:	0	1	2	3	4																	
f(x):	1	2.718	7.381	20.086	54.598																	
	ii) Find the value of $\int_{\pi/3}^{2\pi/3} \left(\frac{\sin x}{x}\right) dx$ using Simpson's 1/3 rd rule and 3/8 th rule by dividing the interval into 6 equal parts.	8	K4	3																		
14. a)	i) Using Taylor's series method, compute y(0.1) correct to 4 decimal places, given that $\frac{dy}{dx} = x^2 + y^2$ and y(0) = 1.	8	K3	4																		
	ii) Use Runge - Kutta method of fourth order to find y(0.1) for the initial value problem $\frac{dy}{dx} = x + y^2$, y(0) = 1.	8	K3	4																		
	(OR)																					
b) i)	Consider the initial value problem $\frac{dy}{dx} = y - x^2 + 1$, y(0) = 0.5. Using modified Euler's method, find y(0.2) with h = 0.2.	8	K3	4																		
	ii) Given $\frac{dy}{dx} = x^2(1 + y)$ and y(1) = 1, y(1.1) = 1.233, y(1.2) = 1.548, y(1.3) = 1.979, evaluate y(1.4) by using Milne's method.	8	K3	4																		

Q. No

M BTL CO

15. a) i) Solve by finite difference method, the boundary value problem $x^2 y'' - 2y + x = 0$; $2 < x < 3$, where $y(2) = 0, y(3) = 0$, taking $h = 1/4$.

8 K3 5

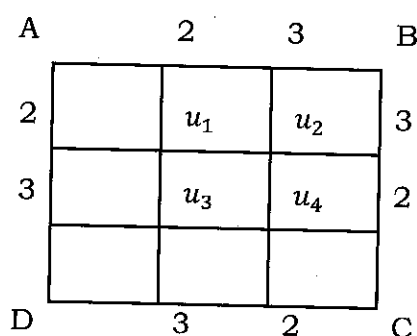
ii) Solve $\frac{\partial^2 u}{\partial x^2} - 2 \frac{\partial u}{\partial t} = 0$, given $u(0, t) = 0, u(4, t) = 0$, $u(x, 0) = x(4 - x)$. Assume $h = 1$. Find the values of u upto $t = 5$.

8 K3 5

(OR)

b) i) Solve $u_{xx} + u_{yy} = 0$ for the following square mesh with boundary values as shown. Iterate until the maximum difference between successive values at any grid point is less than 0.001.

8 K3 5



ii) Solve $u_{xx} = u_{tt}$, $0 < x < 1$; $t > 0$, given $u(x, 0) = u(0, t) = 0$ and $u(1, t) = 100 \sin \pi t$. Compute u for 4 time steps with $h = 0.25$.

8 K3 5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: VI [Part Time]

Electrical and Electronics Engineering

22PTEEE32 – POWER QUALITY

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. Differentiate between sag and swell.	2	K1	1
2. Give any two international standards for power quality.	2	K2	1
3. List out some voltage sag mitigation techniques.	2	K1	2
4. Identify the sources of flicker.	2	K2	2
5. What is called switching transient?	2	K1	3
6. Mention the simulation tools to determine transients.	2	K2	3
7. Enumerate voltage and current distortion.	2	K1	4
8. Interpret about Total Demand Distortion.	2	K2	4
9. Write down the various power quality monitoring steps.	2	K1	5
10. What is use of spectrum analyzer?	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) Explain about various power quality problems in electrical system.	16	K3	1
(OR)			
b) Discuss about the CBEMA curve. Explain the events described in the curve.	16	K3	1
12. a) i) Discuss about the various sources of voltage sags and interruptions.	8	K4	2
ii) Explain about the fundamental principle behind the voltage sag protection.	8	K2	2
(OR)			
b) i) Sketch a detail about principle of regulating voltage to reduce the voltage variation.	8	K4	2
ii) Explain how usage of end capacitor reduces long duration voltage variation.	8	K2	2

Q. No		M	BTL	CO
13. a)	Explain the following for mitigating transients	16	K4	3
	i) Utility system lightning protection			
	ii) Utility capacitor			
	(OR)			
b)	Explain the problems associated with Ferro resonance. Discuss the use of PSCAD in analyzing the power quality.	16	K4	3
14. a)	i) Explain how commercial and industrial loads are responsible for harmonic distortion.	10	K3	4
	ii) Write short notes on the need of locating harmonic sources	6	K3	4
	(OR)			
b) i)	Discuss about the active filters in controlling harmonics.	10	K3	4
	ii) Write down short notes about the importance of harmonic standards.	6	K3	4
15. a)	Explain monitoring consideration of different types of power quality variation.	16	K4	5
	(OR)			
b)	Discuss about the application of intelligent system for power quality monitoring.	16	K4	5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: VI [Part Time]

Mechanical Engineering

22PTMEE10 – ENTREPRENEURSHIP DEVELOPMENT

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. What do you mean by a serial entrepreneur?	2	K1	1
2. Mention the need of stress management.	2	K2	1
3. List out the Maslow classification of need.	2	K1	2
4. Can you infer the meaning of achievement motivation training?	2	K2	2
5. Write the importance of feasibility study.	2	K2	3
6. Write any two objectives of small enterprises.	2	K2	3
7. Highlight your views on Breakeven Point BEP.	2	K3	4
8. Mention external sources of finance.	2	K2	4
9. State any three advantages of joint venture.	2	K2	5
10. Mention the importance of government policy in encouraging woman entrepreneur	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) i) Briefly explain the concepts of entrepreneur.	6	K2	1
ii) How does an entrepreneur differ from a manager?	10	K4	1
(OR)			
b) i) Summarize the factors affecting Entrepreneurial growth.	6	K2	1
ii) Write an elaborate essay on the difficulties and opportunities faced by women entrepreneurs.	10	K4	1
12. a) i) Mention the meaning of EDP.	6	K2	2
ii) Discuss the need and objectives of entrepreneurial development programme.	10	K4	2

(OR)

Q. No		M	BTL	CO
	b) i) Highlight your views on entrepreneur motivation.	6	K2	2
	ii) Examine the nature and process of motivation.	10	K4	2
13. a)	i) Formulate a marketing research plan to be followed by entrepreneurs undertaking business in production and marketing of products to niche markets.	10	K3	3
	ii) Highlight your views on Techno Economic Feasibility Assessment.	6	K2	3
	(OR)			
b) i)	Identify the difficulties faced by small business owners in transportation and operational planning efforts in the course of managing their businesses in India.	10	K3	3
	ii) Write short notes on project appraisal.	6	K2	3
14. a)	i) Discuss in detail the different sources of Finance.	8	K3	4
	ii) Write short notes on Term loans.	8	K2	4
	(OR)			
b) i)	Interpret your views on PERT and CPM.	8	K3	4
	ii) Distinguish between Taxation and Excise duty.	8	K2	4
15. a)	i) Analyze the reasons for sickness of most of the small business enterprises in India.	8	K4	5
	ii) What measures should an entrepreneur do to prevent sickness?	8	K2	5
	(OR)			
b) i)	Examine the need of joint venture, Merger and subcontracting with suitable examples.	8	K4	5
	ii) State some measures taken by Government for encouragement of Small scale enterprises via District Industries centre DIC.	8	K2	5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Mechanical Engineering

12ME603 – APPLIED HYDRAULICS AND PNEUMATICS

(Regulations 2012)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

1. List the benefits of choosing the correct cylinder in a hydraulic system.
2. Point out the applications of fluid power.
3. List the applications of a pressure-reducing valve.
4. Classify the flow control valve.
5. State the functions of accumulators.
6. Indicate the purpose of using a fail-safe circuit in any hydraulic system.
7. List the basic components of a pneumatic system.
8. Interpret the necessity of a lubricator in a pneumatic system.
9. Define Programmable Logic Control (PLC).
10. Indicate the possible ways for the contaminants to enter the hydraulic system.

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

M

11.	a) i)	Explain the external gear pump using a suitable sketch.	(8)
	ii)	Explain the Telescopic cylinder with a suitable sketch.	(8)
		(OR)	
	b) i)	Explain the components of hydraulic and pneumatic systems.	(8)
	ii)	Write short notes on vane-type motors.	(8)
12.	a) i)	Develop a hydraulic drilling circuit using a sequence valve.	(8)
	ii)	Explain the 4/2- Direction Control Valve with a neat sketch.	(8)
		(OR)	
	b) i)	Develop a double-acting hydraulic cylinder reciprocating circuit using limit switches.	(8)
	ii)	Explain the pilot-operated check valve with a neat sketch.	(8)

Q. No	M
13. a) Design and develop a circuit using the hydraulic components for the planning machine operation.	(16)
(OR)	
b) Design and develop an accumulator circuit for the leakage compensation and an auxiliary power source.	(16)
14. a) Design and develop a pneumatic circuit for a pick-and-place robot.	(16)
(OR)	
b) Design and develop an electro-pneumatic system for sorting two different-sized boxes moving on a conveyor.	(16)
15. a) Analyze the pneumatic cascade circuit for the following sequence of operation: $A+ B+B-C+C-A-$.	(16)
(OR)	
b) Analyze the factors influencing the selection of the filter, regulator, lubricator, and sizing of the compressors.	(16)

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time]

Civil Engineering

22CE406 – CONCRETE TECHNOLOGY

(Regulations 2022)

(Use of IS456:2000; IS10262-2019 (pg:1 to 15) and ACI 211.1.91 (pg: 1 to 13, 21 to 23))

Time : 3 Hours

Maximum Marks: 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. What do you mean by 53 grade cement?	2	K1	1
2. List any two superplasticizers and Accelerators used in concrete.	2	K1	1
3. Distinguish between Nominal Mix and Design Mix of concrete.	2	K1	2
4. On what Circumstances High Grade Concrete are utilized?	2	K1	2
5. Define Bleeding.	2	K1	3
6. Draw stress strain graph of concrete.	2	K1	3
7. State the advantage of Ready Mix Concrete.	2	K1	4
8. Define Underpinning.	2	K1	4
9. Define Standard Deviation and Coefficient of Variation.	2	K1	5
10. Mention any two purposes of forensic testing in Concrete.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) i) List the constituent of Cement and state their functions.	8	K2	1
ii) Describe briefly about the properties of Aggregate.	8	K2	1
(OR)			
b) i) Discuss about importance of Quality of Water.	8	K2	1
ii) Distinguish between Accelerator and Retarder with examples.	8	K2	1

Q. No	M	BTL	CO
12. a) Design a concrete mix by IS method for the following requirement: Characteristics compressive strength at 28 days = 25 N/mm ² , Maximum nominal size of aggregate = 20 mm, Shape of aggregate = angular, Degree of workability, slump of concrete = 50 mm Type of exposure = mild, Test data for concrete making materials, Specific gravity: cement = 3.15, coarse aggregate = 2.7 and fine aggregate = 2.6, Water absorption: coarse aggregate = 0.5%, Fine aggregate = 1%.	16	K4	2
(OR)			
b) What are the factors affecting proportioning of a Concrete Mix? Discuss each in detail.	16	K4	2
13. a) List out the fresh tests conducted on Concrete and explain any two test.	16	K2	3
(OR)			
b) Explain the factor affecting the strength of Concrete.	16	K2	3
14. a) Explain the methods of Shoring and Underpinning used in structural repair and foundation strengthening.	16	K3	4
(OR)			
b) Explain in detail about the various methods of Corrosion Protection used in Reinforced Concrete Structures.	16	K3	4
15. a) i) Explain Statistical Quality Control methods used while designing mix proportion for Concrete.	8	K3	5
ii) Explain the acceptance criteria of Concrete as per IS 456.	8	K3	5
(OR)			
b) i) Discuss their principles, procedures and applications of Rebound Hammer Test.	8	K3	5
ii) Discuss their principles, procedures and applications of UPV test.	8	K3	5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: V [Full Time]

Computer Science and Engineering

18CS502 – THEORY OF COMPUTATION

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. Define ϵ -NFA.	2	K1	3
2. Give the Non-Deterministic Automata to accept strings containing the substring 0101.	2	K3	1
3. Find out the language generated by the regular expression $(0+1)^*$.	2	K2	3
4. Compose the difference between the + closure and * closure.	2	K2	1
5. Describe the Unit and Null production detail.	2	K2	3
6. Write the rule for construction of Context Free Grammar from given Push Down Automata.	2	K3	1
7. Define Halting Problem.	2	K1	3
8. Prepare the difference between Finite Automata (FA) and Turing Machine(TM).	2	K2	1
9. What is meant by undecidable problem?	2	K2	3
10. Define NP hard and NP completeness problem.	2	K1	3

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) i) Give the NFA that accepts all strings that end in 01. Give its transition table.	8	K3	1
ii) Explain the steps in conversion of NFA to DFA and using the steps convert the following NFA to DFA Fig.1.	8	K2	2

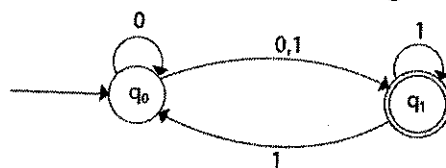


Fig.1

(OR)

Q. No

M BTL CO

- b) i) Explain the steps in conversion of ϵ -NFA to DFA. Using the steps, convert the following ϵ -NFA to DFA Fig.2.

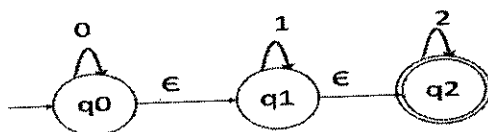


Fig.2

- ii) Identify a DFA that contains set of all strings over $\{0, 1\}$ of length ≤ 2 and Identify a NFA for the set of strings such that the 5th symbol from the right end is '1' over $\Sigma = \{0, 1\}$.
12. a) i) Demonstrate how the set $L = \{a^n b^n / n \geq 1\}$ is not a regular. 8 K2 1
- ii) Evaluate a minimized DFA for the Regular Expression $10+(0+11)0^*1$. 8 K5 1
- (OR)
- b) i) Explain that the regular language are closed under : 8 K2 1
- 1) Union.
 - 2) Complement.
 - 3) Difference.
- ii) Deduce into regular expression using R_{ij} method that denotes the language accepted by following DFA. Fig.3. 8 K5 1

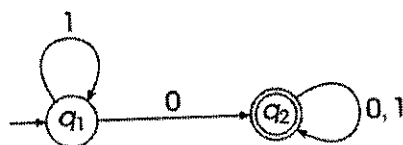


Fig.3

13. a) i) Express the following grammar G into Greibach Normal Form (GNF) 12 K4 2
- $S \rightarrow XB \mid AA$
- $A \rightarrow a \mid SA$
- $B \rightarrow b$
- $X \rightarrow a$
- ii) Examine the language $L(G)$ generated by the grammar G with variables S, A, B, Terminals a, b and productions. 4 K3 1
- $S \rightarrow aB, B \rightarrow b, B \rightarrow bA, A \rightarrow aB.$

(OR)

Q. No

M BTL CO
12 K4 2

- b) i) Define Non Deterministic Push Down Automata. Is it true that DPDA and NDPDA are equivalent in the sense of language acceptance is concern? Justify your answer.
Let $M = (\{q_0, q_1\}, \{0, 1\}, \{X, Z_0\}, \delta, q_0, Z_0, \Phi)$ where δ is given by:
 $\delta(q_0, 0, Z_0) = \{(q_0, XZ_0)\}$
 $\delta(q_0, 0, X) = \{(q_0, XX)\}$
 $\delta(q_0, 1, X) = \{(q_1, \epsilon)\}$
 $\delta(q_1, 1, X) = \{(q_1, \epsilon)\}$
 $\delta(q_1, \epsilon, X) = \{(q_1, \epsilon)\}$
 $\delta(q_1, \epsilon, Z_0) = \{(q_1, \epsilon)\}$
 Construct a CFG $G = (V, T, P, S)$ generating $N(M)$.

- ii) Design parse tree for the grammar $S \rightarrow aS \mid aSbS \mid \epsilon$. This grammar is ambiguous. Show that the string 'aab' has two parse trees.

4 K3 3

14. a) i) Demonstrate a Turing Machine to compute, $f(m+n) = m+n$ | $m, n \geq 0$ and simulate their action on the input 0100.

(OR)

- b) i) Demonstrate a TM for the language which recognizes the language $L = \{a^n b^m c^n d^m \mid n, m \geq 1\}$.

16 K2 3

15. a) i) Formulate the two properties of recursively Enumerable sets which are undecidable

4 K2 1

- ii) Describe in detail notes on universal Turing machines with example and Collect and write the short notes on NP-complete problems.

12 K2 1

(OR)

- b) i) Is it true that the language accepted by a Non-Deterministic Turing Machine is different from Recursively Enumerable Language? Justify your answer.

4 K2 1

- ii) Discuss post correspondence problem. Let $\Sigma = \{0, 1\}$. Let A and B be the lists of three strings each, defined as

12 K2 1

	List A	List B
i	wi	xi
1	1	111
2	10111	10
3	10	0

Does the PCP have a solution? And prove that the Universal Language is Recursively Enumerable.

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time]

Electronics and Communication Engineering

22EC405 – ANTENNA AND WAVE PROPAGATION

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What is meant by radiation mechanism in antennas?	2	K2	1
2. Define an alternating current element in antenna theory.	2	K1	1
3. State the condition for maximum radiation in a broadside array.	2	K2	2
4. Interpret the principle of pattern multiplication.	2	K2	2
5. Write down the radiation resistance of a loop antenna.	2	K1	3
6. List two applications of a paraboloid reflector antenna.	2	K2	3
7. State Huygens' principle.	2	K1	4
8. Which factors influence the impedance of slot antennas?	2	K2	4
9. What is skip distance in sky wave propagation?	2	K2	5
10. How does the ground reflect horizontally polarized waves?	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Summarize the Friis equation of an antenna with diagram. Also explain the individual parameters in the equation in detail. (OR)	16	K4	1
b) Derive the expression for the radiation resistance of a half wave dipole antenna and compare it with that of a short dipole antenna.	16	K4	1
12. a) What are the types of uniform linear array and derive the total field, maximum, minimum and HPPD angles of two element broadside array. (OR)	16	K3	2
b) Design a 50 to 200 MHz log periodic dipole antenna for gain corresponds to scale factor 0.8 and space factor 0.15. Assume the gap spacing at the smallest dipole is 3.6 mm.	16	K3	2

Q. No		M	BTL	CO
13. a)	Analyze the normal mode helical antenna and explain its radiation characteristics.	16	K4	3
	(OR)			
b)	Explore the working principle of a rhombic antenna and analyze its radiation pattern characteristics.	16	K4	3
14. a)	Examine Babinet's principle and its role in slot antenna performance.	16	K3	4
	(OR)			
b)	Discuss the radiation pattern and beam characteristics of an E-plane sectoral horn antenna.	16	K3	4
15. a)	i) Explain the structure of the ionosphere and its role in sky wave propagation.	8	K2	5
	ii) Describe duct propagation with a neat diagram.	8	K2	5
	(OR)			
b) i)	Illustrate space wave propagation and identify the factors that affect its efficiency.	8	K2	5
	ii) Discuss the attenuation characteristics of ground wave propagation.	8	K2	5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: VII [Full Time] / IV [Part Time]

Electrical and Electronics Engineering

18EE701 – POWER SYSTEM PROTECTION AND SWITCHGEAR

22PTEE403 – PROTECTION AND SWITCHGEAR

(Regulations 2018/2018A/2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. Define pick up value and plug setting multiplier.	2	K1	1
2. State the working principle of over frequency relay.	2	K1	1
3. What is current chopping?	2	K1	2
4. Distinguish direct and indirect testing of circuit breakers.	2	K2	2
5. What is balanced earth fault protection?	2	K1	3
6. Mention the protection scheme against loss of excitation in alternator.	2	K1	3
7. Compare static and electromagnetic relay.	2	K2	4
8. State principle of duality in comparators.	2	K1	4
9. List the merits of numerical relays.	2	K1	5
10. Draw the block diagram of static Instantaneous over current relay.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) With a neat diagram explain the working principle of a directional over current relay. Derive the torque equation and also explain about directional relay coordination.	16	K2	1
(OR)			
b) Explain the construction and operating principle of impedance type distance relay with R.X diagram. Also derive universal torque equation.	16	K2	1
12. a) Describe the constructional and operational aspects of Sulphur hexa fluoride (SF ₆) circuit breaker. Also mention its merits, demerits and applications.	16	K2	2

(OR)		M	BTL	CO
Q. No				
	b) What are the types of circuit breakers used in HVDC system? Explain it.	16	K2	2
13. a)	i) Give a brief account on the protection of generator using biased differential protection scheme.	8	K2	3
	ii) Explain the scheme for detection of turn to turn fault in stator winding of the generator.	8	K2	3
	(OR)			
b)	Describe the Merz-Price protection for star - delta power transformer with neat sketch.	16	K2	3
14. a)	What is static relay? Draw and explain the block diagram of static relay.	16	K2	4
	(OR)			
b)	With neat sketch discuss about the static differential relay. Also mention its merits and demerits.	16	K2	4
15. a)	Draw and explain about the block diagram of a numerical relay.	16	K2	5
	(OR)			
b)	With a neat block diagram explain numerical overcurrent relay.	16	K2	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time]

Metallurgical Engineering

22MT404/18MT403 – IRON MAKING

(Regulations 2022/2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Give the condition for iron making process.	2	K2	1
2. Mention two commonly used oxide ore of Iron with chemical formula.	2	K1	1
3. Write down direct and indirect reduction reactions in iron making process.	2	K1	2
4. Is it possible to make iron without coke? Justify.	2	K3	2
5. Give the principle of dust catcher in gas cleaning equipment.	2	K3	3
6. What is the purpose of pre-heating the air blast?	2	K2	3
7. Mention two common irregularities in blast furnace operation.	2	K1	4
8. Define desulphurization in the context of blast furnace operation.	2	K2	4
9. What is sponge iron?	2	K1	5
10. Mention the limitations of electro-thermal process of sponge iron production.	2	K3	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain the classification of iron ores and other raw materials used for iron making with their types, chemical composition and functions.	16	K1	1
(OR)			
b) Discuss the principle of agglomeration in detail with emphasis on sintering and draw the Dwight Lloyd sintering machine.	16	K1	1

Q. No		M	BTL	CO
12.a)	Discuss the C-O, Fe-C-O and Fe-H-O equilibria in the context of blast furnace operations with relevant equilibrium diagrams.	16	K2	2
	(OR)			
b)	Explain the thermodynamic and kinetics of direct and indirect reduction of iron ore.	16	K2	2
13. a)	Explain the construction and design aspects of ancillary equipment used for charging in a blast furnace.	16	K1	3
	(OR)			
b)	Describe the gas cleaning equipment used in iron making with neat sketches.	16	K1	3
14. a)	Discuss the common irregularities encountered in blast furnace operation and suggest their remedies.	16	K2	4
	(OR)			
b)	Explain the modern trends in blast furnace practice and discuss the advantages over conventional methods.	16	K2	4
15. a)	Explain the construction and working of low shaft and electro-thermal processes used in iron making with suitable examples.	16	K3	5
	(OR)			
b)	Explain the production processes of ferroalloys such as Ferrosilicon (Fe-Si) and Ferrochrome (Fe-Cr).	16	K3	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Part Time]

Civil Engineering

22PTCEE01 – IRRIGATION ENGINEERING

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. Define irrigation.	2	K1	1
2. What do you mean by SAR?	2	K1	1
3. Identify the factors affecting the Evapotranspiration.	2	K2	2
4. Write the duty, delta and base period relation.	2	K1	2
5. What is frequency of irrigation?	2	K2	3
6. Name a suitable method of irrigation for a hilly terrain. Justify your answer.	2	K2	3
7. Why canal lining provided?	2	K2	4
8. Define regime channel.	2	K1	4
9. List out any two causes for water logging.	2	K2	5
10. Write short note on water use management.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) Discuss about the need, advantages and disadvantages of Irrigation.	16	K1	1
(OR)			
b) i) Describe the effect of salts on plant growth.	10	K1	1
ii) Elaborate Permanent, Temporary and Ultimate Wilting Point.	6	K1	1
12. a) i) Give a detailed outline on the direct methods to measure the consumptive use of water.	10	K3	2
ii) Explain briefly about Lysimeter.	6	K3	2

(OR)

Q. No		M	BTL	CO
	b) i) A water course has a culturable commanded area of 1200 hectares. The intensity of irrigation for crop A is 40% and for B is 35%, both the crops being Rabi crops. Crop A has a Kor period of 20 days and crop B has Kor period of 15 days. Calculate the discharge of the water if the depth for crop A is 10 cm and for B it is 16 cm.	10	K3	2
	ii) Elaborate the quality of water used for irrigation.	6	K3	2
13. a)	Distinguish surface, subsurface and overhead irrigation system. (OR)	16	K4	3
b)	Summarize Sprinkler method of Irrigation.	16	K4	3
14. a)	Mention the types of cross drainage works. Discuss them briefly with sketches. (OR)	16	K2	4
b)	Compare Kennedy's Theory and Lacey's Theory.	16	K2	4
15. a)	Examine the causes and remedial measures of water logging. (OR)	16	K4	5
b)	Analyze irrigation Management system and the significance of water charge assessment.	16	K4	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: III [Part Time]

Electronics and Communication Engineering

23PTEC304 – MICROPROCESSOR AND MICROCONTROLLERS

(Regulations 2023)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. Name any four Assembler Directives.	2	K1	1
2. Identify the physical address of 8086 microprocessor if CS content is 1234 and IP content is 5678.	2	K3	1
3. Differentiate Maskable and Nonmaskable interrupts and give examples.	2	K2	2
4. List the operating modes of 8086 processor.	2	K1	2
5. Outline SFRs in 8051.	2	K2	3
6. Define bit addressable registers.	2	K1	3
7. Compare the MOVX, MOVC and MOV instruction of 8051.	2	K2	4
8. Draw the interfacing diagram of LCD with 8051 microcontroller.	2	K2	4
9. Analyze the role of timers in a PIC microcontroller.	2	K2	5
10. Distinguish program memory and data memory in a PIC microcontroller.	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) Examine the internal architecture of 8086 microprocessor with neat diagram.	16	K2	1
(OR)			
b) Identify an example for arithmetic and data transfer group of 8086 instructions and explain in detail.	16	K2	1
12. a) Sketch and explain the functional block diagram of 8255 PPI.	16	K2	2
(OR)			
b) Draw and explain bus timing diagram for memory read machine cycle in maximum mode of 8086 processor.	16	K2	2

Q. No		M	BTL	CO
13. a)	Analyze the functions of each block in the architecture of 8051 microcontroller.	16	K2	3
	(OR)			
b)	Categorize the memories and explain the memory organization of 8051 microcontroller and also discuss the functions of Special function registers of 8051 micro controller.	16	K2	3
14. a)	Build an interface circuit of 8051 microcontroller with an ADC and explain.	16	K3	4
	(OR)			
b)	Develop interface circuit to display a character using LCD display interface with microcontroller and explain.	16	K3	4
15. a)	Explain the main characteristics of PIC microcontrollers. Discuss their architecture and summarize the advantages and applications of PIC microcontrollers in embedded systems.	16	K2	5
	(OR)			
b)	Explain the memory organization in PIC microcontrollers. Discuss the function and importance of program memory, RAM data memory, and EEPROM data memory.	16	K2	5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: II [Part Time]

Mechanical Engineering

23PTME203 - MANUFACTURING TECHNOLOGY - II

(Regulations 2023)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What is shot blasting process? How it is different from sand blasting?	2	K1	1
2. What is the purpose of lapping process in gear manufacturing?	2	K1	1
3. What is the Shaw process in metal casting?	2	K1	2
4. Write down various steps of CLA process.	2	K2	2
5. Enumerate any three high energy rate forming processes.	2	K2	3
6. What are the factors to be considered while selecting an HERF process?	2	K1	3
7. State the working principle of USM.	2	K2	4
8. Write down the material removal mechanism of MRAFM process.	2	K1	4
9. What is SGC in 3D printing?	2	K1	5
10. Write short notes on data preparation in rapid prototyping.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) List out the gear finishing processes. Explain any two processes with neat sketches	16	K2	1
(OR)			
b) Explain the principle of gear hobbing operation with neat sketch. What are the advantages, limitations and applications of gear shaping process?	16	K2	1
12. a) i) With neat schematic, explain the electroslog casting process.	8	K2	2
ii) Describe technical aspects of both thixo-casting and rheocasting. Compare the procedures used to generate globular, semi-solid slurry from both processes.	8	K2	2

(OR)

Q.No		M	BTL	CO
	b) i) What is the process of slush casting? Discuss how the parts are manufacturing using this process.	8	K3	2
	ii) Discuss the process of squeeze casting. Enumerate the advantages and applications of this process	8	K3	2
13. a)	i) With simple schematic, explain the electrohydraulic forming process.	8	K2	3
	ii) Briefly examine the stand-off technique of explosive forming process.	8	K4	3
	(OR)			
b) i)	With simple schematic, explain the electro-magnetic forming process.	8	K2	3
	ii) Discuss the process, principle of operation, process variables, process limitations & applications of water hammer forming.	8	K4	3
14. a)	Outline wire cut EDM process with a neat sketch and explain its significant process parameters for good surface finish.	16	K2	4
	(OR)			
b)	Describe the principle and equipment for Water Jet Machining (WJM). Discuss, how the WJM is different from Abrasive flow machining?	16	K2	4
15. a)	Explain the working principle and details of process parameters of an FDM machine. Enumerate advantages and limitations of FDM.	16	K2	5
	(OR)			
b)	With neat sketch, explain the selective laser sintering (SLS) process in detail and how SLS is different from SLG in rapid prototyping.	16	K2	5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Mechanical Engineering

12ME602 - HEAT AND MASS TRANSFER

(Regulations 2012)

(Heat and Mass transfer data book is Permitted)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

1. State Fourier's law of heat conduction.
2. List down the uses of fins in various engineering applications.
3. Compare black body and gray body with examples.
4. Assuming the sun to be a black body emitting radiation with maximum intensity at $\lambda = 0.49 \mu\text{m}$. Calculate the surface temperature of the sun.
5. Which fluid at room temperature requires a larger pump to move at a specified velocity in a given tube among water and engine oil? Justify.
6. Define hydrodynamic boundary layer.
7. Define effectiveness of heat exchanger.
8. Compare drop wise and film wise condensation.
9. Mention the applications of Fick's law of diffusion.
10. Define Molar concentration.

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

M

11. a) A furnace wall consists of three layers. The inner layer of 10 cm thickness is made up of fire brick with $k = 1.04 \text{ W/mK}$. The intermediate layer of 25 cm thickness is made up of masonry brick with $k = 0.69 \text{ W/mK}$ followed by a 5 cm thick concrete wall with $k = 1.37 \text{ W/mK}$. When the furnace is in continuous operation with the inner surface of the furnace is at 800°C while the outer concrete surface is at 50°C . Calculate the rate of heat loss per unit area of the wall, the temperature at the interface of the firebrick and masonry brick and the temperature at the interface of the masonry brick and concrete. (16)

(OR)

- b) Find out the amount of heat transferred through an iron fin of length 50 mm, width 100 mm and thickness 5 mm. Assume $k = 210 \text{ W/mK}$ and $h = 42 \text{ W/m}^2\text{K}$ for the material of the fin and the temperature at the base of the fin as 80°C . Also determine the temperature at tip of the fin, if the atmosphere temperature is 20°C . (16)

12. a) Calculate the following for an industrial furnace in the form of a black body and emitting radiation at 2500°C . i) Monochromatic emissive power at $1.2 \mu\text{m}$ length, ii) Wave length at which the emission is maximum, iii) Maximum emissive power, iv) Total emissive power, v) Total emissive power of the furnace if it is assumed as a real surface with emissivity equal to 0.9. (16)

(OR)

- b) Two large parallel planes are at 1000 K and 600 K. Determine the heat exchange per unit area. i) if the surfaces are black ii) if the hot one has an emissivity of 0.8 and the cooler one 0.5 iii) if a large plate is inserted between these two, the plate having an emissivity of 0.2. (16)
13. a) Engine oil at 80°C flows over a flat surface at 40°C for cooling purpose. If the flow velocity being 2 m/s, determine at a distance of 0.4 m from the leading edge the hydrodynamic and thermal boundary layer thicknesses. Also determine the local and average values of friction and convection coefficients. (16)

(OR)

- b) Water at 10°C enters at the rate of 0.01 kg/s into a tube of 20 mm inner diameter. It is to be heated to 40°C . There is a uniform heat flux of 15 kW/m^2 over the surface. Determine the i) Reynolds number ii) length of the pipe needed iii) heat transfer coefficient iv) tube temperature at outlet v) friction factor and vi) pressure drop over the length (Assume fully developed flow). (16)

14. a) Explain the regimes of pool and film boiling with suitable sketches. (16)

(OR)

- b) Classify the heat exchangers and explain any two types with suitable diagram. (16)

Q. No

M

15. a) Air at 1 atmospheric pressure and 25°C, contains small quantities of iodine flows with a velocity of 5.18 m/s inside a 3.048 cm diameter tube. Determine the mass transfer coefficient for iodine transfer from the gas stream to the wall surface. If C_m is the mean concentration of iodine in kg mol/ m³ in the air stream, determine the rate of deposition of iodine on the tube surface where the iodine concentration is zero. (16)

(OR)

- b) Air at 20°C and 40% RH flows over a water surface at a velocity of 1.4 m/s, length parallel to flow is 200 mm. If average surface temperature is 16°C, calculate the amount of water evaporated per hour/ m² of the surface. Take partial pressure of water vapour at 20°C and 40% RH, is $P_{wet} = 0.011$ bar. The vapour pressure at 16°C and saturated, $P_{ws} = 0.017$ bar. Viscosity of air = $\mu = 16.38 \times 10^{-6}$ kg/ms. Density of air $\rho = 1.22$ kg/m³. Diffusion coefficient $D = 0.256 \times 10^{-4}$ m²/s. (16)

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B.E. Degree Examinations – April/May 2025

Semester: VI [Part Time]

Civil Engineering

16PTCEE25 - MUNICIPAL SOLID WASTE MANAGEMENT

(Regulation 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

(10 x 2 = 20 Marks)

Part A

Answer ALL Questions

1. What are the classifications of Solid waste?
2. State the ill effect of open dumping of Solid waste.
3. How On-site storage waste systems effect the environment?
4. List the different materials used of on-site waste storage.
5. State the use of Transfer station.
6. When will you recommend for Hauled container system for transferring the solid waste?
7. Why composting is recommended for organic waste?
8. How incineration process is effective in cold weathered places?
9. Define the term "Sanitary landfill".
10. Why liners are used in landfill?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain how the solid waste categorised according to the sources. (8)
ii) Explain the various characteristics of MSW. (8)
(OR)
b) i) Write short note on the ill effects caused to open dumping of solid waste. (8)
ii) Explain the NGO role in waste management strategies. (8)
12. a) i) Brief in detail about Onsite handling and Onsite storage method of MSW. (8)
ii) Discuss about the materials used for on-site storage of MSW. (8)
(OR)
b) i) Brief about the Onsite processing and Segregation. (8)
ii) Explain how On-site waste storage reducing the cost involved in waste management. (8)

13. a) i) Enumerate the significance in solid waste collection routing. (8)
ii) With the aid of flow diagram brief about the various MSW collection methods. (8)
- (OR)**
- b) i) List the factors considered for locating a transfer stations. (8)
ii) In what way the Transfer stations helps in act like a per-processing the solid waste. (8)
14. a) i) Brief about the various MSW Off-site processing techniques. (8)
ii) Brief the followings: a) Composing b) Pyrolysis. (8)
- (OR)**
- b) i) Write short note on incineration process. (8)
ii) Explain how Pyrolysis process helps in recovering the resource from waste. (8)
15. a) i) Write short note site selection for a sanitary landfill. (8)
ii) With the aid of neat sketch explain the construction of a municipal sanitary landfill. (8)
- (OR)**
- b) i) Define Leachate. Explain the Leachate collection process in a sanitary landfill. (8)
ii) How the Landfill liners are importance in the construction of a landfill? Explain in brief. (8)

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B.E. Degree Examinations – April/May 2025

Semester: VII [Part Time]

Electrical and Electronics Engineering

16PTEEE16 – POWER QUALITY

(Regulations 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define power quality according to IEEE standards.	2	K1	1
2. What is meant by Voltage Imbalance?	2	K1	1
3. Infer the causes of Voltage sags.	2	K2	2
4. Identify a solution involving capacitors for end-users to achieve effective voltage regulation.	2	K3	2
5. List the various kinds of transient over voltages.	2	K1	3
6. Indicate the common circumstances that lead to ferro resonance problems.	2	K2	3
7. Justify why even harmonics not present in power converters.	2	K2	4
8. Differentiate between linear loads and nonlinear loads.	2	K2	4
9. Identify the importance of power quality monitoring.	2	K2	5
10. Interpret the main purpose of a flicker meter in power quality analysis.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Discuss about any three power quality issues, indicating importance of those issues in power system.	10	K2	1
ii) Discuss about the effects of voltage fluctuations.	6	K2	1
(OR)			
b) i) Explain about the Computer Business Equipment Manufactures Associations (CBEMA) curve. Also explain the events described in the curve.	10	K2	1
ii) Discuss about the power frequency variations in power systems.	6	K2	1

Q. No		M	BTL	CO
12. a)	Describe the procedure for estimating motor switching voltage sag in detail.	16	K2	2
	(OR)			
b)	Explain the Flicker Sources and mitigation techniques.	16	K2	2
13. a)	Discuss in detail about the over voltages due to lightning and the problems associated with it. Explain the lightning system protection.	16	K2	3
	(OR)			
b)	Analyze about different computer tools for transient analysis.	16	K2	3
14. a)	Explain briefly about the phenomena of how current distortion affects the voltage distortion under the presence of harmonics.	16	K2	4
	(OR)			
b)	Elaborate the active filter and passive filter in controlling the harmonic distortion.	16	K2	4
15. a)	i) Explain the role and application of expert systems in power quality monitoring.	10	K2	5
	ii) Construct the block diagram for power quality monitoring using spectrum and harmonic analyser.	6	K3	5
	(OR)			
b) i)	Analyze the power quality issues arising from distributed generation (DG) and propose potential solutions to mitigate their impact on the electrical grid and end-users.	10	K2	6
	ii) Develop intelligent systems in resolving operating conflicts between DG units and the power grid.	6	K3	6

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B.E. Degree Examinations – April/May 2025

Semester: V [Full Time]

Civil Engineering

22CE506 – TRANSPORTATION ENGINEERING

(Regulations 2022)

Time: 3 Hours

Maximum Marks: 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Mention the factors controlling highway alignment.	2	K2	1
2. Define right of way.	2	K1	1
3. What is superelevation?	2	K2	2
4. List the factors affecting sight distance.	2	K2	2
5. Write a note on tests to be carried out on highway materials.	2	K1	3
6. Classify the types of defects in flexible pavements.	2	K1	3
7. State the components of permanent way.	2	K1	4
8. Differentiate horizontal curve from vertical curve.	2	K2	4
9. How is railway track maintained?	2	K2	5
10. Define track resistance.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Explain the specific functions of different modes of transportation.	6	K2	1
ii) Sketch and detail on highway cross sectional elements.	10	K2	1
(OR)			
b) i) Outline on highway alignment.	6	K2	1
ii) Describe the modern methods used for highway alignment.	10	K2	1
12. a) i) Calculate the minimum sight distance required to avoid a head on collision of two cars approaching from the opposite direction at 100 kmph and 80 kmph on a road section. Assume a reaction time of 2.5 seconds, coefficient of friction of 0.7 and brake efficiency of 50% in either case.	8	K3	2

Q. No		M	BTL	CO
	ii) Write a note on PIEV theory. (OR)	8	K3	2
b) i)	Design the rate of super elevation for a horizontal highway curve of radius 500 m and speed 100 kmph.	8	K3	2
	ii) Explain the factors influence the design of vertical curves.	8	K3	2
13. a)	Explain aggregate impact test with neat sketch and mention the recommended aggregate impact values for pavement construction. (OR)	16	K3	3
b)	Explain the materials and methods used for repairing damaged rigid pavement.	16	K3	3
14. a)	Compare and contrast the conventional and modern methods of railway alignment. (OR)	16	K2	4
b)	Why ballast need to use in construction of a railway track? Briefly explain for various types of Ballast used.	16	K2	4
15. a)	Write short notes on a) Signaling b) relaying of track. (OR)	16	K2	5
b)	Give the classification of stations to their location in station yard along with suitable sketches.	16	K2	5

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B.E. Degree Examinations – April/May 2025

Semester: V [Full Time]

Electrical and Electronics Engineering

18EE501 – POWER GENERATION, TRANSMISSION AND DISTRIBUTION SYSTEM

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Write the significance of load curve.	2	K3	1
2. Name the different types of power plants used for generation of electric power.	2	K1	1
3. What is called transposition of transmission lines? Why is it needed?	2	K2	2
4. Define Proximity effect in the transmission line.	2	K1	2
5. Draw the equivalent circuit of medium transmission line in nominal T form.	2	K3	3
6. What is called Ferranti effect?	2	K2	3
7. What are the properties of overhead line insulators?	2	K1	4
8. Why grading is needed for the cables?	2	K3	4
9. List out the advantages of neutral grounding.	2	K2	5
10. How do you define feeder and distributor?	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Draw the structure of electric power system indicating the voltage levels and mention the different subsystems present in it.	8	K2	1
ii) What is called tariff? Write the different types of tariff? Explain the method of tariff used for industrial consumers?	8	K2	1
(OR)			
b) i) Draw the layout of thermal power station and indicate the main elements.	8	K2	1
ii) Develop the schematic diagram of a hydro power plant and explain how it is working?	8	K2	1

Q. No		M	BTL	CO
12. a)	Two conductors of a single phase line, each of 1 cm diameter, are arranged in a vertical plane with one conductor mounted 1 m above the other. A second identical line is mounted at the same height as the first and spaced horizontally 0.25 m apart from it. The two upper and the two lower conductors are connected in parallel. Determine the inductance per km of the resulting double circuit line.	16	K4	2
	(OR)			
b)	Derive an expression for per phase capacitance of a three phase overhead transmission line when the conductors are asymmetrically placed but transposed. Discuss the effect of earth on the capacitance of a overhead transmission line.	16	K4	2
13. a)	An overhead three phase transmission line delivers 5000 kW at 22 kV at 0.8 power factor lagging. The resistance and reactance of each conductor are 4 Ω and 6 Ω respectively. Determine: (i) sending end voltage (ii) percentage regulation (iii) transmission efficiency.	16	K4	3
	(OR)			
b)	Using rigorous method, derive the expressions for (i) ABCD constants and (ii) sending end voltage and current for a long transmission line.	16	K4	3
14. a)	i) List out the different types of insulators and brief the structure and advantages of suspension type insulators.	10	K3	4
	ii) Discuss the methods of improving the string efficiency in the suspension type insulators.	6	K3	4
	(OR)			
b) i)	Calculate the capacitance and charging current of a single core cable used on a three phase, 66 kV system. The cable is 1 km long having a core diameter of 10 cm and an impregnated paper insulation of thickness 7 cm. The relative permittivity of the insulation may be taken as 4 and the supply at 50 Hz.	10	K3	4
ii)	Derive an expression for the dielectric stress of a single-core cable.	6	K3	4

Q. No		M	BTL	CO
15. a)	What is called bus-bar? With the help of the line diagram, elaborate the bus-bar arrangements in the substation and compare its features.	16	K2	5

(OR)

b)	A single phase AC distributor AB 300 meters long is fed from end A and is loaded as under:	16	K2	6

(i) 100 A at 0.707 power factor lagging 200 m from point A

(ii) 200 A at 0.8 p.f. lagging 300 m from point A

The load resistance and reactance of the distributor are 0.2Ω and 0.1Ω per kilometre. Calculate the total voltage drop in the distributor. The load power factors refer to the voltage at the far end.

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B.E. Degree Examinations - April/May 2025

Semester: V [Full Time]

Electrical and Electronics Engineering

22EE506 - SOLAR AND WIND ENERGY CONVERSION SYSTEMS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. For air mass of 1.5, calculate the zenith angle.	2	K2	1
2. Define solar constant.	2	K1	1
3. Compare stalling and furling.	2	K1	2
4. What is Betz limit? Relate the coefficient of power with Betz limit.	2	K2	2
5. Sketch the P-V characteristics of PV cell for different load conditions.	2	K2	3
6. Draw the block diagram of simple PV system fed to load using a MPPT controller.	2	K2	3
7. Compare Fixed and Variable speed Wind turbine.	2	K2	5
8. Frame a relevant mathematical equation that adheres to the statement "Variable-speed wind turbine has the ability to store and extract energy in the rotating parts by letting the rotor accelerate or decelerate".	2	K1	5
9. What is meant by fault ride-through of wind farms?	2	K2	4
10. List the causes of power quality issues.	2	K2	4

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Illustrate the power spectral radiation of sunlight.	8	K2	1
ii) Discuss the solar radiation atmospheric mechanism in both Terrestrial and Extra-terrestrial region.	8	K2	1

(OR)

Q. No		M	BTL	CO
b) i)	Calculate the declination angle, local apparent time and hour angle for the solar PV collector located in Mumbai (19.12 N, 72.51 E) which is tilted at an angle of 30° with the horizontal & pointing due south on October 1.	8	K2	1
	ii) Compare Pyroheliometer and Pyranometer.	8	K2	1
12. a)	Derive the power expression developed for wind and apply it to prove that it is proportional to power coefficient. (OR)	16	K3	2
b)	Deduce a relation between $f(v)$ and c and apply it to show the Weibull and Rayleigh's probability distributions graphically by assuming different wind speed data.	16	K3	2
13. a)	With a neat circuit diagram, discuss the different modes of a boost converter operation and control circuit to achieve almost double the voltage from PV array. (OR)	16	K2	3
b)	Justify the statement "Hill Climbing techniques are quiet suitable for maximum power point tracking", and illustrate them with suitable flowcharts.	16	K2	3
14. a)	Discuss the variable speed wind turbine operation using Doubly-Fed Induction Generators and sketch its characteristics. (OR)	16	K2	5
b)	With a neat circuit diagram, apply the generator-side control to power converter configuration to obtain the variable speed operation in PMSG wind turbines.	16	K2	5
15. a)	Discuss the control methods adopted to improve the Fault-Ride through capability of DFIG based WECS. (OR)	16	K3	4
b)	Discuss the different controlling techniques adopted to overcome the grid disturbances while integrating the solar and wind farms with utility grid.	16	K3	4

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B.E. Degree Examinations – April/May 2025

Semester: V [Full Time]

Metallurgical Engineering

22MT506 – WELDING ENGINEERING

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. List the various shielding methods used in arc welding processes.	2	K2	1
2. What is meant by duty cycle of a welding power source?	2	K2	1
3. Compare fusion welding processes with solid state welding processes.	2	K1	2
4. What is the principle of ultrasonic welding?	2	K1	2
5. List the limitations of electron beam welding.	2	K2	3
6. List the applications of thermit welding process.	2	K2	3
7. Which metals or alloys are usually joined by soldering process?	2	K3	4
8. State the working principle of dip soldering process.	2	K1	4
9. What are different types of surfacing processes based on welding?	2	K2	5
10. List the metal or alloys that should not be cut by oxy-fuel cutting process.	2	K3	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Discuss the FAV and DAV characteristics of arc welding power sources. Give suitable examples of welding processes that make use of these characteristics.	16	K3	1
(OR)			
b) With sketches, explain the three types of flames in oxy acetylene gas welding. Highlight the flame characteristics and applications of each type.	16	K3	1

Q. No		M	BTL	CO
12. a)	Explain the working principle, procedure and applications of rotary friction welding (RFW) process in detail.	16	K4	2
	(OR)			
b)	Explain the working principle, experimental set up and procedure of friction stir welding (FSW) process in detail.	16	K4	2
13. a)	Discuss the principle, procedure and applications of LASER beam welding in detail.	16	K4	3
	(OR)			
b)	Discuss the instrumentation and applications of plasma arc welding process in detail.	16	K4	3
14. a)	Explain the basic principle, working procedure, merits, limitations and applications of manual torch brazing method in detail.	16	K2	4
	(OR)			
b)	Explain the basic principle, working procedure, merits, limitations and applications of iron soldering method in detail.	16	K2	4
15. a)	Write a short note on various welding related surface modification processes.	16	K3	5
	(OR)			
b)	Explain the LASER cutting process in detail with respect to process, equipment, consumables, advantages, limitations and applications.	16	K3	5

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B.E. Degree Examinations – April/May 2025

Semester: V [Part Time]

Civil Engineering

22PTCE502 – FOUNDATION ENGINEERING

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. List the objectives of soil exploration.	2	K2	1
2. Define Area Ratio. Write its value for disturbed and undisturbed samples.	2	K2	1
3. List the factors affecting the bearing capacity of soil.	2	K2	3
4. Name the methods available for calculating the elastic settlement of footing.	2	K1	3
5. Define negative skin friction in piles.	2	K1	5
6. State the methods of driving the pile in soil.	2	K2	5
7. Distinguish between finite and infinite slopes.	2	K2	2
8. Write the formula for Taylor's stability number.	2	K1	2
9. List the assumptions in Rankine's theory.	2	K1	2
10. Differentiate active and passive earth pressure.	2	K2	2

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain the Standard Penetration test with its advantages and limitations.	16	K3	1
(OR)			
b) Briefly explain the various types of foundations with neat sketches.	16	K3	1
12. a) Determine the ultimate bearing capacity of strip footing using IS method, with footing width of 1.5m and its base at a depth of 1m, resting on a dry soil stratum. Take unit weight as 17kN/m ³ , for $\phi = 38^\circ$, $N_q = 48.9$ and $N_\gamma = 56.2$.	16	K3	3
(OR)			
b) Briefly explain the different modes of shear failure in soil with neat sketches.	16	K3	3

Q. No		M	BTL	CO
13. a)	Explain the various methods for determining the load carrying capacity of piles.	16	K3	5
	(OR)			
b)	A square pile group of 9 piles with 25 cm diameter is arranged at a spacing of 1m, Length of each pile is 8 m.If cohesion of clay is 75kN/m ² . Determine the capacity of pile group neglecting the bearing at pile tips. Take adhesion factor as 0.75.	16	K3	5
14. a)	A canal with a depth of 5m and a bank slope 1:1, having $C = 19$ KPa, $\phi = 15^\circ$, $e = 0.7$, $G = 2.6$. Calculate the factor of safety if i) canal is running full ii) canal suddenly emptied.	16	K3	2
	(OR)			
b)	Explain the friction circle method and method of slices for stability analysis of slopes.	16	K3	2
15. a)	A retaining wall of 4 m height supports the backfill having cohesion of 20 KPa, angle of internal friction 29° with bulk unit weight of 18.25 kN/m ³ . Backfill carries a surcharge of 25 kN/m ² . Draw the earth pressure diagram and calculate total active earth pressure force acting on wall and point of application.	16	K4	2
	(OR)			
b)	Explain the Rankine's theory for various backfill condition to calculate the active earth pressure.	16	K4	2

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B.E. Degree Examinations – April/May 2025

Semester: VII [Part Time]

Electrical and Electronics Engineering

16PTEEE20 – SMART GRID TECHNOLOGIES

(Regulations 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is Smart Grid?
2. Enumerate the initiatives taken by Indian economy for smart grid.
3. What is Sub-station Automation?
4. Compare the benefits of Voltage and VAR control.
5. Write about the AMI needs in the smart grid.
6. What is synchrophasor?
7. What is EMC in smart grid?
8. Write the necessity of load compensation.
9. What is HAN?
10. Estimate the Cyber Security requirements in Smart grid.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Examine the Evolution of Electric Grid. (16)
(OR)
b) Discuss about the present development and international policies in Smart Grid. (16)
12. a) Examine the Flexible AC Transmission Systems in smart grid. (16)
(OR)
b) Discuss about the High Efficiency Distribution Transformers in smart grid. (16)
13. a) Describe about the AMI Protocols Standards and Initiatives. (16)
(OR)
b) What is Phasor Measurement Unit (PMU) and explain it? (16)
14. a) Explain the Wind hydro and tidal energy systems in smart grid. (16)
(OR)
b) Estimate the Power Quality Audit for smart grid. (16)

15. a) Describe the Wide Area Network (WAN). (16)
- (OR)**
- b) Illustrate the Cyber Security Functions for Smart Grid. (16)

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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

(Common to **Civil Engineering/Electrical and Electronics Engineering**)

22MEOE06 – PROFESSIONAL ETHICS IN ENGINEERING

18MEOE05 – PROFESSIONAL ETHICS AND HUMAN VALUES

(Regulations 2022/2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. List some methodologies used to develop self-confidence in a person.	2	K1	1
2. Define morals, values and ethics.	2	K1	1
3. Define the term "moral autonomy".	2	K1	2
4. Compare and contrast Kohlberg's and Gilligan's theories.	2	K1	2
5. Explain the basic elements of informed consent.	2	K2	3
6. Differentiate between scientific experiments and engineering projects.	2	K2	3
7. What is fault tree analysis?	2	K1	4
8. Define the term "collective bargaining".	2	K1	4
9. What are the characteristics of engineers as managers?	2	K2	5
10. What is Corporate Social Responsibility (CSR)?	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Define integrity and analyze how it significantly influences work ethics. Apply your understanding with relevant real-world professional examples.	16	K3	1
(OR)			
b) i) Explain in detail the concept of spirituality.	8	K3	1
ii) Interpret and analyze the importance of yoga for professionals, applying its principles to workplace scenarios.	8	K3	1

Q. No		M	BTL	CO
12. a)	Apply the various ethical theories (Utilitarianism, Duty Ethics, Rights Ethics, Virtue Ethics) to real-world professional situations, analyzing their effectiveness in ethical decision-making.	16	K4	2
	(OR)			
b)	Discuss and analyze the concepts of (i) moral dilemma and (ii) moral autonomy. Apply these concepts to relevant case studies or professional scenarios.	16	K4	2
13. a)	Analyze the Challenger Space Shuttle disaster, clearly identifying violations of moral, ethical, and professional standards. Conclude by suggesting practical steps to avoid similar disasters in the future.	16	K4	3
	(OR)			
b)	Identify and analyze the similarities and differences between engineering experiments and standard scientific experiments, applying your analysis with suitable examples.	16	K4	3
14. a)	Discuss and analyze the significance of Intellectual Property Rights (IPR). Apply your understanding by explaining the legislation that covers IPR in India and its implications in engineering practice.	16	K4	4
	(OR)			
b) i)	Explain and analyze the process of risk assessment and safety management.	8	K4	4
ii)	Apply and discuss Event Tree Analysis in detail with a relevant engineering scenario.	8	K4	4
15. a)	Analyze the significance of environmental ethics for engineers, applying relevant examples of environmental issues and their ethical implications.	16	K4	5
	(OR)			
b)	Explain and analyze the Code of Ethics followed by the Institution of Electronics and Telecommunication Engineers (IETE). Apply these codes to a practical scenario demonstrating their importance in professional practice.	16	K4	5

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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Civil Engineering

22MEOE07 – RENEWABLE SOURCES OF ENERGY

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What is meant by solar radiation?	2	K1	1
2. Define renewable energy.	2	K1	1
3. Differentiate between flat plate and concentrating collectors.	2	K2	2
4. State two applications of solar PV systems.	2	K2	2
5. Illustrate the direct combustion in biomass conversion.	2	K2	3
6. List any two features of the Khadi and Village Industries (KVIC) biogas plant.	2	K1	3
7. What are geopressurized resources?	2	K1	4
8. Rephrase the magma resources in geothermal systems.	2	K2	4
9. Relate the role of an electrolyte in a fuel cell.	2	K2	5
10. Recall the principle of operation of a fuel cell.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain in detail the various alternative energy sources available in India and their potential.	16	K2	1
(OR)			
b) Contrast the working principle of pyrheliometer and pyranometer with neat sketch.	16	K2	1
12. a) Enumerate the different types of concentrating type collector. Describe a collector used in power plants for generation of electrical energy.	16	K3	2
(OR)			
b) Build the layout and working of a solar PV power generation system and also Identify the various applications of solar PV systems.	16	K3	2

Q. No		M	BTL	CO
13. a)	Analyze the various thermo-chemical conversion techniques of biomass with neat diagrams.	16	K4	3
	(OR)			
b)	Contrast the design features and working principle of the prapatti biogas plant.	16	K4	3
14. a)	Draw a neat diagram of horizontal axis wind mill and vertical axis wind mill with all required components and construct the function of each component	16	K3	4
	(OR)			
b)	Develop the basic principle of tidal power generation. Explain the components of a tidal power plant and discuss the different operational methods with neat sketches.	16	K3	4
15. a)	Examine the design and principle of operation of a fuel cell. Discuss its components and working mechanism in detail.	16	K4	5
	(OR)			
b)	Distinguish between open cycle and closed cycle MHD systems, and discover the working principle of magneto hydro dynamic power generation with neat sketch.	16	K4	5

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B.E. Degree Examinations – April/May 2025

Semester: VI & VII [Full Time]

(Common to **CSE/Mechanical Engineering**)

22MEOE09/22MEPE57/18MEPE46 – TOTAL QUALITY MANAGEMENT

(Regulations 2022/2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What are the dimensions of quality?	2	K1	1
2. Define strategic planning.	2	K1	1
3. Differentiate between recognition and reward.	2	K2	2
4. List out the types of motivation.	2	K1	2
5. List any four traditional tools of quality.	2	K1	3
6. Compare mean and median.	2	K2	3
7. What is Taguchi's quality loss function?	2	K1	4
8. Illustrate any two reasons to conduct benchmarking.	2	K2	4
9. Relate the need for ISO.	2	K2	5
10. Recall the significance of quality auditing.	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain in detail about the barriers in the implementation of total quality management.	16	K2	1
(OR)			
b) Briefly explain the various quality cost categories and their techniques.	16	K2	1
12. a) Enumerate the Japanese 5S as applicable to services and manufacturing company.	16	K3	2
(OR)			
b) Build the PDCA cycle as an effective tool for continuous improvement. Explain if briefly.	16	K3	2

Q. No		M	BTL	CO
13. a)	Analyze the seven traditional tools of quality with neat flow chart. (OR)	16	K4	3
b)	Contrast the concept of Six Sigma and its application in quality improvement.	16	K4	3
14. a)	i) Construct the benchmarking process in detail.	8	K3	4
	ii) The Taguchi loss function for a certain component is given by $L(X) = 7500(X-N)^2$, where X- the actual value of a critical dimension and N is its Nominal value. Company management has decided that the maximum loss that can be accepted is Rs.400. If the nominal dimension is 35.00 mm. Find the tolerance limits. (OR)	8	K3	4
b)	i) Develop the concept of total productive maintenance.	8	K3	4
	ii) Explain the pillars and implementation steps of TPM.	8	K2	4
15. a)	i) Examine the steps involved in the implementation of a quality system.	8	K4	5
	ii) Analyze the structure and components of TL 9000 and its importance in telecom industries. (OR)	8	K4	5
b)	i) Dissect the steps to be followed in implementing quality system ISO 9001:2008.	8	K4	5
	ii) Discover the ISO 9000:2000 and state its scope and applications.	8	K4	5

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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Electronics and Communication Engineering

22CSOE08 – CLOUD COMPUTING FUNDAMENTALS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Mention the benefits of using cloud computing.	2	K2	1
2. List two key characteristics of cloud computing.	2	K1	1
3. Differentiate full virtualization and para-virtualization.	2	K2	2
4. How do the characteristics of virtualized environments support efficient resource management and system isolation?	2	K2	2
5. Analyze “storage as a service”.	2	K2	2
6. Summarize the benefits and drawbacks of using “Platform as a Service”.	2	K2	2
7. Analyze the open Nebula components.	2	K2	3
8. Analyze the major features of Google App Engine and evaluate how these features address specific challenges in application development and deployment.	2	K2	3
9. Identify potential vulnerabilities in Virtual Machines.	2	K2	4
10. List any two key components of an effective cloud security governance framework.	2	K1	4

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Analyze the essential characteristics of cloud computing. How do these characteristics provide benefits to organizations and end users?	8	K4	1
ii) Explain the layers of the cloud computing reference model in detail with examples.	8	K2	1
(OR)			
b) i) Analyze the principles of parallel and distributed computing.	8	K4	1

Q. No		M	BTL	CO
	ii) Explain in detail about technologies for distributed computing.	8	K2	1
12. a)	Discuss in detail about Machine Reference Model and Hardware Level Virtualization.	16	K2	2
	(OR)			
b)	Explain in detail about Programming Language Level Virtualization and Application Level Virtualization.	16	K2	2
13. a)	Describe service and deployment models of a cloud computing environment with illustrations.	16	K4	2
	(OR)			
b)	Explain with neat diagram about the Cloud Storage Providers and Amazon Simple Storage Service S3.	16	K4	2
14. a)	i) Explain the architecture of Amazon Web Services.	8	K2	3
	ii) Examine the architecture of Eucalyptus.	8	K4	3
	(OR)			
b)	i) Examine the basic file system operation in Hadoop.	8	K2	3
	ii) Discuss Map Reduce with suitable diagrams.	8	K4	3
15. a)	i) Discuss the key security challenges in cloud computing environments.	8	K3	4
	ii) Analyze the architecture of a secure cloud system.	8	K4	4
	(OR)			
b)	i) Discuss the role of cloud computing in ECG analysis.	8	K3	4
	ii) Analyze the role of cloud computing in satellite image processing.	8	K4	4

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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Electronics and Communication Engineering

22CSOE07 – DATA STRUCTURES USING C++

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Write the syntax for declaring a reference variable in C++.	2	K1	1
2. State the reason why a friend function cannot be called using an object.	2	K1	1
3. Identify the functions in C++ that inherently have access to the 'this' pointer.	2	K2	1
4. State the significance of protected members in C++.	2	K1	1
5. Mention any two key characteristics of an Abstract Data Type.	2	K2	2
6. List any two real-world applications of the Queue ADT.	2	K1	2
7. Distinguish between a binary tree and a binary search tree.	2	K2	2
8. Define the adjacency matrix representation of a graph.	2	K1	2
9. List the key steps involved in the Insertion Sort algorithm.	2	K1	3
10. Identify the type of data structure that is commonly used with the Linear Search algorithm.	2	K2	3

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Write a C++ program that dynamically allocates memory for an integer array. Accept values from the user, calculate the average, and deallocate the memory properly.	16	K3	1
(OR)			
b) Write a C++ program to overload the + operator to perform matrix addition on two 2x2 matrices using a class. The program should include appropriate constructors to initialize the matrices and a member function to display the resulting matrix.	16	K3	1

Q. No	M	BTL	CO
12. a) Write a C++ program to demonstrate multilevel inheritance. Define a base class Employee, a derived class Manager that inherits from Employee, and another derived class Team Leader that inherits from Manager. Implement constructors and functions to display information about the team leader.	16	K3	1
(OR)			
b) Write a C++ program to demonstrate dynamic binding using virtual destructors. Define a base class Base with a virtual destructor and a derived class Derived. In the main function, create a Derived object using a pointer to the Base class and delete it. Show how the virtual destructor ensures proper destruction of both base and derived class objects.	16	K3	1
13. a) Illustrate the implementation of the List ADT using a singly linked list. Describe the key operations, such as insertion and deletion.	16	K2	2
(OR)			
b) Illustrate the evaluation of an arithmetic expression in postfix notation using the Stack ADT. Describe how basic arithmetic operators are handled during the evaluation.	16	K2	2
14. a) Describe the structure of a heap. Differentiate max-heap and min-heap with suitable examples or illustrations.	16	K2	2
(OR)			
b) Differentiate Depth-First Search (DFS) and Breadth-First Search (BFS) with respect to traversal strategy, space complexity, and common use cases.	16	K2	2
15. a) Analyze the Quick Sort algorithm, highlighting the selection of the pivot element and the execution of the partitioning process	16	K4	3
(OR)			
b) Analyze why Binary Search cannot be applied to an unsorted array. Examine the prerequisites necessary for using Binary Search effectively.	16	K4	3

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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Metallurgical Engineering

22MEOE05/18MEOE04 – PRINCIPLES OF MANAGEMENT

(Regulations 2022/2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define management	2	K1	1
2. Mention different schools of management.	2	K2	1
3. Define MBO in planning.	2	K1	2
4. Express your views on management levels.	2	K1	2
5. Write any two objectives of budgets.	2	K1	3
6. Mention the importance of operation research.	2	K2	3
7. Express your views on matrix committee based organization.	2	K2	4
8. What do you mean by departmentization?	2	K1	4
9. Can you suggest a method of effective control?	2	K1	5
10. What is the need of staffing?	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Write in detail Henri Fayol's fourteen principles of management	10	K2	1
ii) Define scientific management.	6	K2	1
(OR)			
b) i) Differentiate Management and Administration.	10	K2	1
ii) Specify various decisional roles performed by a manager.	6	K2	1
12. a) i) Explicate the various functions of management.	10	K3	2
ii) Write short notes on management levels.	6	K2	2
(OR)			
b) i) Elaborate in detail about responsibility of managers towards subordinates and peers.	10	K3	2
ii) Write short notes on shareholders.	6	K2	2

Q. No		M	BTL	CO
13. a)	i) Describe in detail the process of decision making that affects the efficiency of an organization.	10	K4	3
	ii) Summarize about the decision making.	6	K2	3
	(OR)			
b) i)	Discuss the benefits and weaknesses of MBO.	10	K4	3
	ii) Illustrate about MBO with block diagram.	6	K2	3
14. a)	i) Distinguish between formal and informal organization with suitable examples.	6	K3	4
	ii) Interpret the importance of public enterprise company.	10	K2	4
	(OR)			
b) i)	Explain briefly about the career development.	6	K3	4
	ii) Explain its purpose and process in detail.	10	K2	4
15. a)	i) Compile the various methods of performance appraisal.	8	K3	5
	ii) Describe the skills needed for various recruitment process.	8	K3	5
	(OR)			
b) i)	Write in detail about types of communication.	8	K3	5
	ii) Mention about barriers in communication	8	K3	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: V & II [Part Time]

Civil Engineering

22PTCE501/23PTCE203 – APPLIED HYDRAULIC ENGINEERING

(Regulations 2022/2023)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define the term open channel flow.	2	K1	2
2. Derive relationship between manning's coefficient and chezy's coefficient.	2	K2	2
3. Write down the assumption for deriving dynamic equation of gradually varied flow.	2	K1	2
4. Enlist the type of surges and when they occur.	2	K2	2
5. State Impulse-Momentum Equation.	2	K1	4
6. Define Jet propulsion.	2	K1	4
7. What is meant by cavitation?	2	K2	5
8. What are the uses of Draft tube?	2	K2	5
9. Distinguish between the centrifugal pump and reciprocating pump.	2	K2	4
10. Write short notes on negative slip.	2	K2	4

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Define specific energy curve. Draw specific energy curve and derive the expressions for critical depth and critical velocity.	16	K2	2
(OR)			
b) Derive the conditions for most economical trapezoidal channel cross section.	16	K2	2
12. a) With the neat sketch explain the different flow profiles of gradually varied flow.	16	K3	2
(OR)			
b) Derive the relationship between prejump and postjump depth in hydraulic jumps.	16	K3	2
13. a) Drive the equation for force exerted by a jet on stationary curved plate.	16	K3	4

(OR)

Q. No		M	BTL	CO
b)	A ship whose resistance is 26.545 kN is to be driven at 5 m/s by means of a jet of water directed under water. The velocity of the jet is to be 7.5 m/s relative to the ship. The efficiency of the pump operating the jet is estimated to be 80%, the frictional resistance of the pipes being equal to 3 m of water. Calculate, a) The power required to drive the pump b) The overall efficiency of the system in the following cases: i) The water enters the ship through an inlet facing ahead ii) The water enters through an inlet in the side of the ship.	16	K3	4
14. a)	A pelton wheel nozzle for which $C_v = 0.97$ is 400 m below the water surface of a lake. The diameter is 80 mm, the pipe diameter is 0.6 m, its length is 4 km and co-efficient of friction = 0.032. The buckets, deflect the jet through 165° and they run at 0.48 times the jet speed, bucket friction reducing the relative velocity at outlet by 15% of the relative velocity at inlet. Mechanical efficiency = 90%. Find the flow rate and shaft power developed by the turbine.	16	K4	4
	(OR)			
b)	Draw and explain the parts of Francis turbine and its velocity triangle.	16	K4	5
15. a)	A centrifugal pump operates against a manometric head of 30 m with a manometric efficiency of 75%. The pressure rise through the impeller is 65% of the total head developed by the pump. The radial velocity of flow which is constant is 3 m/s. the outer diameter of the impeller is 400 mm and the width at outlet is 15 mm. the blades at inlet are curved backwards at 60° to the wheel tangent. Calculate i) The discharge in litres per minute ii) Speed iii) Blade angle at outlet iv) Diameter of impeller at inlet.	16	K3	4
	(OR)			
b)	Explain the indicator diagrams of reciprocating pump with neat sketches.	16	K3	4

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Government College of Engineering, Salem.
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B.E. Degree Examinations – April/May 2025

Semester: VI [Part Time]

Electrical and Electronics Engineering

22PTEEE52- EMBEDDED SYSTEM DESIGN

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Mention the applications of embedded controllers.	2	K1	1
2. List out the role of interrupt controller in embedded system.	2	K2	1
3. What is the need for Direct Memory Access (DMA)?	2	K1	2
4. Enumerate the role of I/O unit in embedded system.	2	K2	2
5. Draw the data frame format of CAN.	2	K3	3
6. Differentiate synchronous communication and Iso-synchronous communication.	2	K2	3
7. Write a simple embedded C code snippet to toggle an LED.	2	K3	4
8. Clarify the scope of a variable in C Programming.	2	K3	4
9. Justify the advantages of mail boxes in RTOS.	2	K2	5
10. Distinguish non preemptive and preemptive scheduling in RTOS.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain the functional building blocks of an embedded system with neat diagrams.	16	K2	1
(OR)			
b) Describe the structure for microcontroller-based embedded systems with an example.	16	K2	1
12. a) Discuss in detail the structural units of a processor and criteria for selecting memory devices in embedded systems.	16	K4	2
(OR)			
b) Explain cache mapping techniques and memory fragmentation with suitable illustrations.	16	K4	2

Q. No		M	BTL	CO
13. a)	Write a detailed technical note on the characteristics of the I ² C bus and explain the process of arbitration.	16	K1	3
	(OR)			
b)	Explain the serial and parallel port interfacing with microcontroller in detail with neat sketches.	16	K1	3
14. a)	Illustrate the structure of an embedded C program and explain various storage classes in C with examples.	16	K3	4
	(OR)			
b)	Explain in detail about interrupt functions in C program	16	K3	4
15. a)	Illustrate with suitable example about the use of semaphore in multitasking. What are the various semaphore operations?	16	K4	5
	(OR)			
b)	Write the fifteen-point strategy for synchronization between the processes, IS Rs, OS functions and tasks for resource management.	16	K4	5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Part Time]

Electrical and Electronics Engineering

22PTEEE55 – INTERNET OF THINGS FOR ELECTRICAL SYSTEM

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define IoT.	2	K1	1
2. List out the major components of IoT.	2	K2	1
3. Mention any two temperature sensors.	2	K1	2
4. What is the use of Solenoid in IoT Based system?	2	K2	2
5. Differentiate between RFID and Bluetooth.	2	K1	3
6. Write down some WLAN protocols.	2	K2	3
7. Compare SQL and NOSQL.	2	K1	4
8. What is query processing?	2	K2	4
9. Enumerate the importance of predictive and preventive maintenance.	2	K1	5
10. Mention wireless sensor network IoT applications.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Discuss about the Conceptual Framework and architecture of IoT with a suitable diagram	16	K3	1
(OR)			
b) Explain about the IoT software components for device hardware.	16	K3	1
12. a) Explain significance of “sensor” in IoT based system. Describe any five types of sensors.	16	K4	2
(OR)			
b) Explain Actuator and its use in IoT? Explain types of actuators in detail.	16	K4	2

Q. No		M	BTL	CO
13. a)	What is M2M communication? Explain about Architecture of M2M for IoT.	16	K4	3
	(OR)			
b)	Compare on Zig Bee, Mobile Network, Wi-Fi and GPRS/GSM cellular networks.	16	K4	3
14. a)	Explain about stages in Data Acquiring with suitable block diagram.	16	K3	4
	(OR)			
b)	Explain in detail the need and types of Data Analytics for IoT.	16	K3	4
15. a)	Discuss how IoT used for vehicle to infrastructure technology.	16	K4	5
	(OR)			
b)	Discuss about RFID and its application on IoT with suitable block diagram.	16	K4	5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: III/IV [Part Time]

Mechanical Engineering

22PTME304/23PTME402 – DESIGN OF MACHINE ELEMENTS

(Regulations 2022/2023)

(Use of Approved PSG Design Data Book is Permitted)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define shock factor and what does it indicate.	2	K1	1
2. Distinguish hardness and toughness.	2	K2	1
3. List out types of stresses are induced in shafts.	2	K1	2
4. Compare rigid and flexible couplings.	2	K2	2
5. What do you understand preloading of bolts?	2	K1	3
6. List out the materials used for rivets.	2	K1	3
7. What is the function of a spring?	2	K1	4
8. Two springs of stiffness K_1 and K_2 are connected in series. Find the stiffness of connection.	2	K2	4
9. Illustrate the main function of a flywheel in an engine.	2	K2	5
10. Recall the heat engine.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) A hollow shaft of 40 mm outer diameter and 25 mm inner diameter is subjected to a twisting moment of 120 N-m simultaneously; it is subjected to an axial thrust of 10 kN and a bending moment of 80 N-m. Compare the maximum compressive and shear stresses.	16	K3	1
(OR)			
b) Calculate the diameter of a shaft to transmit twisting moment varying from 800 N-m to 1600 N-m. The ultimate tensile strength for the material is 600 MPa. And yield stress is 450 MPa. Assume the stress concentration factor = 1.2, surface finish factor = 0.8 and size factor = 0.85.	16	K3	1

Q. No

M BTL CO

12. a) A mild steel shaft transmits 20 kW at 200 rpm. It carries a central load of 900 N and is simply supported between the bearings 2.5 m apart. Determine the size of the shaft, if the allowable shear stress is 42 MPa and the maximum tensile or compressive stress is not to exceed 56 MPa. Build size of the shaft will be required, if it is subjected to gradually applied loads.

16 K3 2

(OR)

- b) Design a cast iron flange coupling for a mild steel shaft transmitting 90 kW at 250 rpm, the allowable shear stress in the shaft is 40 MPa and the angle of twist is not to exceed 1° in a length of 20 m. The allowable shear stress in the coupling bolt is 30 MPa. Take $G = 84 \text{ kN/mm}^2$.

16 K3 2

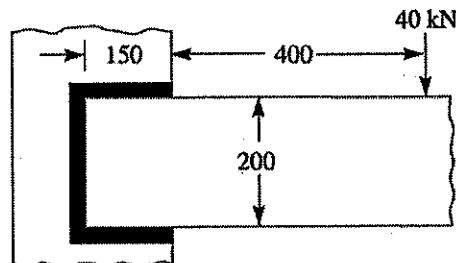
13. a) A plate of 80 mm wide and 6 mm thickness is to be welded to another plate by means of a double parallel fillet. The plate is subjected to a static load of 60 kN. Analyze the length of weld if the permissible shear stress in the weld does not exceed 45 MPa.

16 K3 3

(OR)

- b) A bracket shown in Fig.1 carries a load of 40 kN. Discover the size of weld, if the allowable shear stress is not to exceed 80 MPa.

16 K3 3



All dimensions in mm.

Fig.1

14. a) Design a cantilever leaf spring to absorb 500 Nm energy without exceeding a deflection of 250 mm and a stress of 900 N/mm^2 . The length of the spring is 500 mm. The material of the spring is cast iron.

16 K3 4

(OR)

Q. No	M	BTL	CO
b) A foot lever is 1m long from center of shaft to point of application of 800 N load. Find (i) diameter of shaft (ii) Dimensions of key, (iii) Dimensions of rectangular arm of foot lever at from the center of shaft assuming width of arm as 3 times thickness. Allowable tensile stress may be taken as 73 N/mm ² and shear stress as 70 N/mm ² .	16	K3	4
15. a) Examine a journal bearing for the following data Diameter of the journal (D) = 200 mm Load on the bearing (W) = 10 KN Speed (N) = 1400 rpm.	16	K4	5
(OR)			
b) Discover the dimensions of an I-section connecting rod for a petrol engine from the following data: Diameter of the piston = 110 mm, Mass of the reciprocating parts = 2 kg, Length of the connecting rod from the centre to centre = 325 mm, Stroke length = 150 mm, RPM = 1500 with possible over speed of 2500, Compression ratio = 4:1 and Maximum explosion pressure = 2.5 N/mm ² .	16	K4	5



Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: V [Full Time]

Mechanical Engineering

12ME504 – DESIGN OF MACHINE ELEMENTS

(Regulations 2012)

(Use of Approved Design Data Books may be permitted)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

1. Distinguish between brittle fracture and ductile fracture.
2. What is the use of Goodman diagrams?
3. Under what circumstances flexible couplings are used?
4. Write the bending equation used for design of shaft.
5. What are the stresses act on screw fastenings?
6. What are the practical applications of welded joints?
7. Define Leaf spring.
8. What are the differences between closed coil and open coil helical springs?
9. What are stresses induced in flywheel arms?
10. What is the limitation of McKee's equation?

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

M

11. a) A mild steel shaft of 50 mm diameter is subjected to a bending moment of 2000 N-m and a torque T. If the yield point of the steel in tension is 200 MPa, find the maximum value of this torque without causing yielding of the shaft according to (i) The maximum principal stress; (ii) The maximum shear stress; and (iii) The maximum distortion strain energy theory of yielding. (16)

(OR)

- b) A hot rolled steel shaft is subjected to a torsional moment that varies from 330 N-m clockwise to 110 N-m counterclockwise and an applied bending moment at a critical section varies from 440 N-m to - 220 N-m. The shaft is of uniform cross-section and no keyway is present at the critical section. Determine the required shaft diameter. The material has an ultimate strength of 550 MN/m² and a yield strength of 410 MN/m². Take the endurance limit as half the ultimate strength, factor of safety of 2, size factor of 0.85 and a surface finish factor of 0.62. (16)
12. a) A shaft is supported on bearings A and B, 800 mm between centres. A 20° straight tooth spur gear having 600 mm pitch diameter, is located 200 mm to the right of the left hand bearing A, and a 700 mm diameter pulley is mounted 250 mm towards the left of bearing B. The gear is driven by a pinion with a downward tangential force while the pulley drives a horizontal belt having 180° angle of wrap. The pulley also serves as a flywheel and weighs 2000 N. The maximum belt tension is 3000 N and the tension ratio is 3:1. Determine the maximum bending moment and the necessary shaft diameter if the allowable shear stress of the material is 40 MPa. (16)

(OR)

- b) Design a cast iron protective type flange coupling to transmit 15 kW at 900 r.p.m. from an electric motor to a compressor. The service factor may be assumed as 1.35. The following permissible stresses may be used : (16)
- | | |
|---|----------|
| Shear stress for shaft, bolt and key material | = 40 MPa |
| Crushing stress for bolt and key | = 80 MPa |
| Shear stress for cast iron | = 8 MPa |

13. a) A plate 75 mm wide and 12.5 mm thick is joined with another plate by a single transverse weld and a double parallel fillet weld as shown in Fig.1. The maximum tensile and shear stresses are 70 MPa and 56 MPa respectively. Find the length of each parallel fillet weld, if the joint is subjected to both static and fatigue loading. (16)

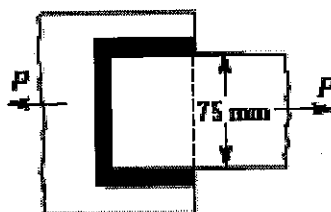


Fig.1

(OR)

- b) A steam engine of effective diameter 300 mm is subjected to a steam pressure of 1.5 N/mm^2 . The cylinder head is connected by 8 bolts having yield point 330 MPa and endurance limit at 240 MPa. The bolts are tightened with an initial preload of 1.5 times the steam load. A soft copper gasket is used to make the joint leak-proof. Assuming a factor of safety 2, find the size of bolt required. The stiffness factor for copper gasket may be taken as 0.5. (16)

14. a) It is desired to design a valve spring of I.C. engine for the following details : (16)

- i. Spring load when valve is closed = 80 N
- ii. Spring load when valve is open = 100 N
- iii. Space constraints for the fitment of spring are :
 - a. Inside guide bush diameter = 24 mm,
 - b. Outside recess diameter = 36 mm
- iv. Valve lift = 5 mm
- v. Spring steel has the following properties:
 - a. Maximum permissible shear stress = 350 MPa
 - b. Modulus of rigidity = 84 kN/mm^2

Find: (i) Wire diameter; (ii) Spring index; (iii) Total number of coils; (iv) Solid length of spring; (v) Free length of spring; (vi) Pitch of the coil when additional 15 percent of the working deflection is used to avoid complete closing of coils.

(OR)

- b) A cranked lever, has the following dimensions: (16)

Length of the handle = 300 mm

Length of the lever arm = 400 mm

Overhang of the journal = 100 mm

If the lever is operated by a single person exerting a maximum force of 400 N at a distance of $1/3^{\text{rd}}$ length of the handle from its free end, Find: (i) Diameter of the handle, (ii) Cross-section of the lever arm, and (iii) Diameter of the journal. The permissible bending stress for the lever material may be taken as 50 MPa and shear stress for shaft material as 40 MPa.

Q. No

M

15. a) A tentative design of a journal bearing results in a diameter of 75 mm and a length of 125 mm for supporting a load of 20 kN. The shaft runs at 1000 r.p.m. The bearing surface temperature is not to exceed 75°C in a room temperature of 35°C. The oil used has an absolute viscosity of 0.01 kg/m-s at the operating temperature. Design a suitable bearing and determine the amount of artificial cooling required in watts. Assume $d/c = 1000$. (16)

(OR)

- b) Design a CI flywheel for four stroke engine developing 150 kW at 200 rpm. Calculate the mean diameter of the flywheel if the hoop stress is not to exceed 4 MPa. Total fluctuation speed is to be 4% of the mean speed. Work done during the power stroke may be assumed to be 1.5 times the average work done during the cycle. Density of CI is 7200 kg/m³. (16)

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Part Time]

Electrical and Electronics Engineering

16PTEEE11 - ENERGY MANAGEMENT SYSTEM AND SCADA

(Regulations 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What is meant by energy audit process?	2	K1	1
2. Mention the important concepts in an economic analysis.	2	K2	1
3. What are the equipment's used in energy management system?	2	K2	2
4. What are the requirements for an energy metering locations?	2	K2	2
5. Write any two concepts of lighting systems.	2	K2	3
6. How the cogeneration system is feasible for energy management?	2	K2	3
7. List the components of SCADA system.	2	K2	4
8. Name any two communication network which is used in SCADA system.	2	K2	4
9. List the applications of SCADA in distribution sector.	2	K1	5
10. Mention any two features of IEC 61850 ring configuration.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Describe the process of energy management program in detail with a neat block diagram.	8	K2	1
ii) Why energy audit process is important in industries? Write an outcome of audit process with report.	8	K2	1
(OR)			
b) i) Draw a utility rate structure of economic models of home building with suitable cost of electricity and loss evaluation.	8	K2	1
ii) How the HVAC system is used to manage the energy? Explain the same in detail.	8	K2	1
12. a) i) What is the role of a transformer and electric motors in energy management system and explain the same.	8	K2	2

Q. No		M	BTL	CO
	ii) Write a short note on utility meter in energy management system.	8	K2	2
	(OR)			
b) i)	Describe the working of instrument transformer burdens which is used in energy metering with neat diagram.	8	K2	2
	ii) Write a short note on multitasking solid state meter in energy management system.	8	K2	2
13. a) i)	What are the advantages and disadvantages of lighting controls?	8	K1	3
	ii) Describe the working of ballasts with the help of the circuit diagram giving the function of various parts.	8	K2	3
	(OR)			
b) i)	Describe the effect of harmonics on power quality issues, explain in detail.	8	K2	3
	ii) Write the energy standards of cogeneration and state its feasibility condition?	8	K2	3
14. a) i)	Explain the architecture of SCADA system in detail.	8	K2	4
	ii) Why interfacing unit is needed in SCADA system and describe Human Machine Interface (HMI) unit with neat block diagram.	8	K2	4
	(OR)			
b) i)	State and explain the functional requirements of SCADA system in detail.	8	K2	4
	ii) Write any two functions of Intelligent Electronic Device module, communication network, SCADA server and control panels.	8	K2	4
15. a) i)	Explain the transmission control through SCADA systems. Describe each component in detail.	8	K2	5
	ii) Explain how SCADA system is implemented in substation and write it's any three configurations.	8	K2	5
	(OR)			
b) i)	Why the gateway interoperability list is implemented in SCADA interconnected power system describe the operation in detail.	8	K2	5
	ii) Write a short note on testing and commissioning of SCADA in power system.	8	K2	5

Register Number :

Government College of Engineering :: Salem
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B.E. Degree Examinations – April/May 2025

Semester: VII [Part Time]

Mechanical Engineering

16PTMEE20 – COMPUTER INTEGRATED MANUFACTURING

(Regulations 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

(10 x 2 = 20 Marks)

Part A

Answer **ALL** Questions

1. Compare the term 'Manufacturing' and 'Production'.
2. Write in short about 'Manufacturing lead time'.
3. Define cellular manufacturing.
4. List the benefits of Group Technology (GT).
5. Classify three phases of shop floor control management.
6. Distinguish between product layout and process layout.
7. Recall about the features of activity cycle diagram.
8. Draw a CIM wheel, which consists of basic CIM components.
9. Define open system interconnections in CIM.
10. Outline the functions of relational database.

Part B

(5 x 16 = 80 Marks)

Answer **ALL** Questions

11. a) Explain various levels of automation applied in production plant with suitable examples. (16)
- (OR)
- b) Summarize the process of production planning and its impact on plant operations by considering financial management. (16)
12. a) Discuss various stages involved in the development and manufacturing of a new product by incorporating generative type computer aided process planning system. (16)
- (OR)
- b) Develop the steps and procedure of OPITZ classification and coding system with form code and supplementary code for your own example part drawing. (16)

13. a) Elaborate about the automated factory data collection systems used (16)
in modern automobile manufacturing sectors.

(OR)

- b) Illustrate different types of FMS layout configurations with their real (16)
time industrial application.

14. a) Explain the framework of CIM Open System Architecture (CIMOSA) (16)
with suitable drawings.

(OR)

- b) Summarize about the fundamentals of Local Area Network (LAN) (16)
along with the procedure of LAN installation in automated industries.

15. a) Outline the features of manufacturing automation protocol and (16)
technical office protocols.

(OR)

- b) Discuss about the development and architecture of database (16)
management system used in advanced CIM industries.

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: III [Full Time]

Civil Engineering

22CE303 – CONSTRUCTION MATERIALS AND TECHNOLOGY

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What are the characteristics of good building stones?	2	K1	1
2. Define refractory's brick and list out their properties.	2	K1	1
3. List out Bogue compound present in cement.	2	K1	2
4. What is flakiness and elongated index?	2	K1	2
5. State the functions of coarse aggregate in a concrete.	2	K2	3
6. Inter the various forms of timber available in market.	2	K2	3
7. List out the advantage and disadvantage of rubber flooring.	2	K1	4
8. What are the requirement of good stair?	2	K1	4
9. List out the fixtures and fastenings used in door.	2	K1	5
10. Define pointing.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain the cause of deterioration and preservation methods of stones.	16	K2	1
(OR)			
b) Illustrate various test conducted on bricks.	16	K2	1
12. a) Explain in detail about manufacturing of cement by wet process.	16	K2	2
(OR)			
b) Explain the shape test and mechanical properties for aggregate with neat sketch.	16	K2	2

Q. No		M	BTL	CO
13. a)	Compare varnish and distemper in detail.	16	K2	3
	(OR)			
b)	Explain the various defect in timber with neat sketch.	16	K2	3
14. a)	Illustrate the cause and effect of dampness.	16	K2	4
	(OR)			
b)	Explain the method of constructing cement concrete flooring. What is the use of granolithic finish and how is it made?	16	K2	4
15. a)	Classify, with the help of sketches, various types of windows based on their method of operation or opening.	16	K3	5
	(OR)			
b)	Identify the on various defects in plastering.	16	K3	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: III [Full Time]

Computer Science and Engineering

22CS303 – DATA STRUCTURES AND ALGORITHMS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define ADT. Give any two examples.	2	K1	1
2. Compare array with linked list.	2	K2	1
3. Evaluate the advantages of using a circular queue over a standard queue.	2	K4	1
4. Describe how the following expression is evaluated with the help of the help of Stack: $2 * (5 + 3) / 4$.	2	K4	1
5. If the depth of the binary tree is k, the maximum number of nodes in the binary tree is $2^k - 1$. Justify.	2	K4	2
6. List out the properties of B Trees.	2	K1	2
7. Show the procedure for Depth First Search.	2	K1	3
8. Show that the number of edges in a complete graph of n vertices is $n(n-1)/2$.	2	K1	2
9. Compare the Time complexity of various sorting algorithm.	2	K2	3
10. Distinguish between linear and binary search technique.	2	K2	3

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Create an algorithm for performing Polynomial addition in Linked List.	16	K3	1
(OR)			
b) Design algorithm for creating, inserting and deleting a singly linked list.	16	K3	1
12. a) i) Analyze and write an algorithm to implement queue functions using arrays.	8	K4	1
ii) Illustrate the enqueue and dequeue operations on double ended queues.	8	K4	1

(OR)

Q. No		M	BTL	CO
b) i)	Explain the process of evaluating arithmetic expressions using stacks. Analyze how stacks are used to evaluate infix expressions by converting them to postfix notation. Apply this to demonstrate the evaluation of a complex infix expression, such as $(3 + 5) * (2 - 8) / 4$.	8	K4	2
ii)	Analyze and write an algorithm to implement stack functions using arrays.	8	K4	2
13. a) i)	Discuss the different traversal technique in a binary tree with suitable algorithms.	8	K3	2
ii)	Design an algorithm for performing insertion and deletion in a binary search tree. Construct the binary search tree using following elements: 35, 15, 40, 7, 10, 100, 28, 82, 53, 25, 3. Show diagrammatically each step of construction of BST.	8	K3	2
(OR)				
b) i)	Design an algorithm for performing insertion and deletion in an AVL tree. Construct an AVL tree by inserting the values from 1 to 10.	8	K3	2
ii)	Show diagrammatic representation of constructing a max heap tree by inserting the following elements 32 15 20 30 12 25 16 and 4.	8	K3	2
14. a)	Explain Prim's algorithm for finding the minimum spanning tree of a graph. Trace the algorithm for the following Fig.1.	16	K4	2

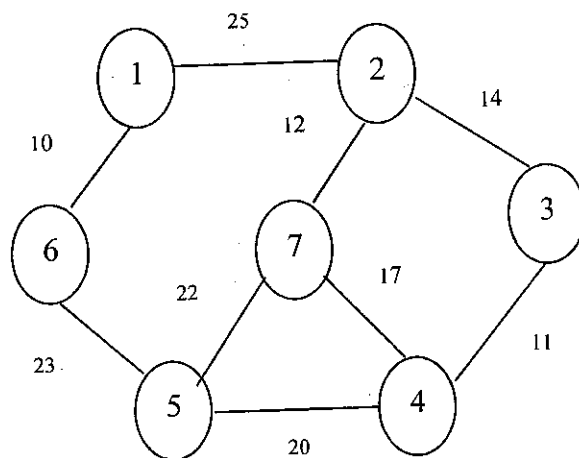


Fig. 1

(OR)

Q. No

M BTL CO

- b) Explain Dijkstra's algorithm for finding shortest path. Trace the algorithm for Fig.2 by considering A as starting vertex.

16 K4 2

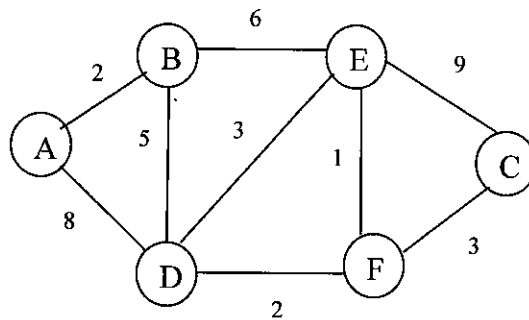


Fig.2.

15. a) Explain hashing in detail and discuss various techniques for collision resolutions.

16 K2 3

(OR)

- b) Explain the algorithm to sort a set of 'N' numbers using quick sort. Demonstrate the algorithm for the following set of numbers: 15, 5, 24, 8, 1, 3, 16, 10 and 20.

16 K2 3

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: III [Full Time]

Electronics and Communication Engineering

22EC303 – NETWORK THEORY AND SYNTHESIS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. State Superposition theorem.	2	K1	1
2. What is the condition for maximum power transfer to the load?	2	K2	1
3. What is meant by transient response?	2	K1	2
4. State convolution theorem.	2	K1	2
5. Write in brief about Dot convention in mutually coupled circuits.	2	K2	3
6. Define mutual inductance.	2	K1	3
7. Express Y parameters in terms of h parameters.	2	K3	4
8. State the differences between Symmetrical and Asymmetrical networks.	2	K2	4
9. Check whether the polynomial $p(s) = s^4 + 3s^3 + 5s^2 + 5s + 2$ is a Hurwitz polynomial.	2	K3	5
10. Write the conditions for a function to be a positive real function.	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Compare Node analysis and Mesh analysis.	6	K2	1
ii) Find Norton's equivalent for the following circuit shown in Fig.1	10	K3	1

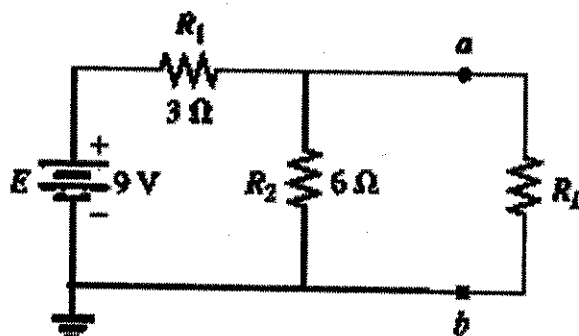


Fig.1

(OR)

Q. No

M BTL CO

- b) i) Explain the concept of source transformation?
ii) Find the equivalent resistance between the terminals A and B shown in Fig.2.

6 K2 1

10 K3 1

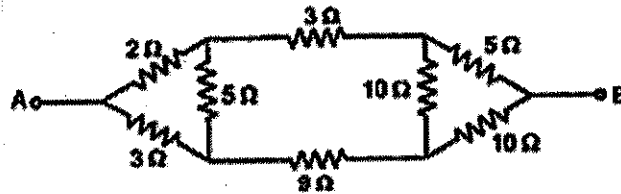


Fig.2

12. a) i) Write the Properties of RC Driving Point Impedance Function
ii) In an RC circuit, having a time constant of 2.5 ms, the capacitor discharges with initial voltage of 80 V. (a) Find the time at which the capacitor voltage reaches 55 V, 30 V and 10 V (b) Calculate the capacitor voltage at time 1.2 ms, 3 ms and 8 ms

6 K2 2

10 K3 2

(OR)

- b) i) Write the Properties of LC Immittance Function.
ii) For the initially relaxed circuit shown in Fig.3, the switch is closed on to position S1 at time $t = 0$ and changed to position S2 at time $t = 0.5$ ms. Obtain the equation for inductor current and voltage across the inductor in both the intervals. Given $E_1 = 100$ V; $E_2 = 50$ V $R = 100 \Omega$ $L = 0.2$ H.

6 K2 2

10 K3 2

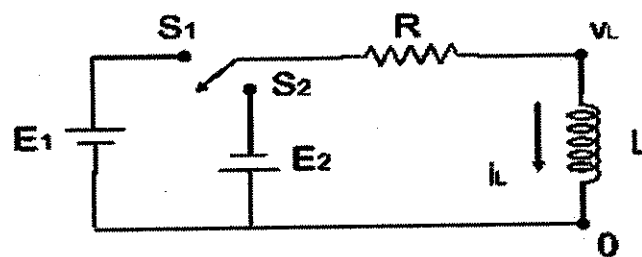


Fig.3

13. a) i) Compare series resonance and parallel resonance.

6 K2 3

Q. No

M BTL CO

- ii) In a parallel Resonant circuit shown in Fig.4 find the Resonant frequency, Dynamic Impedance, Bandwidth, Q-factor and Current at resonance?

10 K3 .3

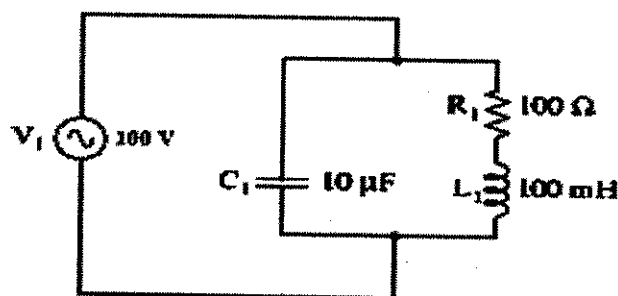


Fig.4

(OR)

- b) i) Write the features of ideal transformer.
- ii) Two coils one of $R_1=0.51\Omega$, $L_1=32\text{mH}$ and other coil of $R_2=1.3\Omega$, $L_2=15\text{mH}$ are in series and are connected in series with a capacitor of $C_1=25\mu\text{F}$, $C_2=62\mu\text{F}$ and a resistor of $R_3=0.24\Omega$. Determine (1) Resonant frequency (2) Quality factor of the circuit (3) Bandwidth (4) Power dissipated in the circuit at resonant frequency if the supply is 230 V AC Supply.

6 K2 3

10 K3 3

14. a) i) Find the Z- parameters for the following circuit shown in Fig.5

8 K3 4

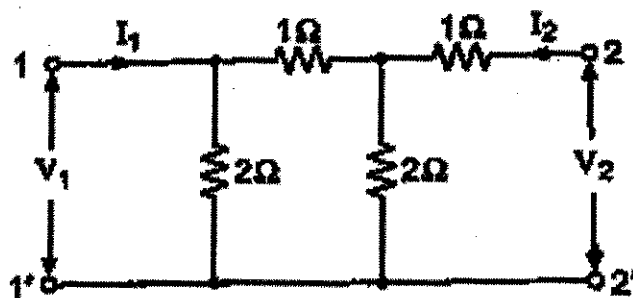


Fig.5

- ii) Derive Z parameters in terms of h parameters.

8 K2 4

(OR)

- b) i) Find the ABCD parameters for the following circuit shown in Fig.6

8 K3 4

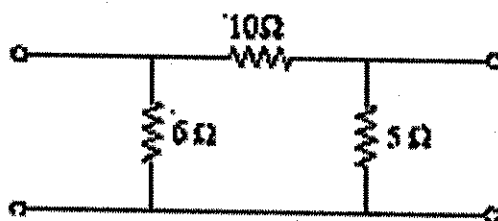


Fig.6

Q. No	M	BTL	CO
ii) Explain in detail about the Transmission parameters.	8	K2	4
15. a) The driving point impedance of a one-port reactive network is given by $Z(s) = \frac{5(s^2+4)(s^2+25)}{s(s^2+16)}$ Obtain the 1st& 2nd Foster networks.	16	K4	5
(OR)			
b) Find two Caue realization of driving point function given by $Z(s) = \frac{(s+1)(s+3)}{(s+2)(s+4)}$.	16	K4	5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: III [Full Time] / I [Part Time]

Electrical and Electronics Engineering

22EE303/22PTEE102/23PTEE102 – DC MACHINES AND TRANSFORMERS

(Regulations 2022/2023)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Distinguish between statically and dynamically induced EMF.	2	K2	1
2. Write the relationship between reluctance and magneto motive force.	2	K1	1
3. State the significance of critical field resistance of a DC shunt generator.	2	K2	2
4. Why commutator is employed in dc generator?	2	K2	2
5. Why DC series motor should be started with loaded condition?	2	K2	2
6. What is the function of no voltage release coil provided in a dc motor starter?	2	K1	3
7. Specify the applications of autotransformer.	2	K1	2
8. Give the conditions to be satisfied for parallel operation of transformer.	2	K1	3
9. Why swinburne's test cannot be conducted on DC series motor?	2	K2	4
10. Full load copper loss in a transformer is 1600 watts. What will be the loss at half load?	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) A ring of magnetic material has rectangular cross section. The inner diameter of the ring is 20 cm and the outer diameter is 25 cm, its thickness being 2 cm. An air gap of 1 mm length is cut across the ring. The ring is wound with 500 turns carrying a current of 2 A. The permeability of the magnetic material is 6000. Find the following : i) Flux density in the air gap. ii) Inductance of the coil. iii) Energy stored in the magnetic material and in the air gap. Neglect fringing and leakage.	16	K4	1

(OR)		M	BTL	CO
Q. No				
b)	Derive an expression for energy, co-energy and force of a doubly excited system.	16	K4	1
12. a)	With neat diagram explain the construction and operating principle of DC generator and also obtain the EMF equation of DC generator.	16	K2	2
(OR)				
b)	Describe the effects of armature reaction on the operation of DC machines and explain the parallel operation of DC generators in detail.	16	K2	2
13. a)	i) Explain the performance characteristics of DC shunt and series motor with necessary graphs.	10	K2	3
	ii) Explain the operation of 3 point starter with circuit diagram.	6	K1	2
(OR)				
b)	i) Explain the various methods of speed control for DC shunt motor.	10	K2	3
	ii) List the applications of different types of DC motors.	6	K1	2
14. a)	Explain the construction and principle of operation of single phase transformer with neat diagram and derive its emf equation.	16	K2	2
(OR)				
b)	Explain the operation of single phase transformer with no load condition and loaded condition with phasor diagram and also draw the equivalent circuit of a single phase transformer.	16	K2	3
15. a)	Describe the procedure with neat diagram for determining a DC generator's efficiency using Swinburne's test.	16	K2	4
(OR)				
b)	With neat circuit diagram explain how the open circuit test and short circuit test performed on a single phase transformer. Also explain how efficiency of transformer is calculated from the test.	16	K2	5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: III [Full Time]

Mechanical Engineering

22ME303 - MANUFACTURING PROCESSES

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Classify the different types of patterns.	2	K2	1
2. Differentiate sand blasting and shot blasting.	2	K2	1
3. List the advantages of AC equipment over DC equipment in arc Welding.	2	K1	2
4. Point out the different types of Oxyacetylene flame by sketches.	2	K1	2
5. Define angle of bite in rolling.	2	K1	3
6. Differentiate hot and cold forging.	2	K4	3
7. Define polymerization.	2	K1	4
8. Point out some examples of reinforced plastics.	2	K1	4
9. List out test methods for testing formability of material.	2	K1	5
10. Analyze the reason for providing proper clearance between the punch and die in a shearing operation.	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) What are the allowances given while making pattern? Explain.	8	K2	1
ii) Enumerate the steps in sequence for producing shell moulding.	8	K2	1
(OR)			
b) i) Explain the principle of operation, advantages, disadvantages and applications of CO ₂ moulding.	8	K2	1
ii) Recommend a suitable casting process for making small toys with suitable example.	8	K2	1

Q. No		M	BTL	CO
12. a)	i) Discuss the components and working principle of submerged arc welding process.	8	K2	2
	ii) Differentiate the operations between MIG and TIG Welding.	8	K2	2
	(OR)			
b) i)	Classify and enumerate the various welding defects with causes of occurrences and describe a method of detecting cracks on a weld surface.	8	K2	2
	ii) Evaluate the equipment and operation of laser beam welding process over the electron beam welding process.	8	K2	2
13. a) i)	Explain the different types of roll stand arrangements used in the rolling mill and state clearly for what purpose each arrangement is used.	8	K2	3
	ii) Derive the mathematical expression for the flat strip rolling process to calculate the rolling load.	8	K3	3
	(OR)			
b) i)	Summarize the types of defects in rolled parts.	8	K2	3
	ii) Develop the technological steps for manufacturing a crane hook with best mechanical properties. Sketch the various stages and name the operations.	8	K3	3
14. a)	Explain transfer moulding. Discuss its advantages and limitations.	16	K2	4
	(OR)			
b)	Choose suitable Manufacturing processes for producing plastic bottles and plastic foot balls.	16	K2	4
15. a) i)	Discuss the types of presses used for bending process.	8	K3	5
	ii) Analyse the limitations and advantages of powder metallurgy.	8	K3	5
	(OR)			
b) i)	Explain the load estimation of sheet metal processes.	8	K3	5
	ii) Recommend the steps involved in manufacturing metal kitchen sinks with neat sketches.	8	K3	5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Mechanical Engineering

18ECOE06 – BASICS OF INTERNET OF THINGS

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. List few applications of Internet of Things.	2	K1	1
2. Define IoT level-1 system.	2	K1	1
3. Mention the key elements of NFV architecture.	2	K2	1
4. Distinguish between Machines in M2M and Things in IoT.	2	K3	1
5. What is Wi-Fi module in IoT?	2	K1	2
6. What kind of power sources does IoT use?	2	K2	2
7. List the main characteristics of Python.	2	K1	3
8. How is Raspberry Pi different from a desktop computer?	2	K1	3
9. Tell about the smart parking.	2	K2	4
10. List the salient features of smart irrigation in agriculture.	2	K1	4

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Explain in detail about the IoT communication models.	8	K2	1
ii) Discuss the key role of wireless sensor networks in IoT.	8	K2	1
(OR)			
b) Write short notes on			
i) Cloud computing	8	K2	1
ii) Big data analytics.	8	K2	1
12. a) State the limitations of conventional network architecture.	16	K3	1
Discuss the Software Defined Networking (SDN) architecture, its layers and its applications for IoT.			

(OR)

Q. No		M	BTL	CO
	b) Describe in brief about the steps involved in the IoT system design methodology by taking IoT-based smart city as an example.	16	K3	1
13. a)	i) With examples, explain any four different types of sensors.	8	K2	2
	ii) Describe actuator and its use in IoT. Explain types of actuators in detail.	8	K3	2
	(OR)			
b)	i) Describe the architecture of an RFID system and explain. How it works.	8	K2	2
	ii) Discuss in detail about the role of Zigbee in IoT networks.	8	K3	2
14. a)	i) Explain the concept of Python modules with examples. What are its advantages?	8	K3	3
	ii) Summarize the common security threats to IoT devices & endpoints.	8	K2	3
	(OR)			
b)	i) Illustrate the programming of Raspberry Pi with Python using suitable examples.	8	K3	3
	ii) Summarize various raspberry Pi interfaces.	8	K2	3
15. a)	Design a home automation IoT system with automatic lighting and home intrusion detection.	16	K3	4
	(OR)			
b)	Discuss in detail about the real time applications of IoT in Weather monitoring system and Forest fire detection system.	16	K3	4

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B.E. Degree Examinations – April/May 2025

Semester: III [Full Time]
Metallurgical Engineering

22MT303 – METALLURGICAL THERMODYNAMICS AND KINETICS
(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define the terms: Path and State properties.	2	K1	1
2. Define Hess's law.	2	K1	1
3. State the second law of thermodynamics.	2	K1	2
4. What are the applications of Gibbs Helmholtz equation?	2	K3	2
5. What is meant by phase equilibria?	2	K2	3
6. State the Gibbs phase rule.	2	K2	3
7. What are partial and integral molar quantities?	2	K2	4
8. Define Henry's law.	2	K1	4
9. What is rate of the reaction?	2	K2	5
10. List the factors affecting transformation kinetics.	2	K3	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Calculate the standard heat of formation of solid WO ₃ from solid W and O ₂ at 298K and at 1 atm. pressure from the following data at 298K and 1atm. pressure. + (O ₂) = < WO ₂ > ; $\Delta H^\circ_{298} = - 560.66$ kJ 3< WO ₂ > +(O ₂)= ; $\Delta H^\circ_{298} = - 550.20$ kJ < W ₃ O ₈ > + ½ (O ₂) =3; $\Delta H^\circ_{298} = -278.24$ kJ.	16	K2	1
(OR)			
b) Derive an equation to measure the entropy of a substance at a given temperature (T).	16	K2	1
12. a) Derive the formula for any two Maxwell's relations.	16	K2	2
(OR)			
b) Explain the criterion of spontaneity based on free energy and entropy of the system with suitable examples.	16	K2	2

Q. No		M	BTL	CO
13. a)	i) Draw and explain the free energy vs temperature diagram for all the allotropes of carbon.	8	K2	3
	ii) Discuss the importance of fugacity, activity and equilibrium constant values in a chemical reactions.	8	K2	3
	(OR)			
b) i)	Draw and explain the free energy vs composition diagrams for the phases at eutectoid reaction temperatures.	8	K2	3
	ii) Describe the behavior of the substances based on thermodynamics of surfaces, interfaces and defects.	8	K2	3
14. a)	Derive the Gibbs – Duhem equation and its applications.	16	K2	4
	(OR)			
b)	Prove that in a dilute solution, a solvent follows Raoult's law while the solute follows Henry's law.	16	K2	4
15. a)	Explain any one method for determining the order of a reaction with an example.	16	K3	5
	(OR)			
b)	A second order reaction has an initial concentration of 0.5moles/liter of the reactants. The reaction is 40% complete in 100 minutes. Calculate the rate constant and the time it takes for the reaction to be 90% complete.	16	K3	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: I [Part Time]

Civil Engineering

23PTCE103 – CONCRETE TECHNOLOGY

(Regulations 2023)

(IS 10262 – 2019 may be Permitted)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. What are Bogue's compounds?	2	K1	1
2. Define particle size distribution of aggregates.	2	K1	1
3. State the importance of controlling workability.	2	K1	3
4. Draw stress strain curve for concrete.	2	K2	3
5. Specify the importance of grading in concrete making.	2	K1	2
6. Differentiate between Nominal mix and Design mix.	2	K2	2
7. What are the applications of light weight concrete?	2	K1	4
8. Define shotcrete.	2	K1	4
9. Define the terms: Standard Deviation and Coefficient of variation.	2	K1	5
10. What is mean by frequency of sampling?	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) Explain in detail any three laboratory tests conducted on cement as per IS code.	16	K1	1
(OR)			
b) Summarize the test procedure for crushing value and impact value of coarse aggregates.	16	K1	1
12. a) List out the test to be conducted on fresh concrete and explain any three.	16	K2	3
(OR)			
b) Describe the properties of hardened concrete and explain any two tests to be conducted on it.	16	K2	3

Q. No		M	BTL	CO
13. a)	Design a mix to achieve the compressive strength as 35 MPa at 28days curing period with following material properties Specific gravity of cement - 3.15 Specific gravity of Ms and 2.64 Specific gravity of coarse aggregate - 2.70 Moisture content in M Sand - 3.2% Moisture content in coarse aggregate - 1.8%.	16	K3	2
	(OR)			
b)	Design a mix to achieve the compressive strength as 45 MPa at 28 days curing period with following material properties. Specific gravity of cement 3.14 Specific gravity of fine aggregate - 2.68 Specific gravity of coarse aggregate - 2.74 Moisture content in fine aggregate - 2.84% Moisture content in coarse aggregate - 1.75% Water absorption of fine aggregate - 3.42% Water absorption of coarse aggregate -2.04%	16	K3	2
14. a)	Explain the methods of corrosion protection in RCC.	16	K1	4
	(OR)			
b)	Write the properties, uses and applications of fibre reinforced concrete.	16	K1	4
15. a)	Describe the statistical analysis of test results.	16	K1	5
	(OR)			
b)	Explain the acceptance and rejection criteria in quality control.	16	K1	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: I [Part Time]

Mechanical Engineering

23PTME103 – MANUFACTURING TECHNOLOGY - I

(Regulations 2023)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. How chip formation occurs in metal cutting?	2	K1	1
2. What are the important characteristics of materials used for cutting tools?	2	K1	1
3. Name the special attachments used in the lathe.	2	K1	2
4. What is Swiss type automate?	2	K1	2
5. Compare reaming and drilling processes.	2	K2	3
6. What do you mean by tapping? And how it can be done?	2	K1	3
7. Define honing process.	2	K1	4
8. List the applications of band saw and circular saw.	2	K1	4
9. Name the limitations of NC machine tools.	2	K1	5
10. What is APT Language?	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Explain the types of machine tools theory of metal cutting.	10	K2	1
ii) Write the factors affecting the tool life and write the Taylor's tool life equation and explain briefly.	6	K2	1
(OR)			
b) i) Explain the basic actions of cutting fluids and its properties.	10	K2	1
ii) What are the differences between orthogonal cutting and oblique cutting?	6	K2	1

Q. No		M	BTL	CO
12. a)	i) Explain various operations performed on the centre lathe.	10	K2	2
	ii) Illustrate the turret indexing mechanism with a neat sketch.	6	K2	2
	(OR)			
b) i)	Explain the semi-automatic lathe with a neat sketch.	10	K2	2
	ii) Compare Capstan and Turret lathe.	6	K2	2
13. a) i)	Explain various types of milling cutters.	8	K2	3
	ii) Explain the shaper machine with a neat sketch.	8	K2	3
	(OR)			
b) i)	How planner machine works? Explain in brief give its advantages and disadvantages.	8	K2	3
	ii) Explain in brief the types of milling machines with neat sketches.	8	K2	3
14. a)	Explain the specification and selection of grinding wheels.	16	K2	4
	(OR)			
b)	Explain the construction of various types broaching machine with neat sketches.	16	K2	4
15. a) i)	Explain the part programming fundamentals of CNC machines.	10	K2	5
	ii) Compare NC machines with CNC machines.	6	K2	5
	(OR)			
b) i)	Explain in brief the construction details of CNC machines.	10	K2	5
	ii) Explicate the computer assisted part programming.	6	K2	5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: V [Part Time]

Mechanical Engineering

22PTME502 – SOLAR AND WIND ENERGY SYSTEM

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Write short notes on Fresnel lens collector.	2	K1	1
2. Compare concentrating and non-concentrating solar collectors.	2	K2	1
3. Mention the range of low medium and high temperature power generation systems with examples.	2	K1	2
4. What is meant by solar distillation?	2	K1	2
5. Note down the significance of P-N junction photodiode.	2	K2	3
6. Define cell efficiency.	2	K1	3
7. Compare horizontal axis and vertical axis wind turbines.	2	K2	4
8. Write down the main components of wind power plants.	2	K1	4
9. Define pitch regulation.	2	K1	5
10. Mention the significance of risk assessment in a wind power plant.	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain the liquid flat plate collectors with suitable sketches.	16	K3	1
(OR)			
b) Elaborate with necessary diagram about the compound parabolic concentrator.	16	K3	1
12. a) What is meant by power generation using paraboloid dish collectors? Explain with sketch.	16	K2	2
(OR)			
b) Explain with suitable sketches about any two type of solar water heating systems.	16	K2	2

Q. No		M	BTL	CO
13. a)	What is the significance of solar photovoltaic cells? Explain with appropriate diagram.	16	K2	3
	(OR)			
b)	Explain the various P-N junction photodiodes with sketches.	16	K2	3
14. a)	Explain with suitable sketch about horizontal axis wind turbine.	16	K2	4
	(OR)			
b)	What are the factors to be considered while selecting the site for a wind power plant? Explain in detail.	16	K2	4
15. a)	Explain with suitable statistical data about the economics of wind power plant.	16	K4	5
	(OR)			
b)	Explain in detail about aerodynamic power regulation of wind power plants.	16	K4	5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: IV [Part Time]

Electrical and Electronics Engineering

16PTEE404 – SOLID STATE DRIVES

(Regulations 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What are the types of load torques?	2	K1	1
2. What is meant by regenerative braking?	2	K2	1
3. What are the drawbacks of converter fed dc motor drives?	2	K2	2
4. Why self commutated power devices preferred over thyristors in dc-dc converters?	2	K4	2
5. What are the advantages of inductor motor over DC motor?	2	K4	3
6. Draw the speed-torque characteristics of Induction motor.	2	K1	3
7. When a synchronous motor is said to be self controlled?	2	K4	4
8. State the advantages of permanent magnet synchronous motors.	2	K1	4
9. How are electric motors classified by efficiency according to IEC standards?	2	K1	5
10. Illustrate the block diagram of a battery-powered vehicle system and describe its key functional components.	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain the speed torque conventions in the four quadrant operation of motor driving a hoist load.	16	K2	1
(OR)			
b) Describe the elements of an electric drive. Obtain the expression governing the motor load dynamics.	16	K2	1
12. a) Explain in detail the operation and steady state analysis of single phase fully controlled converter fed DC drives with neat waveforms in continuous and discontinuous conduction modes.	16	K2	2

(OR)

Q. No		M	BTL	CO
b)	Explain the operation of four quadrant chopper fed DC separately excited motor drive with necessary diagrams.	16	K2	2
13. a)	Explain the principle of V/F control for induction motor drives with neat diagrams.	16	K2	3
	(OR)			
b)	Explain the direct torque control strategy in induction motor drives systems with diagrams.	16	K2	3
14. a)	Explain the self control of synchronous motor drive operated with constant margin angle control.	16	K4	4
	(OR)			
b)	Explain the closed loop speed control of permanent magnet synchronous motor drive system.	16	K4	4
15. a)	What are the factors governing the selection of electric drives for any particular application? And explain how drives can be used for power factor improvement in a system.	16	K4	5
	(OR)			
b)	Explain the operation of Solar powered pump drive system with neat sketch.	16	K2	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: III & IV [Full Time]

(Common to **Civil/Metallurgical** Engineering)

18CY301 – BIOLOGY FOR ENGINEERS

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Inspect the amphoteric nature of amino acids.	2	K2	1
2. Recall the term isoelectric point.	2	K1	1
3. Discover the reason for calling amylase as endoenzymes.	2	K3	2
4. Compare hydrolases and ligases.	2	K2	2
5. Justify that Haemoglobin is a carrier protein.	2	K2	3
6. Show how peptones are produced.	2	K2	3
7. Define exergonic reaction and endergonic reaction.	2	K1	4
8. Construct the structure of ATP.	2	K1	4
9. Develop a corresponding RNA sequence for the given single strand DNA. ATCGATTGAGCTCTAGCG	2	K3	5
10. State the functions of nucleosides.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Categorize the amino acids based on their structure.	8	K4	1
ii) Cellulose is tougher than starch. Defend the statement with their respective structures.	8	K3	1
(OR)			
b) i) Dissect the amino acids based on polarity and nutritional requirements.	8	K4	1
ii) Support the presence of zwitter ion of amino acids with suitable facts.	8	K3	1
12. a) i) Discuss the complete structure of enzymes.	8	K2	2
ii) Examine the various types of specificity of enzyme action.	8	K4	2
(OR)			

Q. No		M	BTL	CO
	b) i) Explain the classification of enzymes based on new system of classification.	8	K2	2
	ii) Analyze the important factors affecting rate of enzyme reaction.	8	K4	2
13. a)	i) Classify the proteins based in composition.	8	K4	3
	ii) Summarize the steps involved in protein synthesis.	8	K3	3
	(OR)			
b) i)	Organize the various types of bonds and forces found in proteins.	8	K4	3
	ii) Narrate the colour reactions shown by proteins.	8	K3	3
14. a)	i) Outline the criteria for spontaneity of a process.	8	K2	4
	ii) Interpret the terms Gibbs free energy and standard Gibbs free energy. Derive the relationship between standard Gibbs free energy and equilibrium constant.	8	K1	4
	(OR)			
b) i)	Rephrase the various internal factors affecting photosynthesis.	8	K2	4
	ii) Distinguish endothermic and exothermic reactions.	8	K1	4
15. a)	i) Contrast Deoxyribonucleic acid and Ribonucleic acid.	8	K3	5
	ii) Build the table of codons for genetic code characteristics.	8	K4	5
	(OR)			
b) i)	Construct the function of mRNA & tRNA.	8	K3	5
	ii) Show the steps involved in the synthesis of DNA.	8	K4	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time]

Civil Engineering

22CE405 - APPLIED HYDRAULICS AND FLUID MACHINERY

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Compare Pipe flow and Open Channel flow.	2	K2	1
2. Define Specific Energy.	2	K1	1
3. Distinguish between Uniform flow and Non-uniform flow.	2	K2	2
4. What are the conditions for formation of hydraulic jump?	2	K1	2
5. Define Impulse.	2	K1	3
6. List the force exerted by a Jet of water on stationary vertical Plate.	2	K1	3
7. Write the names of Impulse Turbines.	2	K1	4
8. Define Specific Speed of Turbine.	2	K1	4
9. What is the necessity of priming in Centrifugal Pumps?	2	K1	5
10. List the advantages of Air Vessels in Reciprocating Pump?	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) List and Explain the types of flow in Open Channel.	8	K1	1
ii) In a rectangular channel of width 0.50 m, a hydraulic jump occurs at a section where the depth of flow is 0.15m and Froude's Number is 2.5. Determine (i) the Specific Energy (ii) the Critical and Subsequent depths (iii) the Loss of head (iv) the Energy dissipated	8	K4	1

(OR)

Q. No	M	BTL	CO
b) i) Derive the condition for open channel flow in the case of a Rectangular channel section of a given area for most economical condition.	8	K1	1
ii) A trapezoidal channel has side slopes of 3 horizontal to 4 vertical. The bed slope of the channel is 1 in 2000. The discharge in the channel is $0.5 \text{ m}^3/\text{s}$. Assume Chezy's constant $C = 80$. Determine the dimensions of the most economical section.	8	K4	1
12. a) i) Develop the Dynamic equation for Gradually Varied Flow.	8	K2	2
ii) In a rectangular channel of bed width 24 m and depth of flow 6 m, the rate of flow of water is $86 \text{ m}^3/\text{s}$. The bed slope of the channel is 1 in 4000. Determine the slope of the free water surface. Assume Chezy's Constant $C = 60$.	8	K4	2
(OR)			
b) i) How do you classify Flow profiles? Explain briefly with sketches.	8	K2	2
ii) In the flow through a sluice in a large reservoir, the velocity downstream in the rectangular channel is 5.33 m/s while the flow depth is 0.0563 m . Determine the downstream conditions if a hydraulic jump takes place downstream. Determine the depth after formation of jump, height of jump, loss of energy, percentage of energy dissipated in the jump.	8	K4	2
13. a) i) Recall Impulse Momentum principle in detail.	8	K1	3
ii) A jet 30 mm diameter with velocity of 10 m/s strikes a vertical plate in the normal direction. Determine the force on the plate if (i) The plate is stationary (ii) If it moves with a velocity of 4 m/s towards the jet and (iii) If the plate moves away from the plate at a velocity of 4 m/s .	8	K4	3
(OR)			
b) i) What are the applications of Impulse Momentum equation? Explain.	8	K1	3

Q. No	M	BTL	CO
ii) A jet of water 30 mm in diameter strikes a hinged square plate at its centre with velocity of 20 m/s. The plate is deflected through an angle of 20° . Determine the weight of the plate. If the plate is not allowed to swing, determine the force required to be applied at the lower edge of the plate to keep it in vertical position.	8	K4	3
14. a) i) How do you classify Turbines? Explain.	8	K1	4
ii) A Pelton Wheel is to be designed for the following specifications: Shaft Power - 9560 kW Head - 350 m Speed - 750 r.p.m. Overall Efficiency - 85% Jet Diameter - not to exceed $\frac{1}{6}$ th the Wheel diameter Determine the following: (i) The Wheel Diameter (ii) Diameter of the jet (iii) The number of jets required Assume co-efficient of velocity of jet $C_v = 0.985$ and speed ratio as 0.45.	8	K4	4
(OR)			
b) i) Recall the working of Pelton Wheel with neat sketch.	8	K1	4
ii) A Kaplan Turbine is to be designed to develop 9 MW. The net available head is 5.6m. The speed ratio is 2.09. The speed ratio is 2.09 and flow ratio is 0.68. The overall efficiency is 86% and the diameter of the boss is $\frac{1}{3}$ the diameter of the runner. Determine the diameter of the runner, speed and specific speed of the turbine.	8	K4	4
15. a) i) What are the components of Centrifugal Pump? Also explain briefly the working principle with a diagram.	8	K2	5

Q. No		M	BTL	CO
ii)	The discharge of a centrifugal pump is 0.118 cumecs and its speed is 1450 r.p.m under a head of 25 m. The impeller diameter is 250 mm, its width at outlet is 50 mm and manometric efficiency is 75%. Determine the vane angle at the outer periphery of the impeller.	8	K4	5
	(OR)			
b) i)	Explain the working principle of Double Acting Reciprocating Pump with a diagram.	8	K2	5
ii)	A single acting reciprocating pump of 180 mm bore and 240 mm stroke operates at 40 r.p.m. The slip is 8%. What is the value of the suction and delivery heads are 6 m and 20 m respectively. Determine (i) the discharge (ii) the coefficient of discharge (iii) the theoretical power required.	8	K4	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time]

Computer Science and Engineering

22CS404 – MICROPROCESSORS AND MICROCONTROLLERS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. List the byte manipulation available in 8086.	2	K1	1
2. What are linking and relocation?	2	K1	1
3. What is an interrupt?	2	K1	1
4. What is a coprocessor?	2	K1	1
5. What are A/D and D/A interfaces?	2	K1	3
6. What is an Alarm Controller?	2	K1	3
7. List the special function registers of 8051.	2	K1	4
8. 8051 has no parallel I/O port. Comment on this statement.	2	K2	4
9. What is interrupt programming?	2	K1	3
10. Differentiate microprocessor from microcontroller.	2	K2	4

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain 8086 architecture with a neat sketch. (OR)	16	K1	1
b) Explain the addressing modes of 8086 with examples.	16	K1	1
12. a) Explain the 8086 system bus timing signals with neat sketch. (OR)	16	K2	1
b) Explain the system bus structure of loosely and tightly coupled multiprocessors.	16	K2	1
13. a) Develop the memory interfacing circuit for connecting a 32GB RAM to 8086 through a DMA controller. (OR)	16	K3	2
b) Develop the I/O interfacing circuit for traffic light control.	16	K3	3

Q. No		M	BTL	CO
14. a)	Explain the architecture of 8051 with the pin diagram.	16	K2	4
	(OR)			
b)	Explain the instruction set of 8051 with examples.	16	K2	4
15. a)	Design a circuit to display the counting sequence from 1 to 60 on a LCD display with 1s delay controlled by 8051 timer.	16	K3	4
	(OR)			
b)	Design a circuit to the interface 8051 microcontroller with a waveform generator to generate a sinusoidal waveform of frequency 100 Hz.	16	K3	4

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time] / III [Part Time]

Electronics and Communication Engineering

22EC404/23PTEC302 – CONTROL SYSTEMS

(Regulations 2022/2023)

(Linear graph, Semilog graph and Polar graph needs to given)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. List any two beneficial effects of negative feedback in control systems.	2	K1	1
2. Construct the signal flow graph for the given system equation. $V_1 = 2V_1 + 3V_2$ $V_2 = 4V_1 + 5V_3 + 2V_2$ $V_3 = 5V_2 + V_0$ $V_0 = 6V_3$	2	K3	1
3. List the standard test signals used in time domain analysis.	2	K1	2
4. What is PID controller? Write the transfer function for the same.	2	K1	2
5. Define the condition for a system to have minimum phase transfer function.	2	K1	3
6. The damping ratio and natural frequency of oscillation of a second order system is 0.5 and 6 rad/sec respectively. Find the resonant peak and resonant frequency.	2	K3	3
7. Define Nyquist stability criterion.	2	K1	4
8. In Routh array, what conclusions can be made when there is a row of all zeros?	2	K2	4
9. When the system is said to be completely controllable?	2	K2	5
10. The system defined by the following differential equation	2	K3	5

$$\frac{d^3c(t)}{dt^3} + 5\frac{d^2c(t)}{dt^2} + 8\frac{dc(t)}{dt} + 12c(t) = 5r(t)$$

Where $c(t)$ is the output and $r(t)$ is the input. Construct the state space matrix.

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

M BTL CO

11. a) i) Apply the block diagram reduction technique to find the overall transfer function $\frac{C(s)}{R(s)}$ for the system with two inputs R_1 & R_2 shown in Fig.1.

10 K3 1

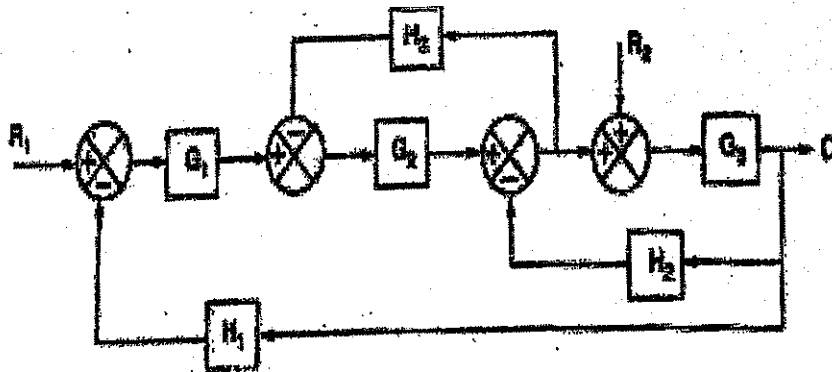


Fig.1

- ii) List the differences between open-loop and closed-loop systems. Also, explain any one application in closed loop.

6 K1 1

(OR)

- b) i) Apply Signal flow graph method to find the closed-loop transfer function for the given block diagram shown in Fig.2.

10 K3 1

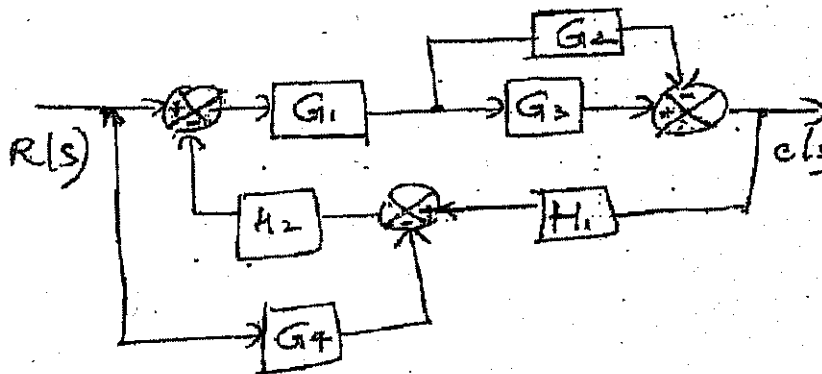


Fig.2

- ii) Find the transfer function of the electrical network shown in Fig.3.

6 K1 1

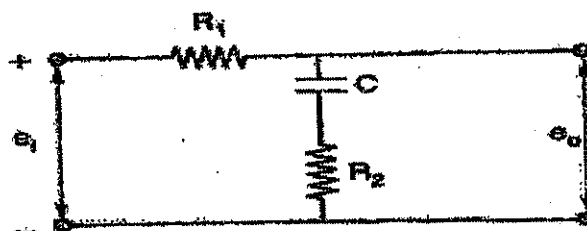


Fig.3

Q. No

M BTL CO

12. a) i) Define all time domain specification parameters of a second order under damping system and derive the output equation for unit step input.

10 K1 2

ii) A second order control system is subjected to unit step input. Find the closed loop transfer function, peak time and settling time. Assume that the values of $\delta = 0.4$ and $\omega_n = 5 \text{ rad/sec}$.

6 K3 2

(OR)

b) i) Find the output response $c(t)$ for the unit ramp input for the system shown in Fig.4.

10 K1 2

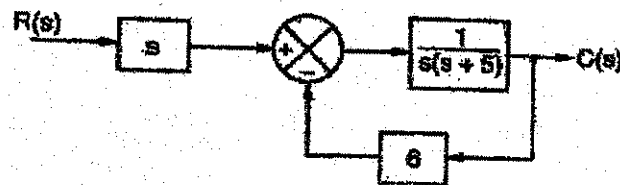


Fig.4

ii) For a unity feedback control system, the open loop transfer function $G(s) = \frac{10(s+2)}{s^2(s+1)}$. Find the static error constants.

6 K3 2

13. a) Make use of bode plot determine the gain cross over frequency, phase crossover frequency, Gain margin & phase margin of a unity feedback system with the open loop transfer function $G(s) = 10/s (1+0.4s)(1+0.1s)$

16 K3 3

(OR)

b) Make use of polar plot, determine the phase margin and gain margin of a unity feedback system with the given open loop transfer function $G(s) = \frac{1}{s(0.5s+1)^2}$.

16 K3 3

14. a) i) The characteristic equation of the system is $S^3 + 5S^2 + (9 - K)S + K = 0$. Find the maximum value of K for stability of closed loop system.

10 K3 4

ii) The characteristic equation of a system is given by $S^4 + 4S^3 + 6S^2 + 4S + 5 = 0$. Identify the location of poles and also find its stability.

6 K3 4

(OR)

Q. No	M	BTL	CO
b) Sketch the root locus and also find the stability for the value of K for the unity feedback system whose open loop transfer function is given by $G(S) = \frac{K(S+9)}{S(S^2+4S+11)}$.	16	K3	4
15. a) i) Construct the phase variable state model for a system described by the differential equation $\frac{d^3y(t)}{dt^3} + 5\frac{d^2y(t)}{dt^2} + \frac{dy(t)}{dt} + 2y(t) = u(t)$	10	K3	5
ii) Use kalman's test to find the controllability for the given system $\begin{pmatrix} \dot{X}_1 \\ \dot{X}_2 \end{pmatrix} = \begin{bmatrix} 2 & 3 \\ 6 & -1 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \end{bmatrix} + \begin{bmatrix} 1 \\ -2 \end{bmatrix} u$	6	K3	5
(OR)			
b) i) Construct the state transition matrix for the given system $\dot{x} = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix} x + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u(t)$	10	K3	5
ii) Find the state space equation from the given system transfer function $T(S) = \frac{Y(S)}{U(S)} = \frac{1}{S^3+6S^2+10S+5}$	6	K3	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time] / III [Part Time]

Electrical and Electronics Engineering

22EE405/23PTEE302 – POWER ELECTRONICS

(Regulations 2022/2023)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What is meant by commutation of an SCR?	2	K1	1
2. What is the purpose of using snubber circuit?	2	K1	1
3. Give the application of freewheeling diode in a full converter.	2	K1	2
4. Why is the power factor of semi converter better than that of full converter?	2	K2	2
5. Define duty cycle in dc chopper.	2	K1	2
6. What are the disadvantages of frequency modulated chopper?	2	K1	3
7. What are the applications of CSI?	2	K1	3
8. Differentiate CSI over VSI.	2	K2	3
9. Mention merits and demerits of AC voltage controller.	2	K1	3
10. Why is half wave AC voltage controller not used?	2	K2	4

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Draw and explain the switching characteristics of a thyristor.	16	K2	1
(OR)			
b) Explain the static and switching characteristics of MOSFET.	16	K2	1
12. a) Explain the working of single-phase fully controlled converter for 'RLE' load using relevant waveforms. Derive the expression for average and RMS value of output voltage.	16	K2	2
(OR)			
b) Explain the operation of 3 phase fully controlled bridge rectifier with necessary waveforms?	16	K2	2
13. a) With neat sketch and output voltage waveforms explain the working of a boost converter. Derive the expression for output voltage.	16	K4	3

(OR)

Q. No		M	BTL	CO
b)	A step-down dc chopper has a resistive load of $R = 10 \Omega$ and input voltage $V_s = 200 \text{ V}$. When the chopper remains ON, its voltage drop is 2 V for a duty cycle of 0.6 . Calculate i) Average and RMS value of output voltage. ii) Power delivered to load.	16	K4	3
14. a)	With the neat sketch and output waveforms, discuss the operation of three phase inverter operating in 180° mode. (OR)	16	K2	4
b)	Explain the principle of working of three phase VSI in 120° conduction mode with a star connected load.	16	K2	4
15. a)	Draw the circuit diagram of single-phase AC voltage controller with RL load. Explain the circuit operation with necessary waveforms. (OR)	16	K2	5
b) i)	Explain the operation of Matrix converter?	8	K2	5
ii)	Write a short note on Multi - stage sequence control of AC voltage controller.	8	K2	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: V [Full Time]

Electrical and Electronics Engineering

18ECOE05 – BASICS OF EMBEDDED SYSTEMS

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Recall Fundamental components of an embedded.	2	K1	1
2. List the various challenges in embedded computing system design.	2	K2	1
3. What are the different types of memory inside embedded systems?	2	K1	2
4. Outline the function of interrupt.	2	K2	2
5. Define I2C bus.	2	K1	3
6. Differentiate between serial and parallel communication.	2	K2	3
7. Illustrate the significance of Task management in RTOS.	2	K2	4
8. Define mutex in RTOS.	2	K1	4
9. What is Host and Target machine?	2	K1	4
10. Interpret Debug kernels.	2	K2	4

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Discuss briefly about overview of embedded system architecture with a suitable diagram.	16	K2	1
(OR)			
b) Explain in detail about the design life cycle in embedded systems.	16	K2	1
12. a) With a neat diagram, explain the working of Direct Memory Access (DMA) and classify the memory management methods.	16	K2	2
(OR)			
b) Explain the following:	16	K2	2
i) Interrupt types			
ii) Interrupt Vector address and			
iii) Interrupt Service Routine (ISR). Analyze the role of ISR in an embedded application development.			

Q. No		M	BTL	CO
13. a)	With a neat diagram, describe the typical bus transactions on the I2C Protocol.	16	K3	3
	(OR)			
b)	Describe the working of RS232, RS422 and RS485 protocols with suitable diagrams.	16	K3	3
14. a)	Classify the scheduling algorithm and explain the cooperative scheduling and round-robin scheduling with a suitable diagram.	16	K3	4
	(OR)			
b)	List out various problems associated with semaphores. Discuss with suitable examples.	16	K3	4
15. a)	Classify and brief the various validation types and methods in the Host and Target system also list the importance of the testing and validation in the embedded system.	16	K3	4
	(OR)			
b)	Do a case study on GPS Navigation system with neat diagrams.	16	K3	4

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time] / III [Part Time]

Mechanical Engineering

22CE409/18ME404/23PTME301 – STRENGTH OF MATERIALS

(Regulations 2022/2018/2018A/2023)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define Hooke's Law.	2	K1	1
2. Write the relationship between bulk modulus and modulus of elasticity.	2	K1	1
3. What are the types of beams?	2	K1	2
4. Show the Shear Force and bending moment diagram for a Cantilever beam loaded with point load at the free end.	2	K2	2
5. What do you mean by conjugate beam?	2	K1	3
6. Define slenderness ratio.	2	K1	3
7. What are the possible failures of a thin cylinder due to internal fluid pressure?	2	K2	4
8. What is hoop stress? Find the expression for hoop stress.	2	K1	4
9. A hollow steel shaft transmits 200 kW of power at 150 rpm. Find the torque transmitted through the shaft.	2	K1	5
10. What is Wahl's correction factor? Why this should be considered in designing of springs?	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) A steel rod of cross-sectional area 1600 mm ² and two brass rods each of cross-sectional area of 1000 mm ² together support a load of 50 kN as shown in Fig 1. Find the stresses in the rods, Take E for steel = 2×10^5 N/mm ² and E for brass = 1×10^5 N/mm ² .	16	K3	1

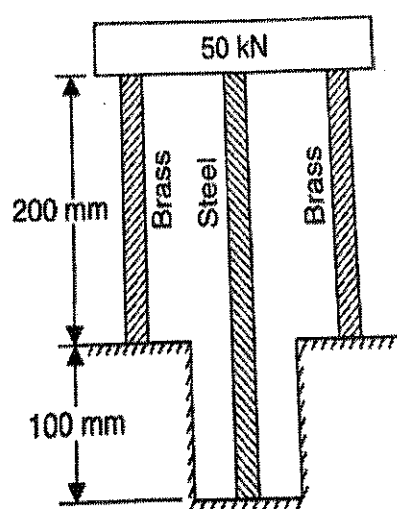


Fig. 1

(OR)

Q. No

M BTL CO

- b) At a point within a body subjected to two mutually perpendicular directions, the stresses are 100 N/mm^2 (tensile) and 75 N/mm^2 (tensile). Each of the above stresses is accompanied by a shear stress of 75 N/mm^2 . Determine the normal, shear and resultant stresses on an oblique plane inclined at an angle of 45° with the axis of minor tensile stress.

16 K3 1

12. a) A simply supported beam of length 8 m rests on supports 6 m apart, the right hand end is overhanging by 2 m. The beam carries a uniformly distributed load of 1500 N/m over the entire length. Draw S.F. and B.M. diagrams and find the point of contraflexure, if any.

16 K4 2

(OR)

- b) A timber beam 100 mm wide and 200 mm deep is to be reinforced by bolting on two steel flitches each 150 mm by 12.5 mm in section. Calculate the moment of resistance in the composite section when the i) flitches attached symmetrically at the top and bottom; ii) flitches attached symmetrically at the sides. Allowable stress in timber is 6 N/mm^2 . What is the maximum stress in the steel in each case? Take $E_s = 2 \times 10^5 \text{ N/mm}^2$ and $E_t = 1 \times 10^4 \text{ N/mm}^2$.

16 K4 2

Q. No

M BTL CO

13. a) A cantilever of length 3 m carries two point loads of 2 kN at the free end and 4 kN at a distance of 1 m from the free end as shown in Fig. 2. Find the deflection at the free end. Take $E = 2 \times 10^5 \text{ N/mm}^2$ and $I = 10^8 \text{ mm}^4$.

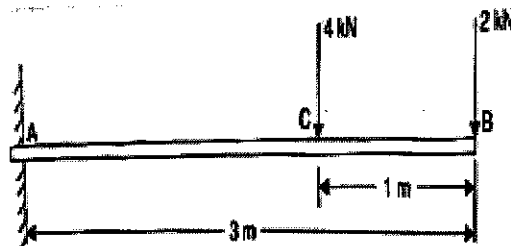


Fig. 2

(OR)

- b) A hollow cylindrical cast iron column is 4 m long with both ends fixed. Determine the minimum diameter of the column if it has to carry a safe load of 250 kN with a factor of safety as 5. Take the internal diameter as 0.8 times the external diameter. Take $\sigma_c = 550 \text{ N/mm}^2$ and $\alpha = 1/1600$ in Rankine's formula.

16 K4 3

14. a) A thin cylindrical shell of 150 cm diameter, 1.2 cm thick and 5.3 m long subjected to an internal fluid pressure of 3 N/mm^2 . Calculate: (i) the change in diameter (ii) change in length and (iii) change in volume of the cylinder. Take the value of $E = 2 \times 10^5 \text{ N/mm}^2$ and Poisson's ratio, $\mu = 0.3$.

16 K4 4

(OR)

- b) A steel tube 240 mm external diameter is to be shrunk on another steel tube of 80 mm internal diameter. After shrinking, the diameter at the junction is 160 mm. Before shrinking on, the difference of diameters at the junction was 0.08 mm. Calculate the radial pressure at the junction and hoop stresses developed in the two tubes after shrinking on. Take $E = 2 \times 10^5 \text{ N/mm}^2$.

16 K4 4

Q. No

M BTL CO

15. a) A solid circular shaft is to transmit 375 kW at 150 rpm.

16 K4 5

i) Find the diameter of the shaft if the shear stress is not to exceed 60 N/mm^2 .

ii) What percentage saving in weight would be obtained if this shaft is to be replaced by a hollow shaft whose internal diameter equal to $1/3$ of its external diameter, the length, the material and maximum shear stress being the same?

(OR)

b) A close coiled helical spring has its free length as 120 mm. It absorbs 40 Nm of energy when fully compressed and the coils are in contact. The mean coil diameter is 75 mm. Determine the diameter of the steel wire required and the number of coils if the maximum shear stress is to be 120 MPa. $G = 80 \text{ GPa}$.

16 K4 5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time]
Metallurgical Engineering

22MT403 – HEAT TREATMENT TECHNOLOGY

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. List the process variables in a heat treatment.	2	K1	1
2. What is the effect of alloying elements on “C” Curve?	2	K2	1
3. Compare the annealing and normalizing processes.	2	K3	2
4. What is Ausforming?	2	K1	2
5. Why the post carburizing treatment is done after carburizing process?	2	K3	3
6. Compare Cyaniding and Carbonitriding processes.	2	K3	3
7. Mention the advantages of salt bath furnaces.	2	K1	4
8. List the gas atmosphere used in carburizing and nitriding processes.	2	K1	4
9. What is austempering of SG Iron?	2	K1	5
10. List the possible heat treatment processes in Copper base alloys.	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Draw an Iron-Carbon phase diagram and give its three invariant reactions. Also calculate the percentage of i) ferrite and pearlite in 0.33 %C ii) pearlite and cementite in 1.45 %C iii) ferrite and cementite in 0.8 % C steels at room temperature.	16	K4	1
(OR)			
b) Explain the TTT diagrams of 0.4 %C, 0.8%C and 1.2 %C steels. Also explain the effect of ferrite and austenite stabilizers on steels with examples.	16	K4	1

Q. No		M	BTL	CO
12. a)	Explain the various types of annealing processes with neat sketches.	16	K1	2
	(OR)			
b)	Explain the Grossman's Critical diameter and Jominy end quench test methods of hardenability determination.	16	K1	2
13. a)	Analyze the principle, methods and operating variables of Induction and Flame hardening processes with neat sketches.	16	K4	3
	(OR)			
b)	Analyze the types of carburizing processes, nitriding process, cyaniding process and carbonitriding process with neat sketches.	16	K4	3
14. a)	Illustrate the various types of quenching media with their advantages, disadvantages and its characteristics.	16	K2	4
	(OR)			
b)	Illustrate the Box type, Muffle type, Pit type, Salt bath type and Sealed quench type furnaces with applications.	16	K2	4
15. a)	Describe the causes and remedies of various possible defects in heat treated parts.	16	K4	5
	(OR)			
b)	Describe the heat treatment procedure of 18/4/1 steel, Grey cast iron and Al-4.5 % Cu alloy.	16	K4	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Part Time]

Civil Engineering

22PTCE603 – DESIGN AND DRAWING (Concrete and Steel)

(Regulations 2022)

(Use of IS 456 2000, Charts and tables from SP 16, Steel Tables & IS 800-2007 are permitted)

Time : 3 Hours

Maximum Marks : 100

PART A (1 x 60 = 60 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
1. a)	Design a combined footing for two columns, one of 400 mm x 400 mm size (with 4#25dia bars) and another of 500 mm x 500 mm size (with 4#28dia bars) supporting axial loads 900 kN and 1600 kN respectively. The exterior face of first column is flush with property line. The centre to centre distance between the columns is 4.5 m. The allowable soil pressure at the base of the footing, 1.5 m below ground level, is 240 kN/m ² . Assume steel of grade Fe415 in columns as well as footing and concrete of M30 grade in columns and M20 in footing. Draw to a suitable scale: i) Plan view ii) Sectional elevation and cross section showing the main and secondary reinforcement details.	60	K4	1
(OR)				
b)	A RCC cantilever type retaining wall is required to support the earth to a height of 5 m above the ground level. The top surface of the backfill is horizontal. The safe bearing capacity of the soil is 180 kN/m ² . Unit weight of soil is 17 kN/m ³ . The angle of repose of soil is 30 degrees. The coefficient of friction between concrete and soil is 0.55. Use M25 grade concrete and Fe415 grade steel. Draw to a suitable scale: i) Plan view ii) Sectional elevation and cross section showing the main and secondary reinforcement details.	60	K4	1

PART B (1 x 40 = 40 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
2. a)	Design a simply supported welded plate girder of span 25 m to carry an superimposed load of 40 kN/m. Assume the plate girder is continuously supported throughout its length. Avoid to use the intermediate transverse stiffeners. Use Fe 410 grade steel. Draw the cross-section, sectional elevation showing the connection details (Not to scale).	40	K4	1
	(OR)			
b)	Design a simply supported gantry girder to carry an electric overhead travelling crane for the following data : Span of gantry girder = 6.5 m Span of crane girder = 16 m Crane capacity = 250 KN Self-weight of crane girder excluding trolley=200 KN Self-weight of trolley = 50 KN Minimum hook approach = 1 m Distance between wheels = 3.5 m Self-weight of rails = 0.3 kN/m Use Fe410 Grade Steel. Assume the girder is laterally supported. Draw cross section and longitudinal sectional (Not to scale).	40	K4	1

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: III [Part Time]

Electrical and Electronics Engineering

22PTEE304 – POWER ELECTRONICS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

M BTL CO

1. A 220 V dc supply voltage is applied to an SCR which is connected in series with RL as shown in Fig.1. The latching current of the SCR is 25 mA. When a gate pulse of 30 μ s is applied. Whether the SCR will be turned or not?

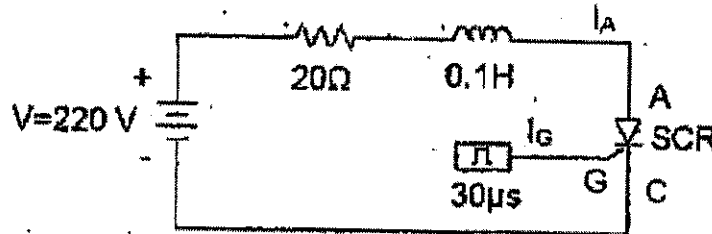


Fig.1

2. Define holding current.	2	K1	1
3. State the effect of source inductance on the output voltage of a converter.	2	K2	2
4. List the functions of freewheeling diode in controlled rectifier.	2	K1	2
5. A step up chopper operating from 200 V source delivers on output voltage of 400 V. Calculate T_{on} of the chopper given its $T_{off} = 80\ \mu\text{s}$.	2	K3	3
6. Differentiate between a Buck-Boost and SEPIC converter.	2	K2	3
7. In PWM based current source inverter (PWM-CSI), why the voltage spikes are produced in the voltage waveform when it is observed across the windings of motor load.	2	K2	4
8. List the drawbacks of single phase half bridge voltage source inverter.	2	K2	4
9. Draw the output voltage waveform for a single phase bidirectional AC voltage controller feeding RL load when $\alpha > \Phi$.	2	K2	5
10. Write the advantages of matrix converter.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
11. a)	Draw the two transistor model of SCR and derive the expression for anode current.	16	K2	1
	(OR)			
b)	What is IGBT? With neat diagrams explain the operation of it. Explain its input, output and transfer characteristics. Also discuss its dynamic characteristics.	16	K2	1
12. a)	Describe the working of single phase fully controlled converter with RL load and also derive the expression for average output voltage while operating in continuous conduction mode.	16	K3	2
	(OR)			
b)	A three phase, six pulse, AC-DC converter is fed from a three phase 400 V, 50 Hz AC supply and it is connected with a constant current load of 90A at a firing angle of 45° . Determine i) output voltage ii) rms output voltage and iii) average thyristor current.	16	K3	2
13. a)	A buck-boost converter has input voltage of 24 V and it operates at 30 kHz. When the duty cycle is 0.4, $L = 500 \mu\text{H}$, $C = 147 \mu\text{F}$ and average load current is 1 A? Determine the average output voltage, peak-peak ripple current through the inductor and peak-peak ripple voltage across the capacitor.	16	K4	3
	(OR)			
b)	A boost regulator has input voltage of 7 V and it operates at 30 kHz. When the output voltage is 15 V, $L = 150 \mu\text{H}$, $C = 220 \mu\text{F}$ and average load current is 0.8 A. Determine the i) duty cycle ii) peak-peak ripple current through the inductor. iii) peak-peak ripple voltage across the capacitor.	16	K4	3
14. a)	Discuss the principle of operation of a three phase bridge inverter with sinusoidal modulation and an appropriate circuit diagram.	16	K2	4
	(OR)			
b)	Enumerate the need for voltage and frequency control of inverters. How the pulse width modulation techniques (PWM) will control both voltage and frequency? Explain any one type of PWM technique.	16	K2	4
15. a)	i) Explain the operation of multistage sequence control of AC voltage controllers with neat diagram.	12	K3	5

Q. No

M BTL CO

- ii) A single phase half wave ac voltage controller using feeds 1.5 kW, 230 V, 50 Hz heater. Find the load power if the firing angle is 45° .

(OR)

- b) i) Explain the operation of a three phase AC voltage controller with two thyristors arranged in antiparallel is connected to a delta connected load. Illustrate the answers with waveforms of source voltage, gate signals, line and phase currents.

- ii) A single phase AC voltage controller with antiparallel thyristor feeds a resistive load of 7.5Ω . The supply voltage of the controller is 230 V at 50 Hz. The thyristors are fired at an angle of $\alpha = 60^\circ$. Determine the rms value of output voltage.

4 K3 5

12 K3 5

4 K3 5

Registration Number :

Government College of Engineering, Salem
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M.E./Ph.D Degree Examinations - April/May 2025

Semester: II [Full Time]

Computer Aided Design/Mechanical Engineering

22CDE41 - EXPERIMENTAL TECHNIQUES AND DATA ANALYSIS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What is the function of a strain gauge in cutting force measurement?	2	K1	1
2. What is a strain gauge rosette?	2	K1	1
3. Define a pyrometer.	2	K2	2
4. List two flow visualization techniques.	2	K1	2
5. What is electron spectroscopy used for?	2	K3	3
6. State one advantage of scanning electron microscopy over optical microscopy.	2	K3	3
7. Define a factorial experiment.	2	K2	4
8. What is uncertainty analysis?	2	K1	4
9. What is the purpose of a linear graph in experiment design?	2	K2	5
10. Mention one objective of response optimization.	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain the construction and working of a typical electrical dynamometer used for torque and power measurement.	16	K2	1
(OR)			
b) Explain the principle of photoelasticity. How is it used to measure stress and strain?	16	K2	1
12. a) Explain the characteristics of thermistors and compare them with resistance temperature detectors.	16	K4	2

(OR)

Q. No		M	BTL	CO
	b) Describe the working of an ultrasonic flow meter. How is it different for transit-time?	16	K4	2
13. a)	Explain how microstructure evaluation contributes to understand material behavior during testing.	16	K3	3
	(OR)			
	b) Discuss the applications of coordinate measuring machine in quality control and reverse engineering	16	K3	3
14. a)	Explain the concept of factorial design. How does it help in identifying interaction effects?	16	K3	4
	(OR)			
	b) How does response surface methodology help in identifying the optimal operating conditions of a system?	16	K3	4
15. a)	Discuss the types of orthogonal arrays and their applications in Taguchi methods.	16	K4	5
	(OR)			
	b) Discuss the loss function is used in identifying and minimizing variations in a product or process.	16	K4	5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

M.E. Degree Examinations – April/May 2025

Semester: II [Full Time]

Communication Systems

22COE52 – ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Name two common sources of Electromagnetic Interference (EMI).	2	K1	1
2. What are the units for radiated emissions and conducted emissions?	2	K1	1
3. Describe the effect of cross talk with reference to EMI/EMC design issues.	2	K2	2
4. Analyze the drawbacks of various coupling mechanisms.	2	K2	2
5. Define grounding and bonding.	2	K1	3
6. Draw the diagram of isolation transformer.	2	K1	3
7. List some procedures for effective grounding in PCB design.	2	K2	4
8. Give at least two procedures for component mounting.	2	K1	4
9. What are MIL-STD-461, and MIL-STD-462, how do they relate to each other?	2	K2	4
10. Mention the two very important needs for TEM cell.	2	K2	4

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Explain the concept of Electromagnetic Interference (EMI) and its significance in electronic systems.	8	K1	1
ii) Discuss the various sources of Electromagnetic Interference (EMI) and how they impact electronic devices.	8	K2	1
(OR)			
b) i) Explain the concept of ESD with waveform and equivalent circuit.	8	K1	1
ii) Distinguish between the features of conducted EMI and radiated EMI.	8	K2	1

Q. No		M	BTL	CO
12. a)	Explain the various EMI coupling modes with Common Mode and Differential Mode current measurement with neat diagrams.	16	K3	2
	(OR)			
b)	How do cable coupling, near and far coupling of EM fields produced can be reduced? How to enhance immunity of circuits/equipment systems.	16	K3	2
13. a)	Explain the concept of electromagnetic shielding and its importance in modern electronic systems. Discuss the different types of shielding materials used and their respective applications.	16	K3	3
	(OR)			
b)	Explain various grounding techniques used in electronic circuits. How does cable routing control EMI? How is signal control achieved?	16	K3	3
14. a)	i) Discuss about the various factors to be considered for EMC design of PCB.	10	K2	4
	ii) Discuss how component selection and mounting control EMI?	6	K2	4
	(OR)			
b) i)	Summarize the grounding techniques adopted in PCB for mixed signal systems and large systems.	10	K2	4
	ii) Explain in detail about VIAs connection and termination.	6	K2	4
15. a)	i) How are measurements made in the following: i) Tx/Rx Antennas ii) EMI Rx.	8	K3	4
	ii) Give detailed notes on anechoic chamber used for EMI measurements.	8	K2	4
	(OR)			
b) i)	With a neat diagram, explain the working of spectrum analyzer.	8	K3	4
	ii) Explain various testing antennas and their frequencies as specified in CISPR standard.	8	K2	4

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: V [Full Time]

Mechanical Engineering

12ME502 – REFRIGERATION AND AIR CONDITIONING

(Regulations 2012)

(Use of standard psychometric chart is permitted)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

1. What do you understand by Refrigeration?
2. List any four applications air refrigeration system.
3. Name some secondary refrigerants.
4. How to designate for in-organic referents?
5. List out the various psychrometry processes.
6. How dehumidification of air achieved?
7. Write the factors affecting human comfort.
8. What is year round air conditioning?
9. Mention the benefits of Air Washers.
10. What is the purpose of ventilation in air-conditioning system?

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q.No

M

11. a) i) Elaborate fundamental processes of simple vapour compression cycle with suitable diagrams. (8)
- ii) Discuss the merits and demerits of air refrigeration system. (8)

(OR)

- b) A refrigeration machine is required to produce i.e., at 0°C from water at 20°C . The machine has a condenser temperature of 298 K while the evaporator temperature is 268 K. The relative efficiency of the machine is 50% and 6 kg of Freon-12 refrigerant is circulated through the system per minute. The refrigerant enters the compressor with a dryness fraction of 0.6. Specific heat of water is 4.187 kJ/kg K and the latent heat of ice is 335 kJ/kg . Calculate the amount of ice produced on 24 hours. The table of properties of Freon-12 is given below : (16)

Temperature K	Liquid heat kJ/kg	Latent heat kJ/kg	Entropy of liquid kJ/kgK
298	59.7	138	0.2232
268	31.4	154	0.1251

12. a) i) Explain working principle of evaporative condenser with neat sketch? (8)
 ii) Describe the working principle and basic components cooling towers. (8)
 (OR)
 b) i) Explain the various desirable properties of ideal refrigerants. (8)
 ii) What is an azeotrope? Give some examples to indicate its importance. (8)
13. a) i) What is sensible heat gain and latent heat gain and list the sources of sensible and latent heat gain in a restaurant? (8)
 ii) Explain with neat sketch the various losses in the duct? (8)
 (OR)
 b) Calculate the following when the DBT is 35°C , WBT is 23°C and the barometer reads 750mm Hg: (16)
 (i) Relative humidity ii) Humidity ratio iii) DPT iv) Density
 (v) Enthalpy of atmospheric air.
14. a) i) Draw a labeled sketch and explain working of window air conditioning system? (8)
 ii) Analyse the challenges might arise in determining the total load for commercial applications. (8)

(OR)

- b) Design an air-conditioning system for an industrial process for the following hot and wet summer conditions: (16)

Outdoor conditions 32°C DBT and 65% R.H.

Required air inlet conditions 25°C DBT and 60% R.H.

Amount of free air circulated 250 m³/min.

Coil dew temperature 13°C.

The required condition is achieved by first cooling and dehumidifying and then by heating.

Calculate the following :

- i. The cooling capacity of the cooling coil and its by-pass factor.
- ii. Heating capacity of the heating coil in kW and surface temperature of the heating coil if the by-pass factor is 0.3.
- iii. The mass of water vapour removed per hour.

Solve this problem with the use of psychrometric chart.

15. a) i) Discuss about various types of condensers and their applications. (8)
- ii) How do cooling towers impact the overall efficiency and performance of an HVAC system? (8)

(OR)

- b) i) Analyze the key considerations air distribution system to ensure efficient and effective duct design. (8)
- ii) Discuss the potential consequences of inadequate thermal insulation in air conditioning systems. (8)

Register Number :

Government College of Engineering :: Salem
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B.E. Degree Examinations – April/May 2025

Semester: VII [Part Time]

Civil Engineering

16PTCEE36 – PREFABRICATED STRUCTURES

(Regulation 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

(10 x 2 = 20 Marks)

Part A

Answer ALL Questions

1. Define Modular Coordination.
2. What are the various techniques involved in Production of Prefabricated Structures?
3. Define Long Wall System.
4. Mention the types of prefabricated structural elements.
5. What are the disadvantages of disuniting of structures?
6. What do you meant by joint deformation?
7. What is the importance of joints in precast structures when compared to cast- in-situ structures?
8. Write the use of expansion joints.
9. Write short note on strong column weak beam concept.
10. What do you meant by equivalent design loads?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) What are the various advantages and disadvantages Prefabricated Structures? (8)
ii) List out the principles of Prefabricated Design. (8)
(OR)
- b) i) Write down the steps to be followed in the erection process of the Prefabricated structure. (8)
ii) Discuss in detail about the process of transportation in Prefabricated construction. (8)
12. a) Explain the methods of construction of Prefabricated Roof and Floor Slab. Also explain the precautions measures needed during the manufacturing process. (16)

(OR)

b) What is the Necessity of providing shear wall in Prefabricated structures? Also discuss the various types of shear wall. (16)

13. a) Explain the steps involved in the process of disuniting of Prefabricated structures. (16)

(OR)

b) Explain the problems in design because of joint flexibility. Discuss with regard to various location. (16)

14. a) What are the merits and demerits of expansion joints in Prefabricated structures? (16)

(OR)

b) Give the recommendations for the detailing the precast elements in respect of connections and erections. (16)

15. a) Mention in detail the codal provision for considering the effect of earthquake and cyclones. (16)

(OR)

b) What are the methods to avoid the progressive collapse? Explain each briefly? (16)

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: VI [Part Time]

Electrical and Electronics Engineering

16PTEEE10 – HIGH VOLTAGE DIRECT CURRENT TRANSMISSION

(Regulations 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Specify few disadvantages in HVAC systems.	2	K1	1
2. Point out the difficulty in DC breakers.	2	K2	1
3. Define Pulse number of the converter.	2	K1	2
4. Specify the difference between Line commutated and self commutated converters.	2	K2	2
5. What is the principle of dc link control?	2	K1	3
6. Compare firing angle control and extinction angle control.	2	K2	3
7. Specify the applications of SVC.	2	K3	4
8. Mention few merits of active filters.	2	K1	4
9. What is the necessity of per unit system for DC quantities?	2	K2	5
10. Draw the equivalent basic circuit model of converter.	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain the following types of HVDC Transmission (i) Monopolar links (ii) Bipolar Links (iii) Homopolar Links (iv) Back to Back Links (v) Multi terminal Links.	16	K1	1
(OR)			
b) Discuss about the series and parallel MTDC system.	16	K1	1
12. a) Explain the complete operation of six pulse Graetz converter for an overlap angle of less than 60 degree along with its output waveforms.	16	K3	2
(OR)			
b) Draw the circuit diagram of a 12-pulse converter and also derive its expression to calculate average DC output voltage.	16	K3	2

Q. No		M	BTL	CO
13. a)	Explain the control schemes adopted for Firing angle and Extinction angle.	16	K2	3
	(OR)			
b)	Explain the control of VSC Based HVDC Link and obtain the mathematical expression.	16	K2	3
14. a)	Analyze the structure of SVC and STATCOM devices utilized for reactive power compensation in HVDC system.	16	K4	4
	(OR)			
b)	Analyze the design procedure for AC Filter and its effectiveness in mitigating the harmonics.	16	K4	4
15. a)	Explain the DC System Model of HVDC Converter and deduce its converter equation.	16	K2	5
	(OR)			
b)	Discuss the Power Flow Analysis of DC system model under dynamic Conditions.	16	K2	5

Register Number :

Government College of Engineering :: Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Part Time]

Mechanical Engineering

16PTME602 – FINITE ELEMENT ANALYSIS

(Regulations 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer **ALL** Questions

1. What are the situations demand the use of finite element method for Engineering analysis?
2. Mention the different types of elements used in FEA.
3. What are the different coordinate systems used in FEM?
4. Define aspect ratio and State its significance.
5. In what way a bilinear element is different from simplex and complex element?
6. Define 'Plane stress' and 'Plane strain'.
7. Write down the shape functions for 4-noded linear quadrilateral element using natural coordinate system.
8. How do you convert Cartesian coordinates into natural coordinates?
9. Consider a wall of a tank containing a hot liquid at a temperature T_0 with an air stream of temperature T_x passed on the outside, maintaining a wall temperature of T_L at the boundary. Specify the boundary conditions.
10. Compare 1-Dimensional scalar and vector variable problems.

Part B

(5 x 16 = 80 Marks)

Answer **ALL** Questions

11. a) Solve by Gauss – elimination method (16)
$$\begin{aligned} 3x + y - z &= 3 \\ 2x - 8y + z &= -5 \\ x - 2y + 9z &= 8 \end{aligned}$$

(OR)

- b) A simply supported beam is subjected to a UDL over the entire length. Determine the deflection at mid span using Raleigh Ritz method. (16)
- 12. a) Derive the shape functions for a 2 noded beam element and a 3 noded bar element. (16)

(OR)

- b) The stepped bar shown in the Fig.1 is subjected to increase in temperature $\Delta T = 80^\circ\text{C}$. Predict the displacements and element stresses. (16)

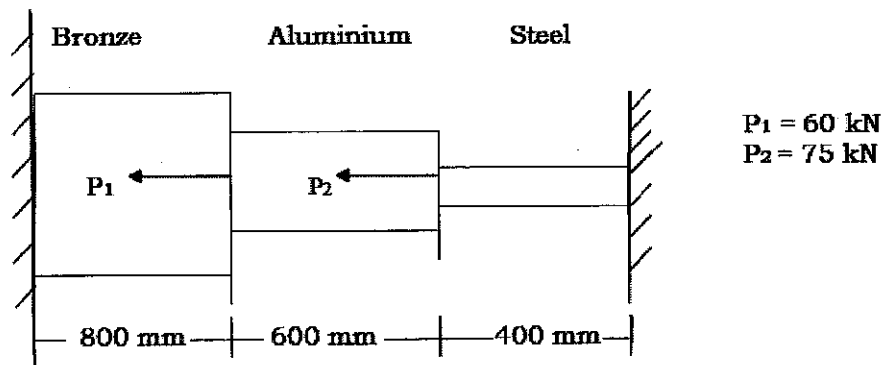


Fig.1

	Bronze	Aluminium	Steel
Area	2400 mm ²	1200 mm ²	600 mm ²
E	83 GPa	70 GPa	200 GPa
α	$18.9 \times 10^{-6}/^\circ\text{C}$	$23 \times 10^{-6}/^\circ\text{C}$	$11.7 \times 10^{-6}/^\circ\text{C}$

13. a) For a 4-noded rectangular element shown in Fig 2. Calculate the temperature at the point (7, 4). The nodal values of the temperatures are $T_1 = 42^\circ\text{C}$, $T_2 = 54^\circ\text{C}$ and $T_3 = 56^\circ\text{C}$ and $T_4 = 46^\circ\text{C}$. Also determine the three points on the 50°C contour line. (16)

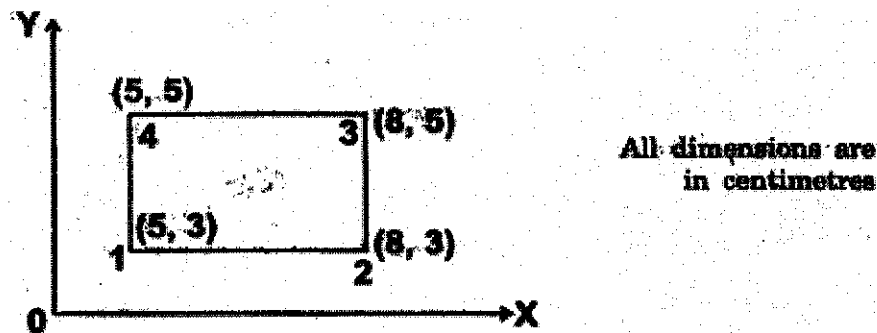


Fig.2

(OR)

- b) Construct the shape functions for an axisymmetric triangular element. (16)
14. a) Integrate $f(x) = 10 + 20x - (3x^2/10) + (4x^3/100) - (-5x^4/1000) + (6x^5/10000)$ between 8 and 12. Use Gaussian quadrature rule. (16)
- (OR)
- b) Conclude short notes on i) Uniqueness of mapping of isoparametric elements ii) Jacobian matrix. (16)

15. a) Aluminium fins of rectangular profile shown in Fig.3 are used to (16)
remove heat from a surface, whose temperature is 100°C . The
temperature of ambient air is 20°C . The thermal conductivity of
aluminium is 168 W/m.K . The natural convective heat transfer
coefficient associated with the air is $30 \text{ W/m}^2.\text{K}$. The fins are 80 mm
long, 5 mm wide and 1 mm thick. Evaluate the temperature
distribution along the fin using finite element model.

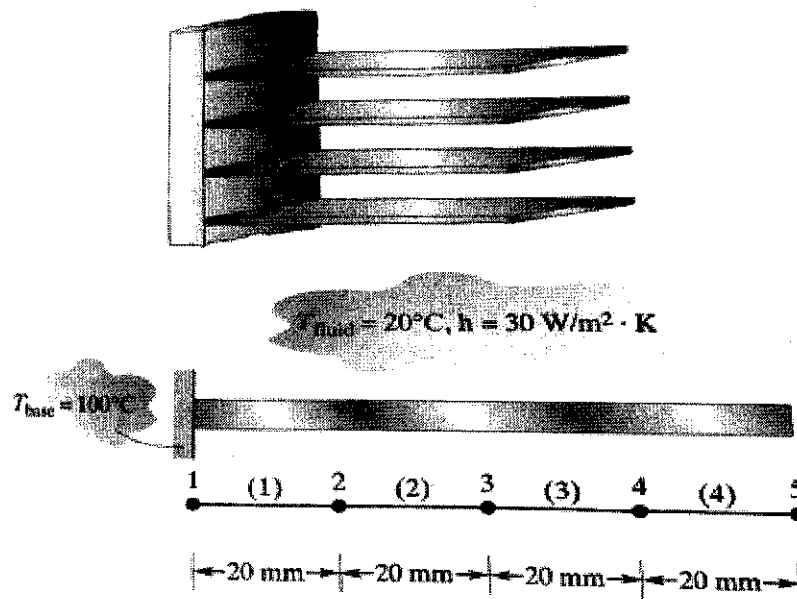


Fig.3

(OR)

- b) For the given fluid flow problem, estimate the potentials at points 2 (16)
and 3 and velocity at points 2, 3 and 4, for the given Fig.4

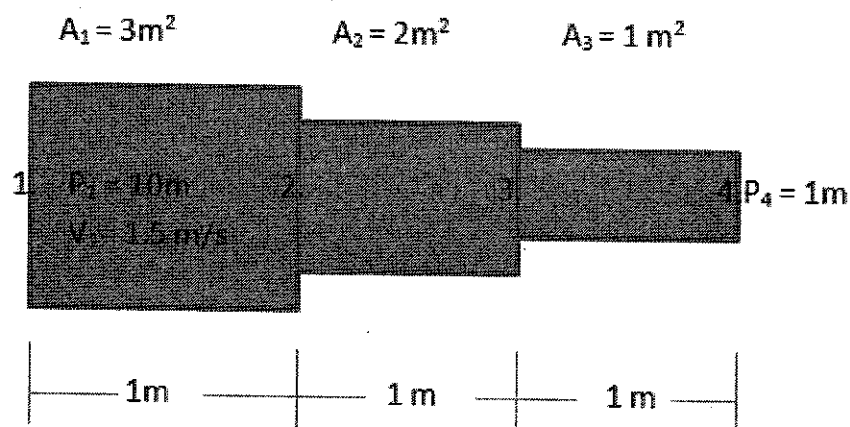


Fig.4

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: V [Full Time]

Civil Engineering

22CE504 – DESIGN OF REINFORCED CONCRETE ELEMENTS

(Regulations 2022)

(Use of IS456:2000 & SP 16 (charts & tables) are permitted)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. State the assumptions made in working stress method.	2	K1	1
2. Differentiate the Limit State of Collapse and Limit State of Serviceability.	2	K2	1
3. How we will differentiate Under –reinforced, Balanced and Over-reinforced section in the analysis of flexure.	2	K2	2
4. Differentiate one way and two way slab.	2	K2	2
5. Enlist the types of shear failure in reinforced concrete beams.	2	K2	3
6. What is bond stress? Write an expression for it.	2	K1	3
7. What is an unbraced column?	2	K1	4
8. Show the effective length of different columns.	2	K1	4
9. Define punching shear.	2	K1	5
10. How the rise and tread will be calculated in staircases?	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain working stress method, limit state method and ultimate load methods of design of R.C structures.	16	K2	1
(OR)			
b) Discuss about the stress strain behavior of concrete and steel with neat sketches.	16	K2	1
12. a) Design a R.C. beam of rectangular section using the following data. Effective span = 8 m. Working live load = 30 kN/m, Overall depth = 650 mm. Width of the beam = 300 mm. Effective cover = 50 mm. Use M20 grade concrete and Fe415 steel.	16	K3	2

(OR)

Q. No	M	BTL	CO
b) Design and draw the reinforcement details of a two way slab for the following data: Size = 7 m x 5 m, Width of the support = 300 mm, Edge condition = two edges are discontinuous, live load = 5 kN/m ² Floor finish as 1 kN/m ² . Use M20 concrete and Fe415 steel.	16	K3	2
13. a) A reinforced concrete beam of cross section 250 x 600 mm is reinforced with 4 bars of 22 mm dia out of 2 bars of bent up near the support section at an angle of 45° where a factored shear force of 350 kN is acting. Use M20 grade concrete and Fe415 grade steel. Design suitable shear reinforcement at the support section.	16	K3	3
(OR)			
b) Design the reinforcement required for a rectangular beam section with the following data: Size of the beam section = 300 mm x 600 mm, Factored shear force = 95 kN, Factored torsion = 45 kNm, Factored Bending moment = 115 kNm, Materials = M20 concrete and Fe415 steel. Adopt limit state design method.	16	K3	3
14. a) A corner column 300 mm x 300 mm, located in the lowermost storey of a system of braced frames, is subjected to factored loads P = 1200 kN, unsupported length of the column is 3.5 m. Design the reinforcement for the column for $M_{ux} = 240 \text{ kNm}$ and $M_{uy} = 180 \text{ kNm}$. Use M25 and Fe415.	16	K4	4
(OR)			
b) Design the longitudinal reinforcement in a short column 400 mm x 600 mm subjected to an ultimate axial load of 1600 kN together with ultimate moments of 120 kN-m and 90 kN-m about the major and minor axis respectively. The reinforcements are distributed equally on all four sides. Adopt M20 grade concrete and Fe415 steel bars.	16	K4	4

Q. No

M BTL CO

15. a) A rectangular column of size 300 mm x 450 mm transmits a static load of 1200 kN. Design a suitable isolated footing for the column by the limit state concept. Safe capacity of soil is 200 kN/m². Use M25 and Fe 415 steel.

(OR)

- b) Design one of the flight of a dog-legged stairs spanning between landing beams using following data. Number of steps in a flight = 10, Tread = 300 mm, Rise = 150 mm, Width of landing beams = 300 mm.

16 K3 5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: V [Full Time] / V [Part Time]

Electrical and Electronics Engineering

22EE505/22PTEE502 – POWER SYSTEM ANALYSIS AND STABILITY

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. State the advantages of per unit analysis.	2	K1	1
2. Distinguish between impedance and reactance diagram.	2	K2	1
3. Why the load flow studies are important for planning the existing system as well as the future expansion?	2	K2	2
4. A power system consists of 61 buses. If there are 20 PV buses in addition to PQ buses and a slack bus then find the size of the Jacobian matrix.	2	K3	2
5. Define short circuit capacity.	2	K1	3
6. List the selection procedure for using circuit breaker in power system.	2	K1	3
7. Draw the zero-sequence network of Y/ Δ transformer with neutral ungrounded.	2	K1	4
8. Compute in polar form: $a^2 - 1$, $1 - a - a^2$.	2	K3	4
9. State few techniques to improve the stability of the power system.	2	K2	5
10. Why swing equation is non-linear?	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) The single line diagram of an unloaded power system is shown in Fig.1. The generator and transformers are rated as follows. Generator, G1 = 20 MVA, 13.8 kV, $X''=20\%$ Generator, G2 = 30 MVA, 18 kV, $X''=20\%$ Generator, G3 = 30 MVA, 20 kV, $X''=20\%$ Transformer, T1 = 25 MVA, 220/13.8 kV, $X=10\%$	16	K3	1

Transformer, T2 = 3 single phase units each rated at 10MVA,
127/18 kV, X=10%

Transformer, T3 = 35 MVA, 220/22KV, X=10%

Transmission line section 1 = $j80 \Omega$

Transmission line section 2 = $j100 \Omega$

Draw the reactance diagram using a base of 50 MVA and 13.8 kV
on generator G1.

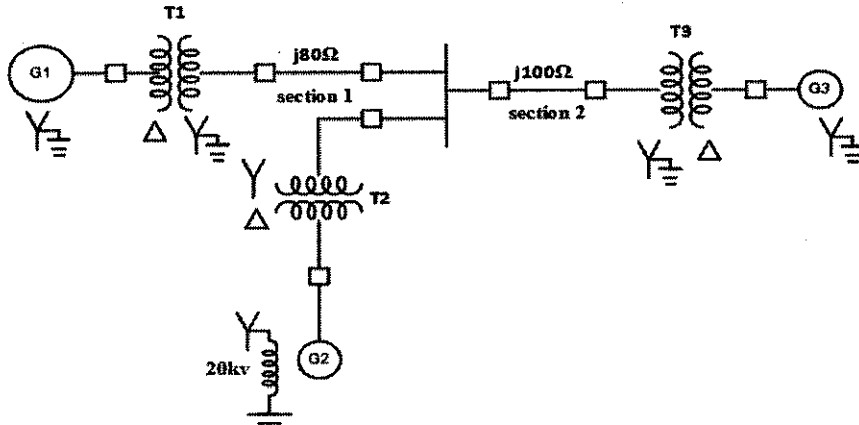


Fig.1

OR)

- b) A 300 MVA, 20 kV, 3 Φ generator has a sub-transient reactance of 20%. The generator supplies 2 synchronous motors (200 MVA, 13.2 kV, 20% and 100 MVA, 13.2 kV, 20%) through a 64 km transmission line having transformers at both ends as shown in Fig.2. In this, T1 is a 3 Φ transformer of 350 MVA, 20/230 kV 10% reactance and T2 is made up of 3 single phase transformer of rating 100 MVA, 127/13.2 kV, 10% reactance. Series reactance of the transmission line is $j50 \Omega/\text{km}$. Draw the reactance diagram with all the reactance marked in p.u. Select the generator rating as base values.

16 K3 1

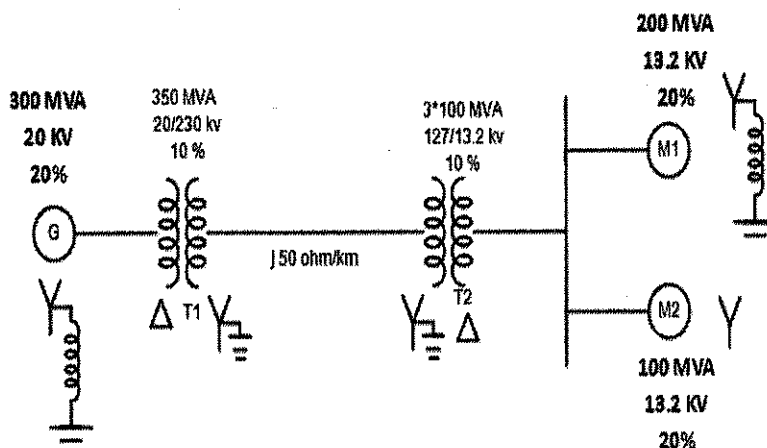


Fig.2

Q. No

M BTL CO

12. a) The parameters of 4 bus system are as follows:

16 K3 2

Bus Code	Line impedance (p.u)	Line charging admittance (p.u)
1-2	$0.2+j0.8$	$j0.02$
2-3	$0.3+j0.9$	$j0.03$
2-4	$0.25+j0.1$	$j0.04$
3-4	$0.2+j0.8$	$j0.02$
1-3	$0.1+j0.4$	$j0.01$

Draw the network and find the bus admittance matrix.

(OR)

b) Three bus power system is shown in Fig.3.

16 K3 2

Bus 1: Slack bus, $V = 1.05+j0$ p.u.

Bus 2: PV bus, $|V| = 1.0$ p.u, $P_g = 3$ p.u.

Bus 3: PQ bus, $P_L = 4$ p.u, $Q_L = 2$ p.u.

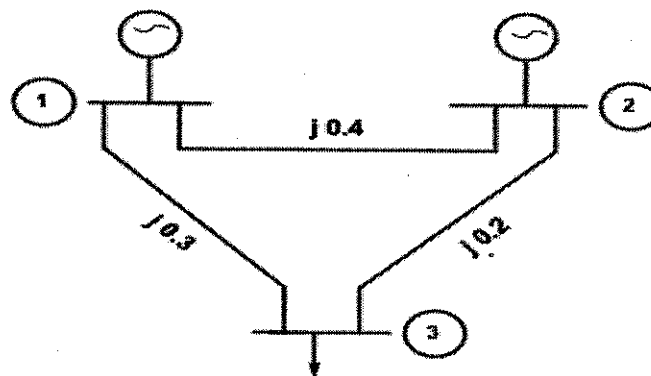


Fig.3

Carry out one iteration of load flow solution by Gauss-Seidal method. Neglect limits on reactive power generation.

13. a) Determine Z_{bus} for system whose reactance diagram is shown in Fig.4, where the impedance is given in p.u. Preserve all the three nodes.

16 K3 3

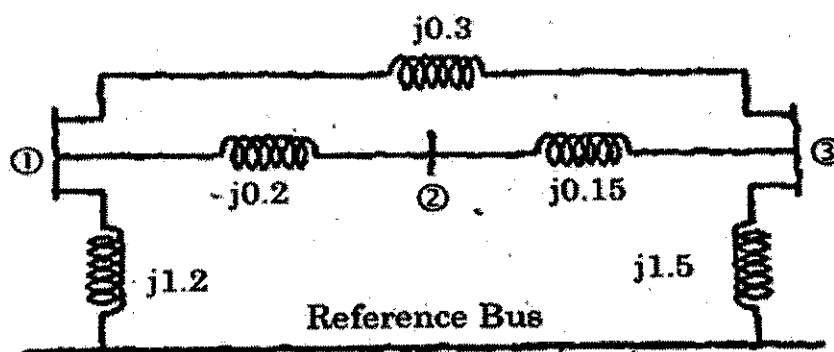


Fig.4

(OR)

- b) For the radial network shown in Fig.5 a three phase fault occurs at point F. Determine the fault current

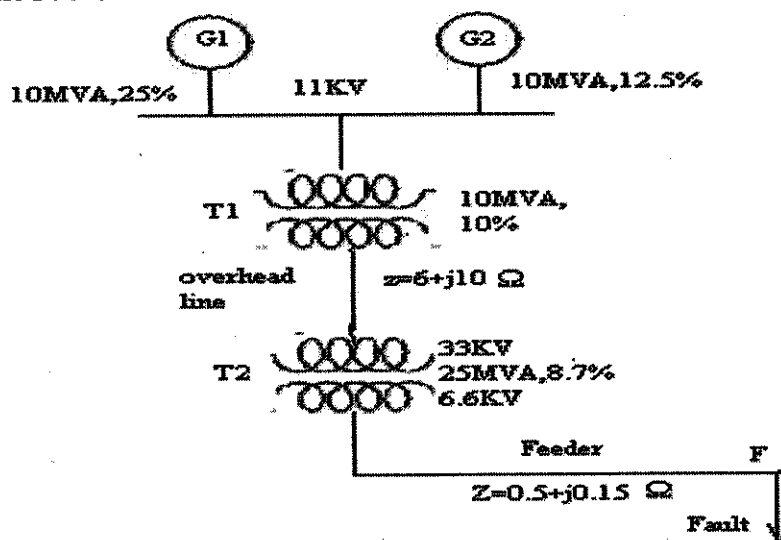


Fig.5

14. a) Derive the expression for the fault current for a single line to ground fault. 16 K2 4

(OR)

- b) Derive the expression for fault current in line to line fault on unloaded generator. Draw an equivalent network showing the interconnection of networks to simulate line to line fault. 16 K2 4

15. a) A large cylindrical rotor generator is delivering 1.0 p.u. power to an infinite bus through a transmission network. The maximum power which can be transferred for fault, during fault and post fault conditions are 1.8 p.u., 0.4 p.u. and 1.3 p.u. Find the critical clearing angle. 16 K3 5

(OR)

- b) A 60 Hz generator is supplying 0.6 p.u. power to an infinite bus system through a reactive network. The maximum power which the generator can deliver to the infinite bus system is 1.0 p.u. A fault occurs and reduces the output of the generator to zero. The fault gets cleared after 3-cycles. In the post fault period, the maximum power which the generator can deliver to the infinite bus system is 0.8 p.u. The inertia constant H of the generator is 5 seconds. Compute swing curve up to 0.15 second. 16 K3 5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: V [Full Time]

Mechanical Engineering

22ME505 – INSTRUMENTATION AND CONTROL SYSTEM

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Write the principle of a basic measurement system.	2	K2	1
2. What is fluid pressure and what is its SI unit?	2	K2	1
3. What is the purpose of using instrumentation sensors?	2	K3	2
4. Write short notes on a chopper in electronics.	2	K2	2
5. What is the purpose of counters and timers in data acquisition?	2	K3	3
6. Differentiate between single-channel and multichannel data acquisition systems.	2	K2	3
7. Discuss the rise time in time response analysis.	2	K3	4
8. Explain the significance of the generalized steady-state error in a control system.	2	K3	4
9. Illustrate the polar plot in control systems.	2	K2	5
10. State the functions of a compensator.	2	K3	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) List the various characteristics of transducers.	12	K2	1
ii) Discuss the classification of transducers.	4	K2	1
(OR)			
b) i) Write about the species of sensors and explain any two.	12	K2	1
ii) Differentiate between sensors and transducers.	4	K2	1
12. a) i) Illustrate the Wheatstone bridge and derivation to the unknown resistance of the Wheatstone bridge with a diagram.	10	K3	2
ii) Explain the characteristics of amplifiers in brief.	6	K2	2
(OR)			

Q. No		M	BTL	CO
b)	i) Identify the current steering voltage to the frequency converter circuit and explain.	10	K3	2
	ii) Explain about A/D and D/A conversion with applications.	6	K2	2
13. a)	i) Describe the architecture and working principle of a typical digital I/O system in data acquisition.	10	K3	3
	ii) Explain the components of the data acquisition system.	6	K3	3
	(OR)			
b)	i) Describe the key components involved in a digital transmission system and its role in real-time interfacing.	10	K3	3
	ii) Explain the concept of data logging and its applications.	6	K3	3
14. a)	i) Explain the classification of feedback control systems. Discuss the significance of each type of system performance.	10	K4	4
	ii) Explain the classification of time response analysis.	6	K4	4
	(OR)			
b)	i) Develop the equation of steady-state error when the input is a unit step signal.	10	K4	4
	ii) Describe the response of a system to impulse, ramp and parabolic inputs.	6	K4	4
15. a)	The open loop transfer function of a unity feedback system is given by $G(s) = 1 / s (1 + s) (1 + 2s)$. Sketch the polar graph and determine the gain margin and phase margin.	16	K4	5
	(OR)			
b)	Discuss the effect of lag compensation on the frequency response of a system.	16	K4	5

Registration Number:

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: IV [Part Time]

Civil Engineering

22PTCE404 – DESIGN OF STEEL STRUCTURES

(Regulations 2022)

(IS 800 : 2007, Steel table, IS 875 Part 1 & Part 2, (1987), Part 3 (2015) are Permitted)

Time: 3 Hours

Maximum Marks: 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Differentiate flexible and rigid connections.	2	K2	1
2. Draw the neat sketch of T-stub connections using bolts.	2	K1	1
3. List the forces acting on steel chimneys.	2	K2	2
4. Write short note on guyed steel chimney.	2	K2	2
5. What is moment amplification factor?	2	K1	3
6. List the parameters that affect the behavior of beam-columns.	2	K2	3
7. Name the different components of Plate-girder.	2	K1	4
8. Draw the typical sketch of Gantry Girder.	2	K2	4
9. Name the components of roof truss.	2	K2	5
10. Draw the sketch of pratt type truss.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Design a stiffened seat angle connection for a factored reaction of 200 kN from a beam of ISMB 500@ 852.5 N/m using 24 mm diameter 4.6 grade bolts to be connected to a column of ISHB 300@576.8 N/m . Assume to use Fe 410 grade steel.	16	K3	1
(OR)			
b) Design an unstiffened welded seat connection for a beam ISMB 250@365.9 N/m transmitting an end reaction of 110 kN due to the factored loads to the flange of column ISHB 200@365.9 N/m. The seat angle is welded to the column flange in the site.	16	K3	1

Q. No		M	BTL	CO
12. a)	A self-supporting steel chimney is 80 m high and its diameter at the top is 4 m. Design the thickness of shell at the bottom of chimney and flue opening for the uniform wind Pressure of 1.5 kN/m ² throughout the height.	16	K3	2
	(OR)			
b)	Write the design steps of guyed steel chimney in details.	16	K3	2
13. a)	A non-sway column with both ends translation and rotation are restrained are having 4 m height is subjected to the following load and moment: Factored axial load = 500 kN Factored Moment M _z At the top of column = 27 kNm At bottom of column = 40 kNm Select a suitable trail section to resist the load and check the cross-section resistance for the combined effects.	16	K3	3
	(OR)			
b)	Write the design steps of Beam-columns in detail.	16	K3	3
14. a)	Design a welded plate girder 18 m in span and laterally restrained throughout. It has to support a factored uniform load of 140 kN/m throughout the span exclusive of the self-weight. Design the girder without intermediate stiffeners. Connection design and bearing stiffener design is not necessary. Use Fe 410 steel.	16	K3	4
	(OR)			
b)	Describe and design a simply supported gantry girder to for the following data: Crane capacity: 160 KN Self weight of crane girder: 200 KN Self weight trolley, electric motor, hooks etc.: 50 KN Min. approach of crane hook to the gantry girder: 1.6 m Wheel base: 2.8 m c/c distance between gantry rail: 12 m c/c distance between column: 6 m Self weight of rail section: 300 N/m Check the section for maximum bending moment due to vertical forces, lateral forces and longitudinal forces.	16	K3	4

Q. No

M BTL CO

15. a) Design a channel purlin for a roof truss having the following data:

16 K4 5

Spacing of truss = 4 m c/c,

Spacing of Purlin = 2 m c/c

Wind pressure = 2.5 kN/m^2 ,

Roof coverage= AC Sheetting weighing 700 N/m

Live load on purlin= 1.4 kN/m .

(OR)

b) Determine the loads acting on the steel roof truss as shown in the Fig. 1 of 16 m span. The trusses are spaced 8 m c/c. the rise of the truss is $\frac{1}{4}$ of the span. Roofing is of asbestos cement of dead load 171 N/mm^2 . The wind load normal to roof truss (suction) is 940 N/mm^2 . One end of the truss is hinged and the other end is supported on rollers.

16 K4 5

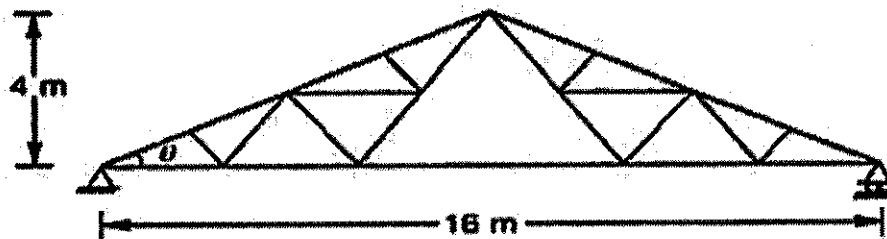


Fig.1.

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: I [Part Time]

Mechanical Engineering

23PTME102 - FLUID MECHANICS AND MACHINERY

(Regulations 2023)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Calculate the density and specific weight of one litre petrol with the specific gravity is 0.7.	2	K3	1
2. A soap bubble 62.5 mm diameter has an internal pressure in excess of the outside pressure of 20 N/m ² . What is the surface tension acting in the soap bubble?	2	K3	1
3. List the assumptions to be made in continuity equation.	2	K1	2
4. Name the dimensions of the following Physical Quantities: (i) Dynamic viscosity (ii) Kinematic Viscosity	2	K1	2
5. Compare laminar and turbulent flow.	2	K2	3
6. List the applications of Moody's diagram.	2	K1	3
7. Classify the hydraulic turbines.	2	K2	4
8. What is draft tube and why it is used in reaction turbine?	2	K1	4
9. Name the components of centrifugal pumps.	2	K1	5
10. Compare centrifugal and reciprocating pumps.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) An oil film of thickness 10 mm is used for lubrication between the two square parallel plates of size 0.9 m × 0.9 m each, in which the upper plate moves at 2 m/s required a force of 100 N to maintain this speed. Determine: i). Dynamic viscosity of oil ii). Kinematic viscosity of oil If the specific gravity of the oil is 0.95.	16	K3	1

(OR)

Q. No	M	BTL	CO
b) Calculate the capillary rise in a glass tube of 4 mm diameter, when immersed in (i) water and (ii) mercury. The temperature of the liquid is 20°C and the values of the surface tension of water and mercury at 20°C in contact with air are 0.07357551 N/m and 0.51 N/m respectively. The angle of contact for water is zero that for mercury 130°. Take density of water at 20°C as equal to 998 kg/m ³ .	16	K3	1
12. a) State Bernoulli theorem for steady flow of an incompressible fluid. Develop an expression for Bernoulli equation and state the assumptions made.	16	K3	2
(OR)			
b) Using Buckingham's π theorem, develop that velocity, through a circular pipe orifice is given by H- head causing flow; D-diameter of orifice; μ = Coefficient of viscosity; ρ = mass density; and g = acceleration due to gravity.	16	K3	2
13. a) Identify the different parameters of hydrodynamic boundary layer, displacement thickness, energy thickness, momentum thickness and explain in detail.	16	K3	3
(OR)			
b) A horizontal pipe line 40 m long is connected to a water tank at one end discharge freely into atmosphere other end for the first 25 m of its length from the tank, the pipe is 150 mm diameter and its diameter is suddenly enlarged to 300 mm. The height of water level in the tank is 8 m above the center of the pipe. Considering all losses of head which occur. Determine the rate of flow. Take $f = 0.01$ for both sections of the pipe.	16	K3	3
14. a) A Pelton wheel has a mean bucket speed of 10 m/s with a jet of water flowing at the rate of 700 lit/s under a head of 30 m. The buckets deflect the jet through an angle of 160°. Calculate the power given by water to the runner and the hydraulic efficiency of the turbine. Assume the co-efficient of velocity as 0.98.	16	K3	4
(OR)			
b) Draw a Kaplan turbine and identify its important functions and advantages over other turbines.	16	K3	4

Q. No		M	BTL	CO
15. a)	A Centrifugal pump having outer diameter equal to 2 times the inner diameter and running at 1200 rpm works against a total head of 75 m. The Velocity of flow through the impeller is constant and equal to 3 m/s. The vanes are set back at an angle of 30° at outlet. If the outer diameter of impeller is 600 mm and width at outlet is 50 mm. Determine (i) Vane angle at inlet (ii) Work done per second on impeller (iii) Monomeric efficiency.	16	K3	5
	(OR)			
b)	Draw a Reciprocating pump with suitable sketch and identify the its important properties and applications over other pumps.	16	K3	5



Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: V [Part Time]

Mechanical Engineering

22PTME501 – INDUSTRIAL ENGINEERING

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. State the reasons for maintaining inventory in industries.	2	K2	1
2. Write the steps of Box-Jenkins method of forecasting.	2	K1	1
3. List down three elements of value-added management.	2	K1	2
4. Brief the concept of Poka-Yoke.	2	K1	2
5. How agile manufacturing is different from traditional manufacturing?	2	K2	3
6. What is BPR?	2	K1	3
7. How “Keiretsu” works in business?	2	K2	4
8. What is meant by ERP? Identify any two ERP packages that are widely used in India.	2	K1	4
9. Enumerate the criteria for the selection of batch size.	2	K1	5
10. What is meant by resource balancing?	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) What are the intrinsic methods of forecasting? Explain time-series method in detail.	8	K2	1
ii) The demand for a product is 1200 units per year. The purchase cost per unit Rs. 10. The order cost Rs. 20. Holding cost 10% p.a. of stock value. Calculate the minimum total cost with a discount of 2% given on orders of 400 and over. Advice whether to purchase at discounted price or not?	8	K3	1

(OR)

Q. No		M	BTL	CO																																	
b) i)	What is extrinsic method of forecasting? Briefly explain regression method of forecasting.	8	K2	1																																	
ii)	For the following data of inventory of a retail store, conduct A-B-C analysis	8	K3	1																																	
<table><tr><td>Item number</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr><tr><td>Annual demand</td><td>720</td><td>250</td><td>50</td><td>900</td><td>75</td><td>12</td><td>1980</td><td>150</td><td>200</td><td>15</td></tr><tr><td>Price</td><td>20</td><td>30</td><td>65</td><td>5</td><td>10</td><td>300</td><td>10</td><td>250</td><td>40</td><td>1200</td></tr></table>					Item number	1	2	3	4	5	6	7	8	9	10	Annual demand	720	250	50	900	75	12	1980	150	200	15	Price	20	30	65	5	10	300	10	250	40	1200
Item number	1	2	3	4	5	6	7	8	9	10																											
Annual demand	720	250	50	900	75	12	1980	150	200	15																											
Price	20	30	65	5	10	300	10	250	40	1200																											
12. a) i)	Bring out the roles of QC and Poka-Yoke in facilities planning.	8	K2	2																																	
ii)	Explain the factors to be considered in facility location study.	8	K2	2																																	
(OR)																																					
b) i)	Explain the role of KAIZEN in facilities planning.	8	K2	2																																	
ii)	What are the basic types of facility layout? Explain them briefly.	8	K2	2																																	
13. a) i)	With a simple case, explain the implementation steps of SMED.	8	K3	3																																	
ii)	What are goals of cellular manufacturing. Brief the process of cellular manufacturing with its advantages.	8	K3	3																																	
(OR)																																					
b) i)	Mention basic elements of JIT Manufacturing. Explain the role of any two elements in modern manufacturing system.	8	K3	3																																	
ii)	Explain various implementations steps of six sigma concepts in an organization.	8	K3	3																																	
14. a)	Differentiate between inbound and outbound perspectives of supply chain.	16	K3	4																																	
(OR)																																					
b)	Compare and contrast MRP, MRP II, and ERP.	16	K3	4																																	
15. a)	Bring out the concept, advantages, and disadvantages of FMS.	16	K3	5																																	
(OR)																																					

Q. No

M BTL CO

- b) A scheduler has four jobs that can be done on any of four machines with respective times (minutes) as shown in table below. Determine the allocation of jobs to machines that will result in minimum time.

16 K3 5

Jobs	Machine			
	1	2	3	4
A	5	6	8	7
B	10	12	11	7
C	10	8	13	6
D	8	7	4	3

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: IV [Part Time]

Electrical and Electronics Engineering

16PTEE403 – DIGITAL LOGIC CIRCUITS

(Regulations 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What are the basic digital logic gates?	2	K1	1
2. Mention the advantages of K-map.	2	K1	1
3. Write the truth table of a full subtractor.	2	K2	2
4. Obtain the logic circuit diagram for a one bit magnitude comparator.	2	K3	2
5. List out the applications of multiplexer.	2	K1	3
6. List the major differences between PLA and PAL.	2	K1	3
7. Differentiate between the Mealy and Moore models.	2	K3	4
8. How many flip-flops are required to build a binary counter that counts from 0 to 1023?	2	K3	4
9. What is the pulse mode sequential circuit?	2	K1	5
10. Define flow table in asynchronous sequential circuit.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Implement the EXOR and EXNOR gate using NAND gates.	6	K6	1
ii) Using Karnaugh map method, simplify the following Boolean function. $F(A,B,C,D) = \sum m(4, 6, 7, 13, 14) + d(5, 10, 12, 15)$	10	K4	1
(OR)			
b) i) Explain a TTL gate with totem pole output.	6	K2	1
ii) Simplify the following Boolean function by using the tabulation method. $F = \sum(0,1,2,8,10,11,14,15)$	10	K4	1
12. a) i) Design and implement a full adder circuit using suitable gates.	8	K6	2

Q. No		M	BTL	CO
	ii) Draw the logic diagram of a BCD adder and explain its operation.	8	K2	2
	(OR)			
b) i)	Design a 4 bit serial adder.	8	K6	2
	ii) Design a logic circuit that compares two 2-bit inputs A and B and produces their relative magnitudes.	8	K6	2
13. a) i)	Design and implement an 8×1 multiplexer using suitable gates.	8	K4	3
	ii) Design and implement a 4-bit binary to gray code converter using Logic Gates.	8	K4	3
	(OR)			
b) i)	Draw a PLA circuit to implement the functions $F_1 = A'B + AC + A'BC'$ and $F_2 = (AC + AB + BC)'$.	8	K4	3
	ii) Design a combinational circuit using PAL for the following Boolean functions. $w(A,B,C,D) = \sum(2,12,13)$ $z(A,B,C,D) = \sum(1,2,8,12,13)$	8	K6	3
14. a) i)	What is sequential circuit? Explain S-R and J K flip flop, with state table, equation and excitation table.	8	K2	4
	ii) Convert D flip-flop into JK flip-flop.	8	K3	4
	(OR)			
b)	Using JK flip flops, design a synchronous counter which counts in the sequence 000, 001, 010, 011, 100, 101, 110, 111, 000.	16	K6	4
15. a)	Consider the following asynchronous sequential circuit and draw maps and transition table, and state table. Shown in Fig.1.	16	K3	5

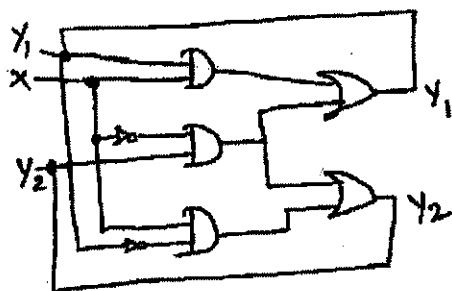


Fig.1

- (OR)
- b) Explain the races and Hazards in asynchronous circuits with examples.

16 K2 5

Registration Number :

Government College of Engineering :: Salem
(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: VII [Part Time]

Mechanical Engineering

16PTME701 – TOTAL QUALITY MANAGEMENT

(Regulations 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is quality statement?
2. Define quality.
3. List out any four benefits of employee involvement.
4. Write the requirements of reliable supplier rating.
5. What is meant by process capability?
6. State the primary objectives of six sigma.
7. What are the reasons for bench marking?
8. List the objectives of TPM programme.
9. What are the general requirements of Quality Management System?
10. What is the need for documentation?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the fourteen steps of Deming's philosophy for improving quality, productivity and competitiveness. (16)
(OR)
b) What are the barriers while implementing TQM? Also explain evolution of quality. (16)
12. a) i) Explain PDCA Cycle. (8)
ii) What is 5S? Explain all the elements of 5S principle in detail. (8)
(OR)
b) i) What is a team? Describe the characteristics of a successful team. (8)
ii) Explain the characteristics of empowered employees. (8)

13. a) What are the traditional QC tools? Explain any two in detail. (16)

(OR)

b) What are the new management tools? Explain any two new management tools in detail. (16)

14. a) With a suitable example, explain the various stages of building a House of Quality matrix. (16)

(OR)

b) Explain the different steps involved in Failure Mode Effect Analysis (FMEA) with an example. (16)

15. a) Explain the need for the ISO 9000 and other quality system. (16)

(OR)

b) Illustrate the detailed procedure for quality auditing. Brief the attributes of a good auditor. (16)

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: III [Part Time]

Electrical and Electronics Engineering

22PTEE303 – DIGITAL LOGIC CIRCUITS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define fan-in and fan-out.	2	K1	1
2. Implement XOR operation using only Nand gates.	2	K2	2
3. Write the difference between half adder and full adder.	2	K2	3
4. What is magnitude comparator?	2	K2	3
5. List out the various applications of multiplexers.	2	K1	3
6. Write the difference between PLA and PAL.	2	K2	3
7. What do you mean by Toggle state in T-FF?	2	K2	4
8. Why D-FF is most suitable for shift register?	2	K2	4
9. Write the advantages of state reduction technique.	2	K2	5
10. How the races are classified in Asynchronous sequential circuits.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Encode data bits 1101 into seven-bit odd parity hamming code and assume that data is transmitted but during transmission a single error occurred in seventh bit (D_7). Explain how this error can be rectified.	10	K2	2
ii) Find the minterms of $A+BC$ by using truth table method.	6	K2	2
(OR)			
b) i) Reduce the given function in both SOP and POS forms and design the circuits using only Nand gates $T = \sum m(0, 2, 4, 6, 10, 11, 12, 14, 15)$.	10	K2	2
ii) Simplify the following Boolean function and design the circuits by using the Quine-McCluskey method $F = \sum m(0, 2, 4, 6, 7)$.	6	K2	2

Q. No		M	BTL	CO
12. a)	i) Design and construct a half adder and full adder circuits.	8	K3	3
	ii) Design and construct a 4-bit parallel binary adder/subtractor.	8	K3	3
	(OR)			
b)	i) Design and construct a 4-bit BCD adder.	8	K3	3
	ii) Design and construct a 2-bit Magnitude Comparator.	8	K3	3
13. a)	i) Design a 3-bit odd and even parity checker circuits.	8	K4	3
	ii) Design a 4-bit binary to gray code converter.	8	K4	3
	(OR)			
b)	i) Implement the following Boolean function with 8X1 Multiplexer $F(A, B, C, D) = \Pi M(0, 3, 5, 6, 8, 9, 10, 12, 14)$	8	K4	3
	ii) Implement the following Boolean function using PLA and PAL $f(x, y, z) = \sum m(0, 1, 3, 5, 7)$.	8	K4	3
14. a)	i) Obtain the truth table, characteristics table, characteristics equation and excitation table of JK flip flop.	8	K4	4
	ii) Construct the transition table, state table and state diagram for mealy model sequential circuit having the following flipflop input equations $T_A = Bx$, $T_B = x$, and output equation $Y = ABx$. In the circuit A & B are present states, A^+ & B^+ are next states, x be the input and Y is the output.	8	K4	4
	(OR)			
b)	i) Design and construct a synchronous 4-bit up and down counter using T – Flip flop and draw their timing diagram.	10	K4	4
	ii) Design a 5-bit ring counter and explain its operation with their timing diagram.	6	K4	4
15. a)	i) A pulse mode asynchronous sequential circuit is described by the following excitation and output function $Y = X_1X_2 + (X_1+X_2)Y$ and output $Z = Y$.	10	K4	5
	i) Draw the logic diagram ii) Derive the transition table and output map iii) Draw the state diagram and describe the behavior of the circuit.			
	ii) Design an asynchronous sequential circuit with two inputs X and Y with one output Z. Whenever Y is 1, input X is transferred to Z. When Y is 0, the output does not change for any change in X. Use D flip-flop.	6	K4	5

(OR)

Q. No		M	BTL	CO
b) i)	Explain cycles and races in Asynchronous sequential circuits.	8	K4	5
ii)	Give hazard free realization for the following Boolean function $F(A, B, C, D) = \sum m(0, 2, 6, 7, 8, 10, 12).$	8	K4	5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: III [Part Time]

Mechanical Engineering

23PTME303 - ENGINEERING MATERIALS AND METALLURGY

(Regulations 2023)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. List the types of solid solution.	2	K1	1
2. What do you mean by HSLA?	2	K1	1
3. What do you mean by hardenability?	2	K1	2
4. Tell the composition of 18-4-1 HSS.	2	K1	2
5. Name some defects in ceramics.	2	K1	3
6. Name the wear mechanisms.	2	K1	3
7. Define fatigue.	2	K1	4
8. What properties are determined from tensile testing of metallic products?	2	K1	4
9. Define surface engineering.	2	K1	5
10. What are the significant of Non - destructive techniques?	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Outline the Iron – Iron carbide phase diagram, name the various fields, line and reactions. Draw the room temperature microstructure of eutectoid steel.	10	K3	1
ii) Illustrate maraging steels.	6	K3	1
(OR)			
b) i) Distinguish between hypoeutectoid and hyper eutectoid steel. How are the critical temperatures in steel designated?	10	K3	1
ii) Examine the properties and applications of bearing alloys.	6	K3	1

Q. No		M	BTL	CO
12. a)	i) Compare and contrast the process of full annealing, stress relief annealing, recrystallization annealing and spheroidises annealing.	10	K3	2
	ii) Analyze precipitation hardening and ageing treatment of Al-Cu alloy.	6	K3	2
	(OR)			
b) i)	Define hardenability. Explain the test procedure to determine hardenability of steel.	10	K3	2
	ii) Illustrate the importance of CCR curves.	6	K3	2
13. a)	i) Demonstrate Chemical vapour deposition.	10	K2	3
	ii) Illustrate a Fibre reinforced composites.	6	K4	3
	(OR)			
b) i)	Examine the properties, applications and chemical structure of any four types of Ceramics Al_2O_3 , SiC, PSZ and Si3.	10	K2	3
	ii) Analyze Plasma spraying.	6	K4	3
14. a)	i) Classify fractures and explain each type in detail	8	K4	4
	ii) Differentiate between Slip and twinning.	8	K3	4
	(OR)			
b) i)	Sketch and explain Brinell hardness test.	8	K4	4
	ii) Compare Izod and charpy impact tests.	8	K3	4
15. a)	i) Illustrate about Liquid penetrant testing.	10	K4	5
	ii) Explain the applications of surface engineering.	6	K4	5
	(OR)			
b) i)	Analyze the process, advantages and disadvantages of magnetic particle inspection.	10	K4	5
	ii) Examine the ultrasonic testing.	6	K4	5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

M.E./Ph.D Degree Examinations – April/May 2025

Semester: II [Full Time]

Thermal Engineering/Mechanical Engineering

22THC23 – INSTRUMENTATION FOR THERMAL SYSTEMS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. How does an error differ from an uncertainty?	2	K2	1
2. State the dynamic character states of measuring instruments.	2	K1	1
3. List the advantages of digital instruments.	2	K2	2
4. List the types of data loggers.	2	K3	2
5. What is the temperature control system used in refrigerator?	2	K1	3
6. What are the application of telemetry in measurement?	2	K3	3
7. Why is Monochromatic light used in an interferometer instead of white light?	2	K3	4
8. Define a spectrometer, and where it is used?	2	K1	4
9. List the Principle of the flux sensor.	2	K1	5
10. Write the PH measurement method.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Design a measurement system for monitoring the temperature of a chemical reactor. Include instrument selection, expected errors, static and dynamic characteristics, and explain how you'd minimize uncertainty.	16	K4	1

(OR)

Q. No

M BTL CO

- b) Compare and analyze temperature sensors: "Thermocouples" and "Thermistors". Discuss their working principles, accuracy and range, response time and sensitivity, and Long-term stability and cost. Finally, recommend which sensor is most suitable for high-temperature furnace control and justify your choice.

16 K4 1

12. a) What are intelligent instruments, and how do they enhance measurement accuracy and decision-making? Explain about Smart multimeter, Digital oscilloscope, and Smart pressure transmitter.

16 K3 2

(OR)

- b) Analyze how sensors are interfaced with microcomputers in a smart instrumentation system in terms of data flow from sensor to software. Use an example like a digital temperature control system to support the analysis.

16 K3 2

13. a) 1) In an instrumentation system, the measured values of voltage are: 5.1, 5.2, 5.0, 5.3, 5.1 V. Find the mean, standard deviation, and uncertainty (95% confidence).

16 K3 3

- 2) Two displacement sensors are tested:

- Sensor A has high sensitivity but a nonlinear response.
- Sensor B has a linear response but low sensitivity.

Analyze which one is more suitable for precise control in a robotic arm and justify your reasoning based on static characteristics.

(OR)

- b) A type K thermocouple gives the following readings during calibration:

16 K3 3

Temperature(°C)	Voltage Output (mV)
0	0.00
100	4.10
200	8.15
300	12.20

1. Plot a graph of Temperature vs Voltage.
2. Determine if the relationship is linear.
3. Calculate the sensitivity in mV/°C.
4. Estimate the temperature for 10.00 mV output.

Q. No		M	BTL	CO
14. a)	Explain the construction and working principle of an Interferometer for flow field measurements. List the applications.	16	K2	4
	(OR)			
b)	Explain the construction and working principle of a laser doppler anemometer (LDA). List the applications.	16	K2	4
15. a)	How are smoke and dust concentrations measured in flue gases or ambient environments?	16	K2	5
	(OR)			
b)	Describe the principle, setup and working of a Gas Chromatograph used for analyzing gas mixtures.	16	K2	5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time]

Mechanical Engineering

12ME402 – ENGINEERING MATERIALS AND METALLURGY

(Regulations 2012)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

1. Give the composition of Brass and Bronze.
2. List the types of solid solutions with examples.
3. What is Austempering?
4. What is carburizing process?
5. Recall the terms: APS and VPS.
6. Mention the advantages of CVD coatings.
7. Compare Slip and Twinning.
8. What is Fatigue in metals?
9. What is surface engineering?
10. What are the applications of radiography?

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

M

11. a) Draw an Iron-Carbon phase diagram and explain the three invariant reactions. (16)

(OR)

- b) Discuss the composition, microstructure, properties and applications of Grey cast iron and SG Cast iron. (16)

12. a) Explain the annealing, normalizing and hardening processes with neat sketches. (16)

(OR)

- b) Explain the Flame and Induction surface hardening processes with neat sketches. (16)

Q. No		M
13.	a) Describe properties and applications of Al_2O_3 , SiC and Si_3N_4 ceramics.	(16)
	(OR)	
	b) Describe the production and applications of Fiber and Particulate reinforced composites.	(16)
14.	a) Analyze the tensile test of Mild steel with stress-strain curve.	(16)
	(OR)	
	b) Analyze the testing procedure of Brinell and Rockwell hardness tests.	(16)
15.	a) Illustrate the testing procedure, advantages and disadvantages of Liquid Penetrant Inspection.	(16)
	(OR)	
	b) Illustrate the testing procedure, advantages and disadvantages of Magnetic Particle Inspection.	(16)

Register Number :

Government College of Engineering :: Salem
(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: III [Part Time]

Civil Engineering

16PTCE302 – SURVEYING

(Regulations 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

(10 x 2 = 20 Marks)

Part A

Answer **ALL** Questions

1. Discuss the characteristics of contours.
2. List the basic principles of surveying.
3. Define traversing.
4. Illustrate the steps in temporary adjustments of theodolite surveying.
5. Distinguish between tangential and stadia tacheometry.
6. Define transit.
7. Discuss about Correlates.
8. What are the classification of errors?
9. Elaborate about source of errors in total station.
10. Write about anti-spoofing.

Part B

(5 x 16 = 80 Marks)

Answer **ALL** Questions

11. a) What are the different types of leveling and explain them in detail. (16)
(OR)
b) The following staff readings were observed successively with a level, (16)
the instrument having been moved after third, sixth and eighth
readings 2.24, 1.66, 0.10, 2.15, 2.90, 1.27, 0.61, 1.56, 1.35, 2.70
meters. Evaluate the R.L. of points if the first reading was taken with
a staff held on a bench mark of 432.60 m.
12. a) With neat sketch, explain the essential parts of theodolite. (16)
(OR)
b) Explain the various method of measuring horizontal angles using (16)
theodolite.

13. a) Explain the principle of stadia tachometry. How will you determine the stadia constants? (16)

(OR)

- b) The tacheometer was set up at a station A and the readings on a Vertically held staff at B were 2.255, 2.605 and 2.955, the line of sight being at a inclination of $+8^{\circ} 24'$. Another observation on the Vertically held staff at B.M gave the readings 1.640, 1.920 and 2.200, the inclination of the line of sight being $+1^{\circ} 6'$. Calculate the horizontal distance between A and B, the elevation of B if the R.L of B.M is 418.685 m. The constant of the instruments were 100 and 0.3. (16)

14. a) Examine the most probable values of the angles A, B, C from the following observations at a station P. (16)

A = $38^{\circ} 25' 20''$ Weight 1

B = $32^{\circ} 36' 12''$ Weight 1

A+B = $71^{\circ} 01' 29''$ Weight 2

A+B+C = $119^{\circ} 10' 43''$ Weight 1

B+C = $80^{\circ} 45' 28''$ Weight 2

(OR)

- b) Explain the general principles of least squares and laws of weight. (16)

15. a) Describe the features, merits and demerits of total station. (16)

(OR)

- b) Explain the space, control and user segments of GPS and their functions? (16)

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: VI [Part Time]

Electrical and Electronics Engineering

16PTEEE07 – SPECIAL ELECTRICAL MACHINES

(Regulations 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Distinguish between axial and radial gap motors.	2	K2	1
2. List any four applications of Synchronous Reluctance motor.	2	K1	1
3. What is meant by micro stepping in stepper motor?	2	K1	2
4. What is the step angle of a four phase stepper motor with 12 stator teeth and 3 rotor teeth?	2	K2	2
5. Give the expression for torque of a Switched Reluctance motor.	2	K2	3
6. Point out the merits of Dump C – Converter.	2	K1	3
7. Mention the difference between the conventional DC motor and PMBLDC motor.	2	K2	4
8. Why a PMBLDC motor is called an electronically commutated motor?	2	K2	4
9. Classify the different types of PMSM.	2	K1	5
10. List few applications of PMSM.	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain the construction and working principle of permanent magnet vernier motor. Mention its applications.	16	K4	1
(OR)			
b) Draw the phasor diagram of synchronous reluctance motor and derive the torque equation of synchronous reluctance motor.	16	K4	1
12. a) i) Discuss the construction details and various modes of excitation of VR stepper motor.	8	K2	2
ii) Explain the static and dynamic characteristics of a stepper motor.	8	K2	2

(OR)

Q. No		M	BTL	CO
	b) i) Explain in detail about different types of power drive circuits used for stepper motor.	8	K2	2
	ii) Briefly discuss the working principle of Hybrid Stepper motor.	8	K2	2
13. a)	Describe the construction and working of Switched Reluctance motor. Also discuss the various operating modes.	16	K4	3
	(OR)			
b)	Describe the various power controller circuits of Switched Reluctance motor and explain the operation of any one scheme with suitable circuit diagram.	16	K4	3
14. a)	i) Draw the circuit and explain the working of electronic commutator.	8	K2	4
	ii) Derive the expressions for the EMF and Torque of a PMSM motor	8	K4	4
	(OR)			
b) i)	Explain the various functional blocks of the controller circuit of PMSM motor.	8	K2	4
	ii) Draw and explain the torque-speed characteristics of a PMSM motor.	8	K4	4
15. a)	Discuss in detail the closed loop speed control of load commutated inverter fed permanent magnet synchronous motor drive.	16	K2	5
	(OR)			
b)	Describe the construction and working principle of PM synchronous machine in detail. Draw its phasor diagram.	16	K2	5

Register Number :

Government College of Engineering :: Salem
(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2024

Semester: VI [Part Time]

Mechanical Engineering

16PTMEE16 – NUCLEAR ENGINEERING

(Regulation 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the role of neutron reactions in nuclear fission?
2. Identify difference between alpha, beta, and gamma radiation.
3. Elaborate the difference between a fertile and fissile isotope
4. Explain nuclear fuel cycle.
5. Explain the role of solvent extraction in reprocessing
6. Discover the characteristics of spent fuel.
7. What is electro-refining?
8. Identify the explain the concept of "fuel element dissolution" in reprocessing.
9. What is the primary goal of nuclear waste disposal?
10. Explain radiation protection.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Examine the different types of nuclear reactors and their key characteristics. (16)
(OR)
b) Explain the mechanism of nuclear fission with a detailed diagram. (16)
12. a) Interview the importance of nuclear fuel cycles in the overall nuclear energy production process. (16)
(OR)
b) Explain the conversion process of uranium to UF₄ and UF₆. (16)
13. a) Elucidate the principles of solvent extraction used in nuclear fuel reprocessing. (16)
(OR)
b) Analyze the environmental and safety concerns associated with nuclear fuel reprocessing. (16)

14. a) i) Examine the PUREX process in detail, including its chemical principles and applications (12)

ii) Compare and contrast the different processes used for the separation of reactor products. (4)

(OR)

b) i) Explain the various chemical processes involved in the separation of reactor products, such as ion exchange, redox, and chelation. (12)

ii) Differentiate between precipitation and ion exchange methods for separation. (4)

15. a) Analyze the international conventions on nuclear safety and their impact on global nuclear energy practices (16)

(OR)

b) What are the safety control measures implemented in nuclear facilities to prevent radiation hazards. (16)

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: III [Full Time]

Civil Engineering

22CE302 - SURVEYING

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define surveying.	2	K1	1
2. Find the reduced bearing values for the whole circle bearings 150° and 270°.	2	K1	1
3. List the types of instruments used in leveling.	2	K1	2
4. What is the use of Bench mark in surveying?	2	K1	2
5. Outline the steps in temporary adjustments of theodolite surveying.	2	K2	3
6. Compare transiting and swinging of theodolite.	2	K2	3
7. What is the use of subtense bar?	2	K1	4
8. List the elements of simple curve.	2	K1	4
9. Define total station.	2	K1	5
10. Show few applications of GPS.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Write about the different sources of error in chain surveying.	6	K1	1
ii) Show which stations are affected by local attraction. Work out the correct bearing of closed traverse ABCDEA.	10	K2	1

Line	Fore Bearing	Back Bearing
AB	190° 30'	17° 0'
BC	73° 30'	250° 30'
CD	36° 15'	214° 30'
DE	266° 45'	84° 45'
EA	234° 15'	57° 0'

(OR)

- b) i) List the accessories required for a chain survey? Explain the functions of each. 6 K1 1
- ii) On a closed compass traverse survey PQRST, following are the observation made with a suspicion of local attraction. 10 K2 1

Line	Fore Bearing	Back Bearing
PQ	147° 3'	26° 45'
QR	74° 30'	253° 00'
RS	41° 30'	222° 45'
ST	312° 15'	132° 45'
TP	219° 15'	39° 15'

Identify the station affected with local attraction, included angles and the corrected bearings.

12. a) i) Explain the different sources of error in leveling and explain them in detail. 6 K2 2
- ii) The following reading were taken with a dumpy level a) when the instrument is midway between two pegs A and B, 100 mts apart. The staff reading on A = 3.345 m. The staff reading on B = 2.025 m. b) when the instrument is kept very near A. The staff reading on A = 2.950 m. The staff reading on B = 2.000 m. Is the instrument in adjustment or not? When the instrument is very near to A. What should be the correct reading on staff B? 10 K3 2

(OR)

- b) i) Compare rise and fall and line of collimation method in reducing leveling observation. 6 K2 2
- ii) The following staff readings were observed successively with a level, the instrument have been moved after third and eighth readings: 0.820, 1.150, 2.250, 2.620, 3.150, 1.605, 0.920, 2.600, 2.900, 1.125, 0.605, 2.265 m. Calculate the R.L of points if the first reading was taken with a staff held on a bench mark of 110.0 m. Carry out the arithmetic check. 10 K3 2

Q. No **M** **BTL** **CO**

13. a) i) With mentioning the essential parts explain the permanent adjustment of theodolite?

8 K2 3

ii) Determine the area for the following observations by Trapezoidal rule

8 K3 3

Ordinate	01	02	03	04	05	06
Distance(m)	0	10	20	30	40	50
Offset(m)	3.25	5.60	4.20	6.65	8.75	6.20

(OR)

b) i) Illustrate the various characteristics and uses of contours with suitable examples.

8 K2 3

ii) determine the area for the following observations by Simpson's rule

8 K3 3

Ordinate	01	02	03	04	05	06
Distance(m)	0	10	20	30	40	50
Offset(m)	3.25	5.60	4.20	6.65	8.75	6.20

14. a) i) Explain the different between tangential and stadia tachometry.

8 K2 4

ii) Determine the gradient from a point A to point B from the following observation made with a tacheometer fitted with an analytic lens. The constant of instrument was 100, Zero and the staff was held vertically.

8 K3 4

Inst. station	Staff station	bearing	Vertical angle	Staff reading
P	A	134°	10° 15'	1.360, 1.915, 2.470
	B	224°	-5° 6'	1.065, 1.885, 2.705

(OR)

b) i) Explain various elements of a simple curve with a neat sketch.

8 K2 4

ii) Two straight lines AC and CB, to be connected by a 30 curve, intersect at a chainage of 2760 m. The WCBs of AC and CB are 450 30' and 750 30' respectively. Calculate all necessary data for setting out the curve by the method of offsets from the long chord.

8 K3 4

Q. No		M	BTL	CO
15. a)	i) Illustrate the various types of GPS devices and their uses.	8	K2	5
	ii) Explain in brief about the components of EDM instrument.	8	K2	5
	(OR)			
b)	i) Demonstrate the emerging Trends in GPS Technology	8	K2	5
	ii) Summarize Drone surveying and brief about the application of it.	8	K2	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: III [Full Time]

Computer Science and Engineering

22CS302 – SOFTWARE ENGINEERING

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Write the IEEE definition of Software Engineering.	2	K2	1
2. Identify the software model that is appropriate when the requirements are not well-understood.	2	K3	1
3. Classify the following as functional /non-functional requirements for a banking system (a) Verifying bank balance (b) Completion of transactions in less than one second. How can refactoring be made more effective?	2	K2	2
4. What do you infer from the design quality attributes 'FURPS'?	2	K2	2
5. 'A system must be loosely coupled and highly cohesive'-Justify.	2	K2	2
6. How can refactoring be made more effective?	2	K1	2
7. Mention the process of measuring cyclomatic complexity.	2	K2	3
8. Distinguish alpha and beta testing.	2	K2	3
9. List out the types of decomposition techniques.	2	K1	3
10. Define the term function point.	2	K1	3

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Illustrate about any two prescriptive process models.	8	K1	1
ii) Compare personal model with team process model.	8	K2	1
(OR)			
b) i) List the other agile process models and explain any two models.	8	K1	1
ii) Explain the concept of extreme programming (XP) in software engineering.	8	K2	1

Q. No		M	BTL	CO
12. a)	i) Describe about Requirement Engineering with an example.	12	K2	1
	ii) Write about software requirement specification for a system of your choice.	4	K2	1
	(OR)			
b) i)	Explain with example, the class based requirements modelling.	12	K2	2
	ii) Explain about quality function deployment and list down its phases.	4	K2	2
13. a)	Classify and explain the various architectural styles in detail.	16	K2	2
	(OR)			
b)	List the steps involved in transaction mapping and describe transaction mapping with example.	16	K2	2
14. a)	i) Explain about basis path testing and its types.	8	K4	3
	ii) Analyze about unit testing and integration testing.	8	K4	3
	(OR)			
b) i)	Compare white – box and black-box testing with an example.	8	K4	3
	ii) Briefly explain about debugging process with a neat diagram.	8	K4	3
15. a)	Discuss COCOMO estimation criteria and Software metrics.	16	K4	3
	(OR)			
b) i)	Explain the need and process of integrating metrics within the software. Also discuss the various metrics to measure the software quality	16	K4	3

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: III [Full Time]

Electronics and Communication Engineering

22EC302 – DIGITAL SYSTEM DESIGN

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

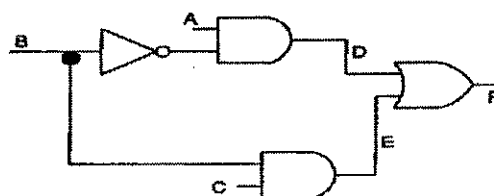
Q. No	M	BTL	CO
1. Express the Boolean function $F = xy + x^1z$ in a product of maxterms.	2	K3	1
2. Implement EXOR function using NAND gates.	2	K2	1
3. Give the expression for difference and borrow of a full subtractor.	2	K1	2
4. List the procedure to perform 2's complement subtraction.	2	K1	2
5. What is race round condition? How it is avoided?	2	K2	3
6. Differentiate Mealy and Moore state machines.	2	K2	3
7. List the two types of Asynchronous sequential circuits.	2	K1	4
8. Differentiate between static-0 and static-1 hazard.	2	K2	4
9. Compare and contrast static RAM and dynamic RAM.	2	K2	5
10. Differentiate PROM, PAL and PLA.	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Using Demorgan's theorem, Express the function $F = \bar{A}B + \bar{A}\bar{B}C + B\bar{C}$ using only 'AND' gate.	8	K3	1
ii) Simplify the following using Quine McCluskey method $F = \sum m(0,1,5)$. Realize the simplified function using logic gates.	8	K3	1
(OR)			
b) i) Simplify the following using K-map $F(W, X, Y, Z) = \sum m(0,1,4,5,9,10,11,15)$.	8	K3	1
ii) Implement a function $F = \bar{A}\bar{B}\bar{C} + \bar{B}\bar{C} + \bar{E}$ Using NAND gates.	8	K3	1

Q. No		M	BTL	CO
12. a)	i) Design a BCD adder and draw the logic diagram.	8	K3	2
	ii) Implement the following function using suitable multiplexer $F(A,B,C,D) = \sum m(0,1,2,6,9,10,12,13).$ (OR)	8	K3	2
b)	i) Design a magnitude comparator to compare two 3-bit numbers.	8	K3	2
	ii) Illustrate the BCD to Excess 3 code converter using minimum number of NAND gates.	8	K3	2
13. a)	i) Design a sequence detector using JK flip flops and additional logic to detect the sequence 100011.	8	K3	3
	ii) Explain state reduction with suitable example. (OR)	8	K1	3
b)	i) Design a 3-bit universal shift register with parallel load capability.	8	K3	3
	ii) Explain the ring counter and its application.	8	K1	3
14. a)	An asynchronous sequential circuit is described by the following excitation and output function: $Y = X_1X_2 + (X_1 + X_2)y$ $Z = y$ i) Draw the logic diagram of the circuit ii) Derive the transition table and output map iii) Describe the behavior of the circuit. (OR)	16	K3	4
b)	In the given circuit Fig.1 assume that each gate has a propagation delay of 10ns. Identify and explain the static hazard present in this circuit by drawing the timing chart. Also design the Hazard free circuit.	16	K3	4



● — represents the connection

Fig.1.

Q. No		M	BTL	CO
15. a)	i) Implement Binary to Gray code converter using PROM devices.	8	K3	5
	ii) Implement the following Boolean function using 3×4×2 PLA, $F_1(X,Y,Z) = \sum (0,1,3,5) \text{ and } F_2(X,Y,Z) = \sum (3,5,7).$	8	K3	5
	(OR)			
b)	i) Implement the following functions using suitable PLA. $F(w,x,y,z) = w'xyz + wx'y'z' + y'z$ $F(w,x,y,z) = wxyz + w'x'y'z'$	8	K3	5
	ii) Demonstrate the realization of the following function using PAL. $F_1(X,Y,Z) = \sum (1,2,4,5,7) \text{ and } F_2(X,Y,Z) = \sum (0,1,3,5,7).$	8	K3	5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: III & IV [Full Time]

Mechanical Engineering

22ME302/18ME403 – FLUID MECHANICS AND MACHINERY

(Regulations 2022/2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Relate various fluid pressures with a sketch.	2	K1	1
2. State hydrostatic law.	2	K1	1
3. List the assumptions made to derive Bernoulli's equation.	2	K1	2
4. Outline the importance of Buckingham Π theorem.	2	K2	2
5. What is flownet?	2	K1	3
6. Interpret the difference between the laminar flow and turbulent flow through circular pipes.	2	K2	3
7. Illustrate the performance curves of Pelton turbine.	2	K2	4
8. Classify fluid machines.	2	K1	4
9. Compare the working of gear and vane pump.	2	K2	4
10. Explain the concept of cavitation in hydraulic pumps.	2	K2	4

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) If the velocity distribution over a plate is given by $u = \frac{2}{3}y - y^2$ in which u is the velocity in meter per second at a distance y meter above the plate, determine the shear stress at $y = 0$ and $y = 0.15$ m. Take the dynamic viscosity of the fluid as 8.63 poise.	8	K3	1
ii) Derive an expression for pressure force and center of pressure for an Inclined immersed plane surface.	8	K3	1

(OR)

Q. No		M	BTL	CO
b) i)	Determine the bulk modulus of elasticity of a liquid, if the pressure of the liquid is increased from 70 N/cm ² to 130 N/cm ² . The volume of the liquid decreases by 0.15 per cent.	8	K3	1
ii)	Find the volume of the water displaced and position of center of buoyancy for a wooden block of width 2.5 m and depth 1.5 m, when it floats horizontally in water. The density of wooden block is 650 kg/m ³ and its length 6 m.	8	K3	1
12. a) i)	Derive Bernoulli's equation by stating the assumptions and limitations.	8	K2	2
ii)	A pipe through which water is flowing is having diameters 20 cm and 10 cm at the cross sections 1 and 2 respectively. The velocity of water at section 1 is given 4 m/s. Find the rate of discharge.	8	K2	2
(OR)				
b)	Using Buckingham's π - theorem, show that the velocity through a circular orifice in a pipe is given by $V = \sqrt{2gH} f\left(\frac{D}{H}, \frac{\mu}{\rho v H}\right)$, where v is the velocity through orifice of diameter D , H is the head causing the flow, ρ and μ are the density and dynamic viscosity of the fluid passing through the orifice and g is acceleration due to gravity.	16	K2	2
13. a)	Three pipes of 400 mm, 200 mm and 300 mm diameter have length of 400 m, 200 m and 300 m respectively. They are connected in series to make a compound pipe. The end of this compound pipe is connected with two tanks whose difference of water levels is 16 m. If the coefficient of friction for these pipes are same and equal to 0.005, determine the discharge through the compound pipe by considering both major and minor losses.	16	K3	3
(OR)				
b)	Make use of expression for shear stress and velocity distribution for the flow through circular pipe and develop the Hagen Poiseuille formula.	16	K3	3

Q. No		M	BTL	CO
14. a)	A pelton wheel is to work at the foot of a dam whose reservoir level is 220 m. The full opening of the turbine nozzle is 200 mm and the coefficient of velocity C_v is 0.98. The turbine is to operate at 250 rpm and develop a power of 3.75 MW. Assuming the blade to jet ratio as 0.46, estimate the desirable wheel diameter at the pitch circle of the blades. The blade outlet angle is 16° . Calculate the blade efficiency, turbine efficiency neglecting frictional effects.	16	K3	4
	(OR)			
b)	The following data are given for a Francis turbine. Net head $H = 60$ m, speed $N = 700$ rpm, Shaft power $P = 294.3$ kW, overall efficiency = 84%, hydraulic efficiency = 93%, flow ratio = 0.20, breadth ratio = 0.1, outer diameter of the runner = 2 x inner diameter of the runner, velocity of flow is constant at inlet and outlet and discharge is radial at outlet. Determine: i) Guide Blade angle. ii) Runner vane angle inner and outer. iii) Diameter of runner at inlet and outlet and iv) Width of the wheel at inlet.	16	K3	4
15. a)	A single acting reciprocating pump running at 50 rpm delivers $0.01 \text{ m}^3/\text{s}$ of water. The diameter of the piston is 200 mm and stroke length 400 mm, determine, i) theoretical discharge ii) coefficient of discharge iii) slip and percentage of slip of the pump.	16	K3	4
	(OR)			
b)	The internal and external diameters of the impeller of a centrifugal pump are 220 mm and 420 mm respectively. The pump is running at 1000 rpm. The vane angles of the impeller at inlet and outlet are 20° and 30° respectively. The water enters the impeller radially and the velocity of flow is constant. Determine the work done by the impeller per unit weight of water.	16	K3	4

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: III [Full Time]

Metallurgical Engineering

22MT302/18MT302 – MINERAL DRESSING, FUELS AND FURNACES

(Regulations 2022/2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Give the differences between ores and minerals.	2	K2	1
2. What is meant by under sized and over sized particles?	2	K2	1
3. What is leaching of ores?	2	K1	2
4. Write the differences between magnetic separation and electro static separation.	2	K2	2
5. Compare and contrast the solid fuels with gaseous fuels.	2	K2	3
6. Calculate the amount of actual air required for 1kg/hr coal combustion.	2	K3	3
7. Give the working principle of industrial thermocouples.	2	K3	4
8. List the differences between batch type furnace and continuous furnace.	2	K2	4
9. Give the metallurgical applications of refractories.	2	K2	5
10. What is meant by neutral refractories and give a few examples?	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) List four industrially important minerals and explain their physical characteristics pertaining to mineral dressing.	16	K2	1
(OR)			
b) With neat sketches, explain the mechanism and procedure of ore crushing by jaw crushers.	16	K2	1
12. a) Discuss in detail various types of classifiers with required sketches.	16	K2	2
(OR)			
b) Explain the principle and procedure of froth flotation process with neat sketches.	16	K2	2

Q. No		M	BTL	CO
13. a)	Demonstrate the manufacturing of metallurgical coke from coal and give the properties of metallurgical coke.	16	K3	3
	(OR)			
b)	A particular coal has the following ultimate analysis on a dry basis, percent by mass. This coal is to be burned with 30% excess air. Calculate the air-fuel ratio on a mass basis.	16	K3	3

Component	Percent by mass
Sulfur	0.6
Hydrogen	5.7
Carbon	79.2
Oxygen	10.0
Nitrogen	1.5
Ash	3.0

14. a)	Explain the construction and operation of coreless induction furnace used for melting of cast irons.	16	K2	4
	(OR)			
b)	Explain the construction and operation of direct arc furnace used for melting of steels and super alloys.	16	K2	4
15. a)	Give a detailed account on the classification and properties of different types of refractories.	16	K2	5
	(OR)			
b)	Give the properties and applications of the following refractories:	16	K2	5
	1) Alumina .			
	2) Dolomite .			

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: I [Part Time]

Civil Engineering

22PTCE102/23PTCE102 – MECHANICS OF FLUIDS

(Regulations 2022/2023)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define pascal's law?	2	K1	1
2. What are the different types of pressure?	2	K1	1
3. Define meta center and metacentric height.	2	K2	2
4. Write the continuity equation for two dimensional forms.	2	K2	2
5. What are the various parts of venturimeter?	2	K1	3
6. Compare laminar flow and turbulent flow.	2	K2	3
7. Differentiate hydraulic gradient line and total energy line.	2	K2	4
8. State the effect of boundary layer separation.	2	K1	4
9. List the type of similarities between model and prototype.	2	K1	5
10. Define the term scale effect.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Calculate the specific weight, mass density, specific gravity and specific volume of oil having a volume of 4.5 m ³ and weight of 40 kN.	6	K3	1
ii) A liquid with a kinematic viscosity of 4 centistokes and specific weight 8000 N/m ³ fills the space between a large stationary plate and a parallel plate of 550 mm ² which are kept 2 mm apart. If a parallel plate is to be pulled with a uniform velocity of 3 m/s, determine the force and power required to maintain this speed.	10	K2	1

(OR)

Q. No	M	BTL	CO
b) i) If certain oil has density 1370 kg/m^3 , the shear stress of a point in oil of 0.354 N/m^2 and the velocity gradient at that point is 0.23 per second. Calculate the kinematic viscosity.	6	K3	1
ii) Explain different types of manometers for pressure measurements.	10	K2	1
12. a) i) A circular plate of 2.5 m diameter is immersed in an oil of specific gravity 0.8. The center of the plate is 4 m from the free surface of oil. Find the total pressure and position of center of pressure.	8	K3	2
ii) Explain the different fluid flow classification. (OR)	8	K2	2
b) i) A square plate of side 3 m is immersed in water vertically, top edge is parallel and 2 m below the free surface. Find the total pressure and position of center of pressure using pressure diagram.	8	K3	2
ii) What is stream function and velocity potential function? Write it's laplace equations?	8	K2	2
13. a) State Bernoulli's theorem for steady flow of a incompressible fluid. Derive an expression for Bernoulli's equation from first principle and state the assumption made for such a derivation. (OR)	16	K2	3
b) Oil of viscosity 0.183 Ns/m^2 and specific gravity 0.87 flows through a horizontal pipe of 35 mm diameter. If the pressure drop per meter length of the pipe is 14 kN/m^2 determine the a) rate of flow b) shear stress at the pipe wall c) shear stress within the fluid 10 mm from pipe center d) Reynolds number of flow e) power required per 50 m length of pipe to maintain the flow	16	K2	3
14. a) Discuss about the major and minor losses in pipe. Write different expression to find major and minor losses. (OR)	16	K2	4

Q. No	M	BTL	CO

- b) The velocity distribution in the boundary layer is given by $\frac{u}{U} = \frac{y}{\delta}$

16	K2	4

where,

u = velocity at a distance y from the flat plate and $u = U$ at $y = \delta$
and δ = Boundary layer thickness.

Determine the value of

- i) Displacement thickness
- ii) Momentum thickness
- iii) Energy thickness

15. a) The discharge (Q) of a centrifugal pump depends upon the mass density of fluid (ρ), speed of the pump (N), diameter of the impeller (D), manometric head (H) and viscosity of fluid (μ). Show that

16	K3	5

$$Q = ND^3 \phi \left[\frac{gH}{N^2 D^2}, \frac{\mu}{\rho N D^2} \right]$$

(OR)

- b) Efficiency η of a fan depends on the density (ρ), dynamic viscosity of the fluid (μ), angular velocity (ω), diameter (D) of the rotor and discharge (Q). Express η in terms of dimensional parameters.

16	K3	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: III [Full Time] / II [Part Time]

Electrical and Electronics Engineering

22EE302/22PTEE201/23PTEE201 – ELECTROMAGNETIC THEORY

(Regulations 2022/2023)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Check if the following vector field is compressible or incompressible: $\vec{F} = -x^2y\vec{i} + y^2x\vec{j}$	2	K2	1
2. State Curl theorem Give and its applications.	2	K3	2
3. List the properties of a charged conductor in electrostatic conditions.	2	K2	3
4. Distinguish between Dielectric constant and Dielectric strength.	2	K2	1
5. What are the characteristics of a static magnetic field?	2	K1	2
6. A coil has a self-inductance of 1 H and a resistance of 4 Ω . If it is connected to a 40 V DC supply, estimate the energy stored in the magnetic field when the current has attained the final steady value.	2	K3	4
7. Define the terms: (i). MMF, and (ii). Reluctance.	2	K2	3
8. Distinguish between conduction and displacement currents.	2	K2	4
9. Write the one dimensional wave equation for an EM wave traveling in z-direction.	2	K1	2
10. Calculate the intrinsic impedance of free space.	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) By means of Gauss's law, determine the electric field intensity inside and outside a spherical shell of radius R. The shell contains a total charge Q uniformly distributed over the surface.	10	K3	1
ii) Given point Q(-1, 5, 2) and $\vec{A} = 2y\vec{i} + (x+3z)\vec{j}$, express $\vec{A}$ in spherical coordinates.	6	K4	2

(OR)

Q. No		M	BTL	CO
b)	i) A circular ring of radius 'a' carries a uniform charge 'λ' C/m and is placed on the xy-plane with axis the same as the z-axis. Apply Coulomb's law to determine the electric field intensity E at a point P distant 'h' along the axis perpendicular to the plane of the ring. What values of 'h' give the maximum value of E? ii) Determine the divergence of the following vector fields and evaluate them at the specified points. (1). $\vec{P} = 2yz\vec{a}_x + 4xy\vec{a}_y + 3y\vec{a}_z$ at (1, -3, 2) (2). $\vec{Q} = 3\rho z \sin\phi\vec{a}_\rho + 6\rho z^2 \cos\phi\vec{a}_\phi$ at (4, $\pi/2$, 1).	10	K3	2
12.	a) i) Derive Laplace's and Poisson's equations from Gauss's law for a linear material medium. State the importance of these equations. ii) Describe in detail the concept of Polarization in dielectrics. (OR) b) i) Find the expression for the potential due to a dipole at a point P not in the line connecting the two poles of the dipole. ii) A parallel plate capacitor is charged to a potential difference of 500 V. The two parallel metal plates are of 30 cm $\times$ 30 cm surface area and are separated by 5 mm in air. Find the capacitance of the capacitor. Also find the total energy stored by the capacitor and the energy density.	10	K2	3
		6	K1	1
13.	a) i) Derive boundary conditions for static magnetic fields in the general form across a common boundary separated by two different media. The common boundary has a surface current density 'K'. ii) What is the maximum torque on a square loop of 1000 turns in a field of uniform flux density of 1 Tesla? The loop has 10 cm sides and carries a current of 3 A. What is the magnetic moment of the loop? (OR) b) i) By means of Biot - Savart's law, derive an expression for the flux density produced by an infinitely long straight wire carrying a current 'I', at any point P distant 'a' normal to the wire.	10	K4	4
		6	K3	2
		10	K4	4

Q. No		M	BTL	CO
	ii) If the vector potential is given by $\vec{A} = \vec{i} 5(x^2 + y^2 + z^2)^{-1}$ Wb/m, find the magnetic flux density $\vec{B}$.	6	K3	2
14.	a) i) State and explain the laws of electromagnetic induction and the rule which determines the direction of the induced emf.	6	K1	4
	ii) Derive the Maxwell's equations in both point and integral forms from Ampere's law and Faraday's law of electromagnetic induction.	10	K2	3
	(OR)			
	b) i) Show that the total displacement current between the condenser plates connected to an alternating current voltage source is exactly same as the value of charging current (conduction current) flowing in the leads.	6	K1	4
	ii) By means of a simple RLC series circuit, explain the relationship between the field theory and circuit theory.	10	K2	3
15.	a) Describe in detail the electromagnetic wave propagation in lossy dielectrics.	16	K4	5
	(OR)			
	b) Show that the total power flow along a coaxial cable is given by the surface integration of the Poynting vector over any closed surface.	16	K4	5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV [Part Time]

Mechanical Engineering

22PTME401 – HEAT AND MASS TRANSFER

(Regulations 2022)

(Use of Heat and Mass Transfer data book and Steam table is Permitted)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define the Fourier law of heat conduction.	2	K1	1
2. Recall the uses of Heisler chart.	2	K1	1
3. Define Kirchoff's law of radiation.	2	K1	2
4. Compare black body and gray body.	2	K2	2
5. Define boundary layer thickness.	2	K1	3
6. Compare forced convection and natural convection.	2	K2	3
7. List the modes of condensation.	2	K1	4
8. Show the temperature profiles of parallel flow and counter flow in heat exchangers.	2	K1	4
9. Name the examples of mass transfer.	2	K1	5
10. What do you understand by convective mass transfer?	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) A furnace wall is made up of three layers of thicknesses 25 cm, 10 cm and 15 cm with thermal conductivities of 1.65 W/mK, 4.83 W/mK and 9.2 W/mK respectively. The inside wall is exposed to gases at 1250°C with a convection coefficient of 25 W/m ² K and the inside surface is at 1100°C. The outside surface is exposed to air at 25°C with convection heat transfer coefficient of 12 W/m ² K. Determine i) The overall heat transfer coefficient ii) Temperatures at all intermediate points	16	K3	1

(OR)

Q. No	M	BTL	CO
b) An aluminum alloy fin of 7 mm thick and 50 mm long protrudes from a wall, which is maintained at 120°C. The ambient air temperature is 22°C. The heat transfer coefficient and thermal conductivities of the fin material are 140 W/m ² K and 55 w/mK respectively. Determine i) Temperature at the middle of the fin ii) Total heat dissipated by the fin.	16	K3	1
12. a) A black body at 3000 K emits radiation. Calculate the following: i). Monochromatic emissive power at 1 μm wave length. ii). Wave length at which the emission is maximum iii). Maximum emissive power iv). Total emissive power v). Calculate the total emissive power of the furnace if it is assumed as a real surface having emissivity equal to 0.85.	16	K3	2
(OR)			
b) Calculate the net radiant heat exchanger per m ² area for two large parallel plates at temperatures of 427°C and 25°C respectively. Emissivities of hot and cold plates are 0.9 and 0.6. If a polished aluminum shield of emissivity 0.04 is placed between them, find the percentage of reduction in the heat transfer.	16	K3	2
13. a) Air at 10°C and at a pressure of 100 kPa is flowing over a flat horizontal plate at a velocity of 3 m/s. If the plate is 30 cm wide and at a temperature of 60°C. Calculate the following quantities at x = 0.3 m. i) Local convective heat transfer coefficient, ii) The heat transfer from the plate	16	K3	3
(OR)			
b) A vertical plate of 12 cm outer diameter and 2.3 m long, at a surface temperature of 120°C is in a room where the air is at 20°C. calculate: i) Convective heat transfer coefficient. ii) The heat loss per metre length of the pipe.	16	K3	3

Q. No		M	BTL	CO
14. a)	Dry saturated steam at a pressure of 2.45 bar condenses on the surface of a vertical tube of height 1 m. The tube surface temperature is kept at 117°C. Estimate the thickness of a condensate film.	16	K3	4
	(OR)			
b)	A counter flow heat exchanger is used to heat air entering at 400°C with a flow rate of 6 kg/s by exhaust gas entering at 800°C with a flow rate of 4 kg/s. The overall heat transfer coefficient is 100 W/m ² K and the outlet temperature of air is 551.5°C. The specific heat at constant pressure for both air and exhaust gas can be taken as 1100 J/kgK. Calculate: i) Heat transfer area needed and ii) Number of transfer units.	16	K3	4
15. a)	The molecular weight of the two component A and B of a gas mixture are 24 and 28 respectively. The molecular weight of a gas mixture is found to be 30. If the mass concentration of the mixture is 1.2 kg/m ³ , determine the following; i) Density of component A and B ii) Molar fraction iii) Mass fraction iv) Total pressure, if the temperature of the mixture is 290 K.	16	K3	5
	(OR)			
b)	Dry air at 30°C and one atmospheric pressure flows over a flat plate of 600 mm long at a velocity of 55 m/s. Calculate the mass transfer co-efficient at the end of the plate.	16	K3	5



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Government College of Engineering :: Salem
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B.E. Degree Examinations – April/May 2025

Semester: III [Part Time]

Civil Engineering

16PTCE304 – STRUCTURAL ANALYSIS - I

(Regulations 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Distinguish between influence line diagram and Bending Moment Diagram
2. State the use of ILD.
3. What is absolute maximum Bending Moment?
4. State Muller Breslau's principle.
5. Define two hinged Arch.
6. Name the internal stress resultants induced in an arch section
7. What is cable over saddle?
8. What is the main function of stiffening girders in suspension bridges?
9. List out the assumption made for plastic analysis.
10. State lower bound theory.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) A single load of 100 kN rolls along a girder 20 m span. Draw the ILD of maximum bending moment, maximum positive shear force and negative shear force. (6)
- ii) Two concentrated loads 200 kN and 80 kN spaced at 2 m apart move on the span of girder of 16 m. if any wheel load can lead the other, calculate the maximum bending moment at a section 6 m from left support. (10)

(OR)

- b) i) An UDL of length 4 m and intensity 40 kN/m rolls across a girder of span 10 m. Calculate the maximum bending moment at a section 4 m from left support. (6)
- ii) A truck with axle loads of 40 kN and 60 kN on a wheel base of 5 m rolls across a 10 m span. Compute the maximum bending moment. (10)
12. a) i) An UDL of length 2 m and intensity 25 kN/m rolls across a girder of span 10 m. Calculate the maximum shear force at a section 4 m from left support. (4)
- ii) The four equal loads of 150 kN each equally spaced at apart 2 m and UDL of 60 kN/m at a distance of 1.5 m from the last 150 kN loads cross a girder of 20 m from span R to L. Using influence line calculate the S.F at a section of 8 m from L.H.S support when leading of 150 kN 5 m from L.H.S (12)

(OR)

- b) i) Where do you have the absolute maximum bending moment in a simply supported beam when a series of wheel loads cross it? (4)
- ii) A Simply supported of span 10 m, When a train of four wheel loads of 50 kN, 60 kN, 100 kN, 80 kN spaced at 0.5 m, 1 m, 0.2 m respectively cross the span with 50 kN load leading. Determine Absolute max BM of the beam. (12)
13. a) i) A parabolic 3-hinged arch carries a UDL of 30 kN/m on the left half of the span. It has a span of 40 m and central rise of 10 m. Determine the resultant reaction at supports. Find the bending moment at 15 m from left support. (8)
- ii) A two hinged parabolic of Arch of span 30 m and rise 9 m carries a UDL of 20 kN/m over the left half. Find the horizontal reaction and vertical reaction at the supports. (8)

(OR)

- b) i) A two hinged parabolic of Arch of span 60 m and rise 12 m carries a point load of 80 kN at 15 m from the left support. Find the horizontal reaction and vertical reaction at the support. (8)
- ii) A three hinged circular arch hinged has a span of 40 m and central rise of 80 m. It carries a concentrated load of 100 kN at the right quarter span point. Find the normal thrust and radial shear at 10 m from left support. (8)

14. a) i) A suspension cable having supports at the same level has span of 50 m and the maximum dip is 4.2 m. the cable is loaded with a UDL of 20 KN/m run over the whole span. Find the maximum tension in the cable. (4)
- ii) A suspension bridge of 250 m span has two nos. of three hinged stiffening girders supported by cables with a central dip of 25 m. if four point loads of 300 kN each are placed at the centre line of the roadway at 20, 30, 40 and 50 m from left hand hinge. Find the shear force and bending moment in each girder at 62.5 m from each end. Calculate also the maximum tension in the cable. (12)

(OR)

- b) i) A suspension cable is suspended between two points at the same level 55 m apart. It carries a UDL of 15 KN/m. Determine the minimum central dip that may be allowed if the maximum tension in the cable is limited to 1150 KN. Find also the length of the cable. (4)
- ii) A suspension cable has a span of 120 m and a central dip of 10 m and is suspended from the same level at both towers. The bridge is stiffened by a stiffening girder hinged at the end supports. The girder carries a single concentrated load of 100 kN at a point 30 m from left end. Assuming equal tension in the suspension hangers. Calculate the horizontal tension in the cable and the maximum positive bending moment. (12)
15. a) i) Calculate the shape factor of I section having dimension top and bottom flange 300 mm x 50 mm and web 50 mm x 200 mm. the value of yield stress is 250 N/mm². Find the plastic moment capacity of the section. (8)
- ii) A portal frame of beam span 6m, and column height 5 m is fixed at both supports and has uniform cross section. It is loaded with point load of 40 KN at the centre of beam as well as a horizontal force 15 KN at its top left corner. Calculate the plastic moment capacity of the frame. (8)

(OR)

- b) i) A two span continuous beam of uniform section is fixed at A and hinged at B and C. Span AB is 8 m and BC is 6 m Long. A point load of 50 KN is acting on AB at 4m from A. Span Bc is Loaded with UDL of intensity 10 KN/m. Determine the required M_p . (8)
- ii) A portal frame of beam span 5 m, both left and right column height 5 m is hinged at left support and fixed at right support and has uniform cross section. It is loaded with UDL of 25 KN/m at entire length of beam. Calculate the plastic moment capacity of the frame. (8)

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV [Part Time]

Electrical and Electronics Engineering

16PTEE402 – TRANSMISSION AND DISTRIBUTION

(Regulations 2016/206A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Specify few disadvantages in EHVAC systems.	2	K1	1
2. List the application of HVDC transmission system.	2	K2	1
3. Mention the effect of bundling of conductors.	2	K1	2
4. Specify the difference between skin and proximity effects.	2	K2	2
5. What is the need for ABCD constants?	2	K1	3
6. Compare the performance of short line and medium line transmission.	2	K2	3
7. Specify the applications of LT and HT cables.	2	K3	4
8. Define string efficiency of insulator.	2	K1	4
9. What is the necessity of effective grounding system?	2	K2	5
10. Draw the resonant grounding system.	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain the structure of the following types i) HVDC Transmission ii) EHVAC Transmission.	16	K1	1
(OR)			
b) Discuss about the economics of transmission and technical performance and reliability.	16	K1	1
12. a) Derive the expression to determine the inductance of three phase transmission lines with transposition.	16	K3	2
(OR)			
b) Derive the expression to determine the capacitance of single phase transmission lines.	16	K3	2

Q. No		M	BTL	CO
13. a)	Discuss the equivalent circuits, phasor Diagrams, transmission efficiency and voltage regulation of Short transmission lines.	16	K2	3
	(OR)			
b)	Elaborate the effects of corona loss and its impact in power transmission capability.	16	K2	3
14. a)	Analyze the potential distribution over a 3-disc string of suspension insulators.	16	K4	4
	(OR)			
b)	Analyze the dielectric stress in a single core cable and the effectiveness of grading of cables.	16	K4	4
15. a)	Explain the different methods of neutral grounding.	16	K2	5
	(OR)			
b)	Discuss the radial and ring- main distribution systems.	16	K2	5

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Government College of Engineering :: Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Part Time]
(Mechanical Engineering)

16PTME601 – ENGINEERING ECONOMICS AND FINANCIAL MANAGEMENT

(Regulations 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

(10 x 2 = 20 Marks)

Part A

Answer **ALL** Questions

1. Differentiate sunk cost and opportunity cost.
2. Define Profit –Volume ratio.
3. List out the advantages and application of value engineering.
4. What is the function of money?
5. Define future worth method.
6. List out the fund flow techniques.
7. Write the scope of financial management.
8. What is probability index?
9. What is meant by accounting?
10. List out the significance of ratio analysis.

Part B

(5 x 16 = 80 Marks)

Answer **ALL** Questions

11. a) Briefly discuss about the five components of break-even analysis. (16)
(OR)
b) Explain the concepts of law of supply and demand with suitable example. (16)
12. a) Discuss briefly the basic steps in value engineering. (16)
(OR)
b) Explain the equal payment series sinking fund factor and equal payment series payment present worth factor. (16)

13. a) Investment proposals A and B have the net cash flows as follows: (16)

<i>Proposal</i>	<i>End of years</i>				
	0	1	2	3	4
A (Rs.)	-10,000	3,000	3,000	7,000	6,000
B (Rs.)	-10,000	6,000	6,000	3,000	3,000

Compare the present worth of A with that of B at $i = 18\%$. Which proposal should be selected?

(OR)

- b) Explain the procedure of rate of return method with an example. (16)

14. a) Explain in detail about the working capital management. (16)

(OR)

- b) Briefly describe about the five types of time value of money. (16)

15. a) Explain the different types of ratios used in ratio analysis with its significance and limitations. (16)

(OR)

- b) Briefly describe about the purpose of financial statement. (16)

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Civil Engineering

22CEPE04 - AIR POLLUTION CONTROL ENGINEERING

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q.No	M	BTL	CO
1. Define primary and secondary air pollutants.	2	K1	1
2. What are the devices used for air sampling?	2	K2	1
3. Define Environmental lapse rate.	2	K3	2
4. Name two effects of air pollution on meteorological conditions.	2	K1	2
5. What is control efficiency?	2	K1	3
6. List out the types of scrubbers.	2	K2	3
7. What is acoustic zoning?	2	K1	4
8. Write short note on air quality monitoring.	2	K2	4
9. Mention the preventive measures of noise pollution.	2	K2	5
10. State Noise Standards.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q.No	M	BTL	CO
11. a) i) How is high volume air sampler used for ambient air quality sampling? Explain.	8	K4	1
ii) Discuss about the air pollutants that contribute climate change.	8	K4	1
(OR)			
b) i) Summarize the causes of "Ozone layer depletion" with necessary equations.	8	K4	1
ii) Analyze the effects of air pollution on human beings, animals and vegetation.	8	K4	1

Q.No		M	BTL	CO
12. a)	i) Evaluate the factors influencing the atmospheric dispersion of air pollutants.	8	K4	2
	ii) Examine the role of meteorological factors in the dispersion of air pollutants in the atmosphere.	8	K4	2
	(OR)			
b) i)	Analyze the Gaussian plume model with a neat sketch.	8	K4	2
	ii) Illustrate the wind rose diagram.	8	K4	2
13. a)	Describe the working principle of electro static precipitator with its advantage and disadvantage.	16	K1	3
	(OR)			
b)	Define adsorption and differentiate between physical and chemical adsorption.	16	K1	3
14. a)	i) Demonstrate the air pollution control acts and regulation in India.	6	K2	4
	ii) Explain what do you understand by air quality standards and air quality monitoring.	10	K2	4
	(OR)			
b) i)	Outline the engineering design of condensation mode of air pollution control effects.	10	K2	4
	ii) Write a short note on Environmental impact Assessment.	6	K2	4
15. a)	Elaborate the causes and effects of noise pollution	16	K3	5
	(OR)			
b)	Identify the various sources of noise pollution.	16	K3	5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Civil Engineering

22CEPE06 – SUBSURFACE INVESTIGATION AND INSTRUMENTATION

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. List the objectives of soil exploration programme.	2	K1	1
2. Differentiate direct and indirect methods of subsurface exploration.	2	K2	1
3. State any two limitations of rotary drilling.	2	K1	2
4. Interpret the need for borehole stabilization during drilling operations.	2	K2	2
5. A thin walled soil sampler has an outside diameter 60 mm and an inside diameter of 56 mm. Find the area ratio.	2	K3	3
6. Write the challenges in offshore sampling.	2	K2	3
7. Mention the corrections applied in standard penetration number (N) in Standard penetration test (SPT).	2	K1	4
8. Give the difference between monotonic and cyclic loading in field tests.	2	K2	4
9. Mention the working mechanism of resistance strain gauge.	2	K1	5
10. Name any two instrument used to measure pore water pressure and mention its applications.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Explain the importance of bore hole spacing and depth in subsurface investigation. How does it vary for different types of structures?	8	K2	1
ii) With a neat labelled sketch, Illustrate the seismic method of subsoil investigation. Also mention its limitations.	8	K2	1

(OR)

Q. No		M	BTL	CO
b)	i) Describe the working principle and field setup of multichannel analysis of surface waves.	8	K2	1
	ii) Discuss in detail about seismic cross hole method of soil investigation with neat sketch.	8	K2	1
12. a)	Compare and contrast the displacement and non- displacement boring methods. Also analyze the challenges faced while drilling in difficult subsoil condition.	16	K4	2
	(OR)			
b)	Analyze the impact of improper borehole stabilization on sample integrity and data accuracy in geotechnical investigations. Also discuss the bore log report.	16	K4	2
13. a)	i) Elaborate the components and working of split spoon sampler with neat labelled sketch.	8	K2	3
	ii) Discuss the design features affecting the sample disturbance.	8	K2	3
	(OR)			
b)	i) Write a brief note on offshore sampling technique in geotechnical investigation.	8	K2	3
	ii) Summarize the factors to be considered for preservation and handling of samples.	8	K2	3
14. a)	Explain field vane shear test with neat sketch. How to interpret the results to arrive the shear strength parameters.	16	K2	4
	(OR)			
b)	Discuss the field permeability test with neat sketch. Also discuss the impact of regular soil profile on soil permeability.	16	K2	4
15. a)	Evaluate the effectiveness of different instrumentation techniques used in monitoring the stability of earth dam. Justify suitable recommendations with real world examples.	16	K4	5
	(OR)			
b)	Assess the suitability of load cell and pressure cell in foundation testing. How do these instruments help in ensuring structural safety?	16	K4	5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

(Common to **CSE/Mechanical Engineering**)

22ECOE06 – BASICS OF INTERNET OF THINGS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What role does the cloud play in IoT systems?	2	K2	1
2. What is the difference between M2M and IoT?	2	K2	1
3. Distinguish between M2M and IoT value chains.	2	K2	2
4. What is the need for standards in IoT?	2	K2	2
5. Assess the importance of data management in IoT systems.	2	K1	3
6. How does IoT analytics improve decision making?	2	K2	3
7. Define an IoT physical device.	2	K1	4
8. Mention the advantages of using Python for IoT programming?	2	K2	4
9. Name two challenges in deploying smart parking systems.	2	K1	5
10. State the features of future commercial building automation.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explore the evolution from M2M communication to IoT with suitable examples.	16	K4	1
(OR)			
b) Examine the global context of M2M and IoT adoption. Highlight its challenges and opportunities.	16	K4	1
12. a) Analyze the emerging industrial structure for IoT.	16	K4	2
(OR)			
b) Discuss the main design principles and required capabilities for building an IoT architecture,	16	K4	2

Q. No		M	BTL	CO
13. a)	Discuss the role of devices and gateways in IoT communication.	16	K2	3
	(OR)			
b)	Define "Everything as a Service" (XaaS) and discuss its implications for IoT.	16	K2	3
14. a)	Evaluate the Raspberry Pi board in detail with neat sketch.	16	K4	4
	(OR)			
b)	Describe the different layers of the IoT reference model with a neat diagram.	16	K4	4
15. a)	Discuss the design and implementation of an IoT-based home automation system.	16	K3	5
	(OR)			
b)	Explain the architecture and working of an IoT-based forest fire detection system.	16	K3	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Computer Science and Engineering

18CSPE604 – PYTHON PROGRAMMING

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Evaluate the difference between lists and tuples.	2	K2	1
2. Compare break and continue statement.	2	K2	1
3. Mention the significance of <code>_init_()</code> method in python.	2	K2	2
4. Write a program to determine the factorial of a given number using recursion.	2	K3	2
5. Point out different modes of file opening.	2	K1	2
6. Discuss assertions with example.	2	K2	2
7. Differentiate static and class methods.	2	K2	3
8. Mention the significance of global interpreter lock.	2	K2	3
9. Mention two HTTP methods used in web programming.	2	K1	4
10. Name any two layout managers in Tkinter.	2	K1	4

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Explain in detail about (i) Creating a dictionary (ii) Accessing values in a dictionary (iii) Updating dictionary (iv) Deleting elements from dictionary (v) Copying a dictionary.	10	K2	1
ii) Illustrate the use of break and continue.	6	K2	1
(OR)			
b) i) Explain the various looping statement with a suitable example.	10	K2	1
ii) Describe string slicing. Illustrate how it is done in Python with example.	6	K2	1

Q. No		M	BTL	CO
12. a)	Explain in detail about modules. Create a calculator Module which contains basic arithmetic operations and use the respective operation by importing the module in the program.	16	K3	2
	(OR)			
b)	Discuss in detail about Functions and also discuss about	16	K3	2
	i) Creating functions			
	ii) Calling functions			
	iii) Passing arguments.			
13. a)	Explain in detail about Exception handling. Illustrate the concept of Exception Handling with an appropriate example.	16	K4	2
	(OR)			
b)	Describe in detail about File handling in python. Write a Python program to demonstrate the file I/O operations.	16	K4	2
14. a)	i) Explain in detail about pattern matching using regular expression module.	8	K3	3
	ii) Describe in detail about various types of Inheritance with suitable example programs.	8	K2	3
	(OR)			
b) i)	Write a program to model bank application using class and object concepts.	8	K3	3
	ii) Explain in detail about Operator overloading.	8	K2	3
15. a)	Describe the steps to connect, create, insert, update, and delete records in a SQLite database using Python.	16	K3	4
	(OR)			
b)	Explain how to design a simple GUI application using Tkinter. Include an example with widgets like Label, Entry, and Button.	16	K3	4

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

(Common to **Mechanical and ECE** branches)

**18CSOE02 – OPERATING SYSTEMS/
22CSOE02 – OPERATING SYSTEMS PRINCIPLES**

(Regulations 2022/2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Differentiate symmetric and asymmetric multiprocessing.	2	K2	1
2. Why is the separation of mechanism and policy a desirable principle?	2	K2	1
3. Compare user threads and kernel threads.	2	K2	2
4. Distinguish between preemptive and nonpreemptive Scheduling.	2	K2	2
5. State the importance of process synchronization. Give example.	2	K1	3
6. List out the methods for handling deadlock.	2	K1	3
7. Why swapping of processes from main memory to secondary memory happen?	2	K2	4
8. Define Belady's anomaly.	2	K1	4
9. List the various file attributes.	2	K1	5
10. How free-space is managed using bit vector implementation? List its advantages?	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Explain about the features of Multiprocessor and Desktop systems.	10	K4	1
ii) Write short notes about the services of operating system.	6	K1	1
(OR)			
b) i) Explain the various types of system calls and its categories.	10	K4	1
ii) Describe the three general methods for passing parameters to the operating system.	6	K1	1
12. a) Illustrate the concept of cooperating processes using bounded buffer problem.	16	K3	2

(OR)

Q. No

M BTL CO

- b) Consider the following set of processes, with the length of the CPU burst time given in millisecond. The processes are assumed to have arrived in the order P1, P2, P3, P4, P5, all at time 0.

16 K3 2

Process	Burst Time	Priority
P1	2	2
P2	1	1
P3	8	4
P4	4	2
P5	5	3

Sketch the gantt chart that illustrates the execution of the processes using the scheduling algorithms Non Preemptive SJF, Non Preemptive priority scheduling (a larger priority number implies a higher priority). Compute the turn around and waiting time of each process for each of these scheduling algorithms.

13. a) Examine the two-process solutions in critical section problem for process synchronization with example.

16 K4 3

(OR)

- b) Analyze the characterization and methods for handling deadlocks. Examine that atleast one of the necessary deadlock conditions cannot hold in deadlock prevention.

16 K4 3

14. a) i) Examine in detail about paging and its architecture.

10 K2 4

- ii) Outline the architecture of TLB in paging.

6 K2 4

(OR)

- b) i) Examine in detail about segmentation and its architecture.

10 K2 4

- ii) Outline the architecture of segmentation with paging.

6 K2 4

15. a) Solve the problem of allocating space to the files in the disk in which disk space is utilized effectively and the files are accessed quickly using contiguous and indexed methods.

16 K3 5

(OR)

- b) Consider a disk queue with requests for I/O to blocks on cylinders 98, 183, 41, 122, 14, 124, 65, 67. The head is initially at cylinder number 53. The cylinders are numbered from 0 to 199. Calculate the total head movement (in number of cylinders) incurred while servicing these requests using FCFS, SSTF, SCAN, LOOK disk scheduling algorithms.

16 K3 5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: V [Full Time]

Mechanical Engineering

18CSOE04 – PYTHON PROGRAMMING

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. List the features of Dictionary.	2	K1	1
2. Evaluate the difference between lists and tuples.	2	K2	1
3. Point out different modes of file opening.	2	K2	1
4. Compare break and continue statement.	2	K2	1
5. Illustrate Assertions with an example.	2	K3	2
6. What is the Difference between Errors and Exception?	2	K2	2
7. Differentiate Local variable and Global variable.	2	K2	2
8. Write a program to determine the factorial of a given number with the use of recursion.	2	K3	2
9. Differentiate between static and class methods.	2	K2	3
10. What is an object? Give an example for creating an object.	2	K2	3

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Describe String and Explain its operation with suitable examples.	10	K2	1
ii) Explain how tuples are immutable with example.	6	K3	1
(OR)			
b) i) Describe the following	10	K2	1
i) Creating the list			
ii) Accessing values in the lists			
iii) Updating the list			
iv) Deleting the list elements (v) Copying a list			
ii) Write a program to create a list of even numbers in a given range.	6	K3	1

Q. No		M	BTL	CO
12. a)	i) Write a Python program to demonstrate the file I/O operations.	10	K3	1
	ii) Write a program to reverse a given string.	6	K3	1
	(OR)			
b) i)	Describe in detail about Conditional structures in Python with example programs.	10	K3	1
	ii) Explain in detail about List Comprehension with example.	6	K3	1
13. a) i)	Create a calculator Module which contains basic arithmetic operations and use the respective operation by importing the module in the program.	10	K3	2
	ii) Discuss in detail about the random module.	6	K2	2
	(OR)			
b) i)	Illustrate the concept of Exception Handling with an appropriate example.	10	K3	2
	ii) Describe python packages.	6	K2	2
14. a)	Discuss in detail about Functions and also illustrate different kinds of function arguments with an example.	16	K3	2
	(OR)			
b)	Describe about Map, Filter and Reduce function in python with suitable programs.	16	K3	2
15. a)	Explain in detail about pattern matching using regular expression module.	16	K3	3
	(OR)			
b)	Write a program to model bank application using class and object concepts.	16	K3	3

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Government College of Engineering, Salem

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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Mechanical Engineering

22ECOE07 – BASICS OF ARTIFICIAL INTELLIGENCE

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define "Artificial Intelligence" based on the concept of rational agents.	2	K1	1
2. List the type of problems that are typically solved using adversarial search algorithms like Minimax?	2	K2	1
3. Define 'Prior Probability' and 'Posterior Probability' in the context of Bayesian inference.	2	K1	2
4. What is the primary goal of probabilistic reasoning systems?	2	K2	2
5. Identify the purpose of the sigmoid function in Logistic Regression?	2	K3	3
6. Mention one potential disadvantage of using a simple least-squares linear regression model.	2	K3	3
7. Identify the basic principle behind the voting scheme in model combination?	2	K3	4
8. Justify, how does the K-Nearest Neighbours (KNN) algorithm work for classification?	2	K2	4
9. Distinguish between a single-layer perceptron and a multilayer perceptron.	2	K2	5
10. Brief the concept of dropout as a regularization technique.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Describe Breadth-First Search (BFS) and Depth-First Search (DFS) algorithms. Compare their performance based on the four evaluation criteria (completeness, optimality, time complexity, space complexity).	16	K4	1

(OR)

Q. No		M	BTL	CO
	b) Define a Constraint Satisfaction Problem (CSP). Describe the standard Backtracking Search algorithm used for solving CSPs. Explain two heuristics or techniques used to improve the efficiency of Backtracking Search	16	K4	1
12. a)	i) Explain the 'naïve' assumption of conditional independence and derive the formula used for classification based on Bayes' theorem.	8	K3	2
	ii) Discuss a potential application in Mechanical Engineering, such as classifying product quality (Good/Defective) based on sensor readings (e.g., vibration, surface finish measurements).	8	K3	2
	(OR)			
b)	i) Discuss the concept of Causal Bayesian Networks.	8	K3	2
	ii) Explain how they extend standard Bayesian Networks to model causal relationships.	8	K3	2
13. a)	i) Analyse the method of least squares for fitting a linear model to data with multiple independent variables (Multiple Linear Regression)	8	K4	3
	ii) Analyse step-by-step, how the Batch Gradient Descent algorithm finds the optimal parameters in linear regression.	8	K4	3
	(OR)			
b)	i) Analyse the concept of the maximal margin hyperplane and its importance in Support Vector Machine (SVM).	8	K4	3
	ii) Analyse the concept of a 'kernel trick' and why it is useful for SVMs?	8	K4	3
14. a)	i) Compare and contrast the bagging and boosting ensemble learning techniques.	8	K2	4
	ii) Explain why techniques like Random Forests (based on bagging) are often more robust than individual decision trees.	8	K2	4
	(OR)			
b)	i) Describe the step-by-step process of the K-means clustering algorithm.	8	K2	4

Q. No	M	BTL	CO
ii) Given the following data points and an initial choice of two centroids $c1 = (1,1)$ and $c2 = (4,4)$: $P1=(1,2)$, $P2=(1.5,1.5)$, $P3 = (5,4)$, $P4 = (3,3)$, $P5 = (5,5)$. Perform one iteration of the K-means algorithm, showing the assignment of data points to clusters and the recalculation of the centroids.	8	K2	4
15. a) Describe Multilayer perceptron and activation functions.	16	K1	5
(OR)			
b) Explain how error propagation is done in deep neural networks.	16	K1	5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Mechanical Engineering

22CEOE01 – ENVIRONMENTAL MANAGEMENT

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Differentiate renewable and non-renewable resources.	2	K2	1
2. Summarize the effect of overharvesting in fisheries.	2	K3	1
3. Define Pollutant.	2	K1	2
4. Write short notes on nuclear holocausts	2	K3	2
5. Enumerate the importance of environmental auditing.	2	K1	3
6. List the factors to be considered for life cycle assessment.	2	K2	3
7. Discuss the objectives of environmental law and policy.	2	K1	4
8. List the major points of national environment policy.	2	K2	4
9. Summarize the hurdles for sustainable development.	2	K3	5
10. Define sustainable development.	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) What are renewable energy sources? Describe in detail about soil and land resources.	16	K1	1
(OR)			
b) Explain in detail about the various uses of forest resources.	16	K1	1
12. a) Identify the causes, effects, and control measures of air pollution.	16	K3	2
(OR)			
b) Elaborate the process of management of liquid and solid waste in detail.	16	K3	2

Q. No		M	BTL	CO
13. a)	Examine the purpose, procedure and benefits of environmental impact assessment.	16	K4	3
	(OR)			
b)	Analyze how effectively graphical interface system and remote sensing are used in environmental management systems.	16	K4	3
14. a)	Summarize the salient features of environment protection act and national green tribunal act.	16	K2	4
	(OR)			
b)	Outline the principles of international law and international treaties.	16	K2	4
15. a)	Demonstrate the impact of energy – environment sources in achieving sustainable development.	16	K3	5
	(OR)			
b)	Discuss briefly about the definition, concepts and goals of sustainable development.	16	K3	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Metallurgical Engineering

22MEOE01 – DESIGN OF MACHINE ELEMENTS AND MACHINING

(Regulations 2022)

(Usage of Approved Design Data Book is Permitted)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Interpret the term factor of safety.	2	K2	1
2. What are preferred numbers?	2	K1	1
3. What do you understand by torsional rigidity?	2	K1	2
4. Classify the rivet heads according to Indian standard specifications.	2	K2	2
5. What is stiffness of spring?	2	K1	3
6. Name the various types of ball bearing.	2	K1	3
7. List the functions of cutting fluids.	2	K1	4
8. Define machinability.	2	K1	4
9. Give the comparison between planner and shaper.	2	K2	5
10. Name the various accessories used on lathe.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) A mild steel rod of 12 mm diameter was tested for tensile strength with the gauge length of 60 mm. Following observations were recorded: Final length = 80 mm, Final diameter = 7 mm, Yield load = 3.4 kN and Ultimate load = 6.1 kN. Calculate: i). Yield stress, ii). Ultimate tensile stress, iii). Percentage Reduction in area and iv). Percentage elongation.	8	K3	1

Q. No

M BTL CO

- ii) A hydraulic press exerts a total load of 3.5 MN. This load is carried by two steel rods, supporting the upper head of the press. If the safe stress is 85 MPa and $E = 210 \text{ kN/mm}^2$. Calculate the diameter of the rods extension in each rod in a length of 2.5 m.

8 K3 1

(OR)

- b) i) The load on a bolt consists of an axial pull of 10 kN together with a transverse shear force of 5 kN. Find the diameter of bolt by using Maximum principal stress theory and Maximum shear stress theory.

8 K3 1

- ii) A cast iron link, as shown in Fig.1 (All dimensions are in mm), is required to transmit a steady tensile load of 45 kN. Find the tensile stress induced in the link material at sections A-A and B-B.

8 K3 1

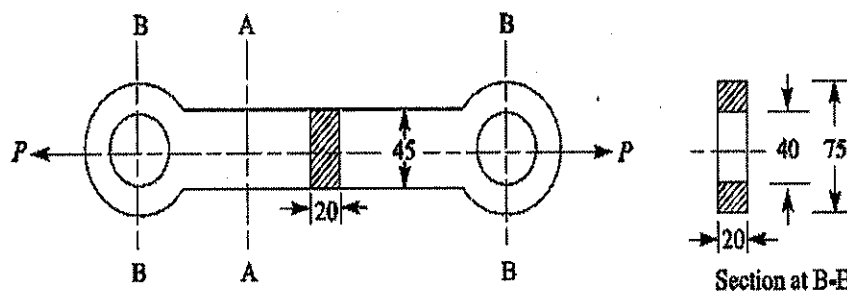


Fig.1

12. a) A plate 75 mm wide and 12.5 mm thick is joined with another plate by a single transverse weld and a double parallel fillet weld as shown in Fig.2. The maximum tensile and shear stresses are 70 MPa and 56 MPa respectively.

16 K3 2

Calculate the length of each parallel fillet weld, if the joint is subjected to both static and fatigue loading.

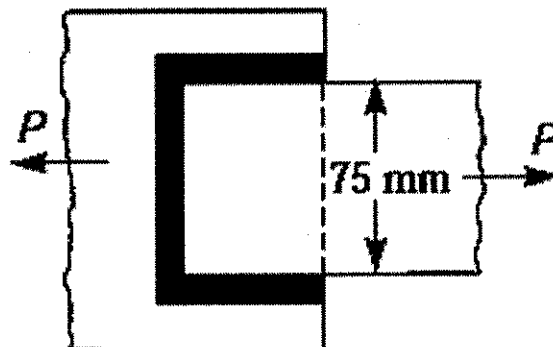


Fig.2

(OR)

Q. No

M BTL CO

- b) Plan a double riveted butt joint with two cover plates for the longitudinal seam of a boiler shell 1.5 m in diameter subjected to a steam pressure of 0.95 N/mm². Assume joint efficiency as 75 %, allowable tensile stress in the plate 90 MPa, compressive stress 140 MPa and shear stress in the rivet 56 MPa.

16 K3 2

13. a) A single-row deep groove ball bearing is subjected to a 30 seconds work cycle that consists of the following two parts:

16 K4 3

	Part I	Part II
Duration (s)	10	20
Radial load (kN)	45	15
Axial load (kN)	12.5	6.25
Speed (rpm)	720	1440

The static and dynamic load capacities of ball bearing are 50 kN and 68 kN respectively. Examine the expected life of the bearing in hours.

(OR)

- b) Analyze a closed coil helical compression spring for a service load ranging from 2250 N to 2750 N. The axial deflection of the spring for the load range is 6 mm. Assume a spring index of 5. The permissible shear stress intensity is 420 MPa and modulus of rigidity, $G = 84 \text{ kN/mm}^2$. Neglect the effect of stress concentration.

16 K4 3

14. a) The following data was obtained from an orthogonal cutting test.

16 K4 4

Rake angle = 20°,

Depth of cut = 6 mm,

Feed rate = 0.25 mm/rev,

Chip length before cutting = 29.4 mm,

Chip length after cutting = 12.9 mm,

Vertical cutting force = 1050 N,

Horizontal cutting force = 630 N,

Using Merchant's analysis, Examine,

- Magnitude of resultant force,
- Shear plane angle.
- Friction force and friction angle

(OR)

Q. No		M	BTL	CO
	b) Discuss with a neat sketch what you understand by the term orthogonal cutting and its relevance in metal cutting.	16	K4	4
15. a)	i) Explain the working principle and operation of a shaper with neat sketch.	10	K2	5
	ii) Compare ASA and ORS systems of tool nomenclature.	6	K2	5
	(OR)			
b) i)	Explain the working principle of the centerless grinding operation with a neat sketch.	10	K2	5
	ii) Summarize the features and characteristics of CAD/CAM system.	6	K2	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: II [Part Time]

Civil Engineering

23PTCE202 – STRENGTH OF MATERIALS

(Regulations 2023)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. List the advantages of Macaulay's method in calculating the deflections.	2	K2	1
2. Draw a deflected profile of simply supported beam carries point load W at mid span. write the formula for deflection at mid span.	2	K2	1
3. Distinguish between statically determinate and indeterminate beams.	2	K3	2
4. Write formula for theorem of three moment equation.	2	K2	2
5. Define slenderness ratio.	2	K1	3
6. List the limitations of Euler's equation.	2	K3	3
7. Write the various causes for unsymmetrical bending.	2	K2	4
8. Define Principal Moment of Inertia.	2	K1	4
9. State Lami's theorem.	2	K1	5
10. Which failure theory is suitable for brittle materials, justify.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) A simply supported beam of span 6 m carries point load of 5 kN at mid span of the beam. Calculate slope at support and deflection at mid span. Assume EI as constant.	16	K4	1
(OR)			
b) A simply supported beam of span 5 m carries UDL of 3 kN/m throughout the span. Calculate slope at support and deflection at mid span using Castigliano's theorem. Assume EI as constant.	16	K4	1

Q. No		M	BTL	CO
12. a)	A fixed beam (AB) of span 4m carries an UDL of 6 kN/m throughout the span. If $EI = 20000 \text{ kN/m}^2$, determine i) fixed moment at A, B ii) maximum deflection	16	K4	2
	(OR)			
b)	A continuous beam ABC consists of span AB and BC of lengths 4m and 6 m, carries a point load of 8 kN at mid span of AB and 3 kN/m throughout the span BC. If A, C are hinged supports, draw shear force and bending moment diagram for the above beam.	16	K4	2
13. a)	Derive the Euler's crippling load formula for the column with support conditions of one end hinged and other end is fixed.	16	K3	3
	(OR)			
b)	A solid round bar 3 m long, 45 mm diameter has $E = 200 \text{ GPa}$. Determine the crippling loads for following conditions. i) both ends hinged ii) one end hinged and other end fixed iii) both ends are fixed iv) one end fixed and other end free.	16	K3	3
14. a)	Calculate the stress at corners of rectangular cross sectional (40 mm X 60 mm) simply supported beam of span 6 m carries a point load of 5kN at mid span with 30° inclination with vertical axis.	16	K4	4
	(OR)			
b)	Derive shear centre formula for channel section with flange length of b, web length of h. Assume thickness of web and flange as t.	16	K4	4
15. a)	Determine the Radial and Hoop stress at inner and outer side for a pipe of 350 mm internal diameter and 110 mm thick subjected to a fluid pressure of 20 N/mm^2 .	16	K3	5
	(OR)			
b)	Briefly explain the various Failure Theories with neat sketches.	16	K3	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV [Part Time]

Electronics and Communication Engineering

23PTEC404 – ANTENNA AND WAVE PROPAGATION

(Regulations 2023)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Examine the types of an antenna.	2	K1	1
2. Compare FNBW and HPBW?	2	K2	1
3. Interpret the features of binomial array.	2	K2	2
4. Derive the input impedance of a three-conductor folded dipole antenna.	2	K3	2
5. What are the applications of helical antenna?	2	K1	3
6. Exhibit the concept of spill over in parabolic reflector.	2	K1	3
7. Outline the principle of Babinet used in slot antenna.	2	K1	4
8. List the applications of an aperture antenna.	2	K1	4
9. Recall the different modes of propagation.	2	K1	5
10. How the virtual height of ionosphere can be measured?	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Derive the expression for the far field component of an alternating current element.	8	K1	1
ii) Derive the expression for radiation resistance of an alternating current element.	8	K1	1
(OR)			
b) i) Describe the current distribution in a thin wire antenna.	8	K1	1
ii) Define the following parameters and explain how they affect antenna performance (i) Antenna beamwidth (ii) Gain (iii) Aperture area (iv) Efficiency	8	K1	1

Q. No		M	BTL	CO
12. a)	Describe a broadside array. Deduce an expression for the radiation pattern of a broadside array with two point sources.	16	K1	2
	(OR)			
b)	Explain the principle of operation of Log periodic antenna with neat schematic diagram.	16	K1	2
13. a)	i) Explain how the induced emf in a small loop antenna is related to the magnetic field of the incident wave.	8	K3	3
	ii) Derive the expression for radiation resistance of a small loop antenna along with field equation.	8	K1	3
	(OR)			
b) i)	Explain the operation of helical antenna under normal mode and axial mode of operation.	8	K3	3
	ii) Discuss the working principle of various types of reflector antenna with neat diagram.	8	K1	3
14. a)	i) Formulate the Uniform aperture distribution on an infinite ground plane for a circular aperture.	8	K1	4
	ii) Explain the radiation characteristics of a Huygens' source.	8	K1	4
	(OR)			
b) i)	Describe the working of slot antennas and discuss the various feeding methods employed.	8	K1	4
	ii) Draw the radiation pattern of horn antenna and hence describe the radiation mechanism with neat diagram.	8	K1	4
15. a)	i) Draw the structure of ionosphere and explain the mechanism of ionosphere propagation and its electrical properties.	8	K1	5
	ii) Discuss the effect of the earth's magnetic field on ionosphere radio wave propagation.	8	K3	5
	(OR)			
b) i)	Explain the terms Maximum Usable Frequency, Skip distance, Virtual height.	8	K1	5
	ii) Describe the troposphere and explain how ducts can be used for microwave propagation.	8	K3	5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time]

Civil Engineering

22CE404 – WATER SUPPLY ENGINEERING

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define Design Period.	2	K1	1
2. State the objectives of Public Water Supply Scheme.	2	K2	1
3. Compare Gravity Conduits with Pressure Conduits.	2	K2	2
4. Mention the basis for the selection of types and capacity of pumps.	2	K1	2
5. Differentiate between unit operation and unit process.	2	K2	3
6. Define Breakpoint Chlorination.	2	K1	3
7. List out the various types of Aerators used in water treatment.	2	K1	4
8. What are Membrane Bioreactors?	2	K1	4
9. Outline the requirements of good water distribution system.	2	K1	5
10. Examine the methods available to find the leakages in pipelines.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Determine the daily water demand of the city in 2031, if the per capita water demand is 135 Lpcd and the city population records is as given below.	16	K2	1

Census Year	1950	1965	1980	1995	2010
Population	25000	52000	94000	164000	247000

(OR)

b) Summarize various sources of water and give a brief account of the characteristics of water.	16	K2	1
-
12. a) Classify the types of Intakes. Also explain the working of a Reservoir Intake with a neat sketch.	16	K2	2
- (OR)
- | | | | |
|---|----|----|---|
| b) Illustrate the different types of Pipe Appurtenances used in water supply project. | 16 | K2 | 2 |
|---|----|----|---|

Q. No		M	BTL	CO
13.	a) Design a Rapid Sand Filter to treat a city of population 100000 with an average percapita demand of 160 lpcd. (OR)	16	K3	3
	b) Design of a Sedimentation Tank for Water Treatment Plant to treat 8 MLD of water. Assume a surface loading rate of $30 \text{ m}^3/\text{m}^2/\text{day}$. Draw the plan of the water treatment plant.	16	K3	3
14.	a) Describe the principle and mechanism of Desalination process. (OR)	16	K2	4
	b) Discuss the various techniques involved in Defluoridation.	16	K2	4
15.	a) Discuss with neat sketches the various types of layout of distribution system. (OR)	16	K2	5
	b) Classify the different Plumbing systems with neat sketches.	16	K2	5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time]

Computer Science and Engineering

22CS403 – OBJECT ORIENTED PROGRAMMING USING C++

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Write the structure of C++ program.	2	K1	1
2. Evaluate the following expression $x = a++*b/--d+ ++a*--b$ consider $a=10$, $b=4$ and $d=3$	2	K2	3
3. Mention the operators cannot be overloadable in C++.	2	K1	1
4. Can a non-member function access the private members of a class? How can non-member functions access private members?	2	K2	2
5. Differentiate the private inheritance from protected inheritance.	2	K2	2
6. What is function overriding? How is it differ from function overloading?	2	K2	3
7. Write a template function swap () that swap the two variables of any datatypes.	2	K3	2
8. When is bad_exception used? Give example.	2	K2	1
9. State the different ways to open files in C++? Give example.	2	K2	1
10. What function can be used to check the file is opened successfully before reading?	2	K2	1

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Explain the procedure-oriented paradigm and object-oriented paradigm. Analyze when one might be preferred over the other.	8	K2	1
ii) Write a C++ program to check the given number N is perfect number or not. [Note: A perfect number is a positive integer where the sum of its proper divisors (excluding the number itself) equals the number. Example 6, as $1 + 2 + 3 = 6$]	8	K3	2

Q. No		M	BTL	CO																
	(OR)																			
b) i)	Illustrate the basic concepts of object-oriented programming.	8	K2	1																
ii)	Write a C++ program to calculate the income tax of the employee based on salary with following slabs:	8	K3	2																
	<table><tr><th>Income Tax Slabs</th><th>Tax Rate</th></tr><tr><td>Upto Rs. 4,00,000</td><td>NIL</td></tr><tr><td>Rs. 4,00,001 - Rs. 8,00,000</td><td>5%</td></tr><tr><td>Rs. 8,00,001 - Rs. 12,00,000</td><td>10%</td></tr><tr><td>Rs. 12,00,001 - Rs. 16,00,000</td><td>15%</td></tr><tr><td>Rs. 16,00,001 - Rs. 20,00,000</td><td>20%</td></tr><tr><td>Rs. 20,00,001 - Rs. 24,00,000</td><td>25%</td></tr><tr><td>Above Rs. 24,00,000</td><td>30%</td></tr></table>	Income Tax Slabs	Tax Rate	Upto Rs. 4,00,000	NIL	Rs. 4,00,001 - Rs. 8,00,000	5%	Rs. 8,00,001 - Rs. 12,00,000	10%	Rs. 12,00,001 - Rs. 16,00,000	15%	Rs. 16,00,001 - Rs. 20,00,000	20%	Rs. 20,00,001 - Rs. 24,00,000	25%	Above Rs. 24,00,000	30%			
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Rs. 20,00,001 - Rs. 24,00,000	25%																			
Above Rs. 24,00,000	30%																			
12. a) i)	Define a class for product with code, name, price are the attributes and define the necessary member functions. Write a program to read N product details and arrange the products in descending order with product price.	8	K3	2																
ii)	Analyze the different types of constructor and destructor with suitable code.	8	K4	2																
	(OR)																			
b) i)	Create a class for employee with id, name, salary and overload the operators ==, != based on the salary and also overload the << and >> operators.	8	K3	2																
ii)	Examine the type conversion from basic to user-defined and user-defined to basic with suitable code.	8	K4	2																
13. a)	Create a base class Person. Derive Student and Employee classes from Person, then derive Working class from both Student and Employee. Is there an ambiguity occurs in this derivation? If occurs, how to resolve the ambiguity? Create the class without ambiguity.	16	K3	3																
	(OR)																			
b)	Design a base class Payment Method with pure virtual function processing Payment(). Create derived classes like Card, UPI and Paypal. Each class should handle processing differently. and implement payment () method with suitable demonstration.	16	K3	3																

Q. No		M	BTL	CO
14. a)	Develop a template class Array<T> that holds an array of any type, implement the methods for reading, displaying and finding maximum element. Demonstrate with basic data types and user-defined object student.	16	K3	2
	(OR)			
b)	Build the code to handle the multiple exceptions with single try block and multiple catches. Demonstrate with basic exceptions and user-defined exception.	16	K3	2
15. a)	i) Explain the formatted I/O functions with suitable examples.	8	K2	1
	ii) Illustrate the manipulators with examples.	8	K2	1
	(OR)			
b)	i) Demonstrate the sequential files operations with example program.	8	K2	1
	ii) Describe the random file operations with example.	8	K2	1

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time] / II [Part Time]

Electronics and Communication Engineering

22EC403 / 23PTEC203 – SIGNALS AND SYSTEMS

(Regulations 2022/2023)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Check $x(t)=\sin\omega t$, is energy or power signal?	2	K3	1
2. Differentiate between continuous time systems and discrete time systems.	2	K2	1
3. Find the Fourier transform of $\cos\omega_0 t u(t)$.	2	K3	3
4. State the condition for a function $x(t)$ to have Fourier series.	2	K2	3
5. Find the Laplace transform and ROC for $x(t)=t u(t)$.	2	K3	2
6. Define region of convergence of Laplace transform.	2	K1	2
7. Determine Nyquist sampling rate and Nyquist interval for $x(t)=\frac{\sin(4000\pi t)}{\pi t}$	2	K3	4
8. Compare Laplace transform and Z-transform.	2	K2	2
9. Find the DTFT of $x(n)=\delta(n+3)-\delta(n-3)$.	2	K3	3
10. What are the different types of system realization of discrete time LTI systems?	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) For the signal $x(t)$ shown in Fig.1, sketch the following signals a) $x(t-3)$ b) $x(2t+2)$ c) $x(\frac{5}{3}t)$ d) $x(-t+2)$ e) $3x(5t)$	10	K3	1

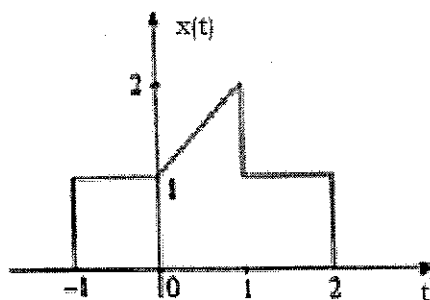


Fig.1.

Q. No		M	BTL	CO
ii)	a) Determine the signal $(2+\sin 4\pi t)$ is periodic or aperiodic b) Find the signal $\sin 3t u(t-1)$ is causal or non-causal. c) Find the signal $(3e^{j4\pi t})$ is even or odd signal.	6	K3	1
	(OR)			
b) i)	Determine the following continuous time system 1. $y(t)=10x(t)+5$ 2. $y(n)=x(n^2)+x(-n)$ a) Static/Dynamic b) Linear/Nonlinear c) TIV/TV d) Causal/non causal e) Stable /unstable.	10	K3	1
ii)	Find the convolution of $x_1(t)=\cos t u(t)$ & $x_2(t)=u(t)$.	6	K3	1
12. a) i)	Find the Fourier series of half wave rectified sine wave as shown in Fig.2.	10	K3	3

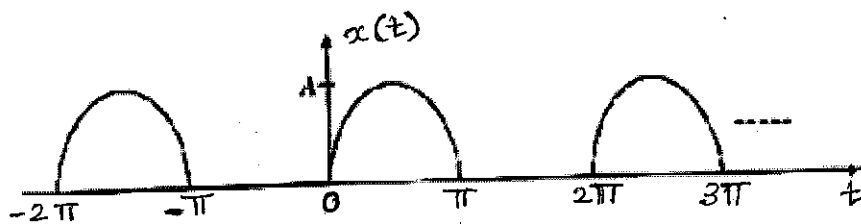


Fig. 2

ii)	Derive any four properties of continuous time Fourier transform.	6	K2	3
	(OR)			
b) i)	Find the Fourier transform of $x(t) = \begin{cases} 1-t^2, & 0 < t < 1 \\ 0, & \text{otherwise} \end{cases}$	10	K3	3
ii)	The input and output of a causal LTI system are described by the differential equation $\frac{d^2 y(t)}{dt^2} + 3 \frac{dy(t)}{dt} + 2y(t) = x(t)$ a) Find the frequency response of the system. b) Find the impulse response of the system.	6	K2	3

Q. No		M	BTL	CO
13. a)	i) Find the Laplace transform and ROC of a) $[1+\sin 2t \cos 2t] u(t)$ b) $e^{-at} \cos \omega t u(t)$	8	K3	2
	ii) Find the inverse Laplace transform of $X(s) = \frac{3s^2 + 22s + 27}{(s^2 + 3s + 2)(s^2 + 2s + 5)}$	8	K3	2
	(OR)			
b) i)	A signal has Laplace transform of $X(s) = \frac{s+1}{s^2+3s+4}$ Find the Laplace transform of : a) $y_1(t) = x(2t)$ b) $y_2(t) = tx(t)$	8	K3	2
	ii) Find the impulse response and step response of the system $H(s) = \frac{5}{s^2+4s+5}$	8	K3	2
14. a) i)	State and Prove Sampling theorem.	8	K2	4
	ii) Find the Z-transform and ROC of $X(z)$ for $x(n) = 3(5/7)^n u(n) + 2(-1/3)^n u(n)$	8	K3	2
	(OR)			
b) i)	Detail on different types of sampling techniques.	8	K2	4
	ii) Determine the inverse Z transform of $X(z) = \frac{1}{2-4z^{-1}+2z^{-2}}$ a. ROC; $ z > 1$ b. ROC; $ z < 1/2$	8	K3	2
15. a) i)	Compute DFT of the Sequence $r(n) = [1, 2, 3, 4]$.	8	K3	3
	ii) Realize the system in direct form II. $y(n) - (5/6)y(n-1) + (1/6)y(n-2) = x(n) + 2x(n-1)$	8	K3	5
	(OR)			
b) i)	Obtain the DTFT of the sequence. $x(n) = \left(\frac{1}{2}\right)^n \sin\left(\frac{n\pi}{4}\right) u(n)$	8	K3	5
	ii) Obtain the cascade form realization of the system described by the difference equation. $y(n) - (1/4)y(n-1) - (1/8)y(n-2) = x(n) + 3x(n-1) + 2x(n-2)$	8	K3	5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time] / IV [Part Time]

Electrical and Electronics Engineering

22EE404/22PTEE402/23PTEE401 – POWER GENERATION, TRANSMISSION AND DISTRIBUTION SYSTEM

(Regulations 2022/2023)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Write the expression for cost of electrical energy in the tree part form?	2	K3	1
2. Compare thermal power plant and hydro power plant in terms of initial cost, operating cost and efficiency?	2	K2	1
3. Specify the effect of earth on the capacitance of single phase overhead lines with suitable mathematical expression.	2	K2	2
4. Define Proximity effect in the transmission line.	2	K1	2
5. Draw the equivalent circuit of short transmission line and specify its ABCD constants.	2	K3	3
6. What is called surge impedance loading? Write its mathematical expression.	2	K2	3
7. What are the properties of overhead line insulators?	2	K1	4
8. Classify the cables based on the voltage level.	2	K3	4
9. List out the advantages of neutral grounding.	2	K1	5
10. Define the terms: feeder and distributor.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Draw the structure of electric power system indicating the voltage levels and mention the different subsystems present in it.	6	K2	1

Q. No

M BTL CO

- ii) The annual load duration curve of a certain power station can be considered as a straight line from 20 MW to 4 MW. To meet this load, three turbine-generator units, two rated at 10 MW each and one rated at 5 MW are installed. Determine (i) installed capacity (ii) plant factor (iii) units generated per annum and (iv) load factor.

(OR)

- b) i) Draw the schematic arrangement of nuclear power station and mention the function of nuclear reactor.

- ii) Develop the schematic diagram of a 100 MW thermal power plant and explain how steam generating plant is working?

12. a) Find the inductance per phase per km of double circuit three phase overhead transmission lines as shown in Fig.1 The conductors are transposed and are of radius 1.2 cm each. The phase sequence is ABC.

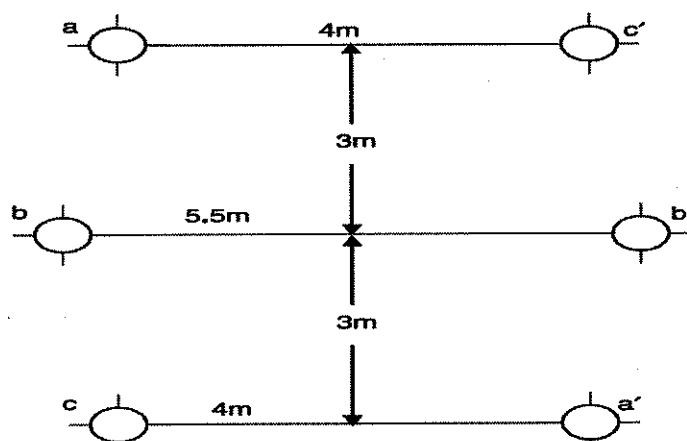


Fig.1

(OR)

- b) Derive an expression for line to neutral capacitance of a three phase overhead transmission line when the conductors are asymmetrically placed but transposed. Also deduce the expression of capacitance if conductors are arranged at the corners of an equilateral triangle.

13. a) A 100-km long, three phase, 50-Hz transmission line has following line constants:

Resistance/phase/km = 0.1Ω Reactance/phase/km = 0.5Ω Susceptance/phase/km = $10 \times 10^{-6} \text{ S}$

The transmission line supplies load of 20 MW at 0.9 power factor lagging at 66 kV at the receiving end, calculate by nominal π method : (i) sending end voltage and power factor (ii) voltage regulation and (iii) transmission efficiency

(OR)

Q. No		M	BTL	CO
	b) Using rigorous method, derive expressions for sending end voltage and current for a long transmission line with its equivalent circuit. Also deduce its ABCD constants.	16	K3	3
14. a)	i) An insulator string consists of three units, each having a safe working voltage of 15 kV. The ratio of self-capacitance to shunt capacitance of each unit is 8:1. Find the maximum safe working voltage of the string. Also find the string efficiency.	10	K3	4
	ii) List out the different types of insulators and brief the advantages of suspension type insulators?	6	K2	4
	(OR)			
b) i)	A single core cable for use on 11 kV, 50 Hz system has conductor area of 0.645 cm^2 and internal diameter of sheath is 2.18 cm. The permittivity of the dielectric used in the cable is 3.5. Find (i) the maximum electrostatic stress in the cable (ii) minimum electrostatic stress in the cable (iii) capacitance of the cable per km length (iv) charging current.	10	K3	4
	ii) Derive an expression for the thermal resistance of dielectric of a single-core cable.	6	K2	4
15. a) i)	Draw the layout of 110 kV/11 kV substation and mention the functions of main components in it.	10	K2	5
	ii) Draw the line diagram of single bus-bar system in the substation and mention the main components with its function.	6	K2	5
	(OR)			
b) i)	Discuss the radial and ring main distribution systems and compare its merits and demerits.	10	K2	5
	ii) Elaborate the requirements and design considerations of a distribution system.	6	K2	5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: V [Full Time]

Electrical and Electronics Engineering

18EE503 – POWER ELECTRONICS

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Discuss the need of isolation and gate driver circuits for power semiconductor devices.	2	K2	1
2. Sketch the V-I characteristics of SCR.	2	K1	1
3. List the functions of freewheeling diode in the phase controlled converters.	2	K2	2
4. Draw the block diagram of dual converter.	2	K1	2
5. A step down chopper has a resistive load of 10Ω and input voltage of 200V DC. If the switching frequency is 1kHz and duty cycle is 60%, determine average output voltage and current.	2	K3	3
6. Enumerate the difference between current limit control and time ratio control. Why current limit control is preferred over any other strategies?	2	K2	3
7. Illustrate the need for connecting diodes in anti-parallel with the power semiconductor switches in an inverter circuit.	2	K2	4
8. Specify the techniques by which the harmonics can be reduced in the inverters.	2	K2	4
9. A two-pole, three phase induction motor fed with a cycloconverter runs at 475 rpm at a slip of 5%. Calculate the input frequency of the motor.	2	K3	5
10. Write the advantages of matrix converter.	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Draw the two transistor analogy of SCR. Derive an expression of anode current and explain that how does positive feedback action take place during the turn on of a SCR.	16	K2	1

(OR)

Q. No		M	BTL	CO
	b) Explain the function of IGBT. Sketch the dynamic characteristics of IGBT and define the turn-on and turn-off times of the device.	16	K2	1
12. a)	i) Discuss the effect of source inductance on the output of three phase full converter.	8	K2	2
	ii) A single phase half controlled bridge converter is triggered at 75° . The converter is supplied from a 230 V, 50 Hz single phase supply. The load consists of a pure resistance of 100Ω . Compute i) average load voltage ii) average load current iii) average load power iv) duration of current conduction.	8	K3	2
	(OR)			
b) i)	A three phase, six pulse, AC-DC converter is fed from a three phase 400 V, 50 Hz AC supply and it is connected with a constant current load of 90A at a firing angle of 45° . Determine: i) output voltage ii) rms output voltage and iii) average thyristor current.	8	K3	2
	ii) With circuit diagram and waveform, describe the working of single phase fully controlled bridge converter in the rectifying mode and inversion mode. Derive the expressions for average output voltage and rms output voltage of single phase fully controlled converter with RL load.	8	K2	2
13. a)	i) The DC-DC converter which feeds the power train in the Electric Vehicle has output voltage of 380 V DC. The input voltage is 200 V DC. The output power of the DC-DC converter is 7.6 kW. Suggest a suitable DC-DC converter for this application. Assume the following: The switching frequency is 25 kHz. The peak-to-peak output ripple voltage is 1V. The peak-to-peak ripple current of the inductor is limited to 1 A. Determine i) the duty cycle ii) the filter inductor L iii) the filter capacitor C	8	K3	3

Q. No		M	BTL	CO
	ii) Design a DC boost regulator with an output voltage of 15 V from a 6 V source. The load is a pure resistor of 25 Ω . The peak to peak ripple is to be less than 0.6%. The inductor is to be continuous. Also find the maximum and minimum values of the inductor current.	8	K3	3
	(OR)			
b) i)	With circuit diagram and waveform, explain the operation of SEPIC converter.	8	K3	3
ii)	A buck converter has input voltage of 24 V and it operates at 30 kHz. When the duty cycle is 0.4, $L = 500 \mu\text{H}$, $C = 147 \mu\text{F}$ and average load current is 1 A. Determine the i) average output voltage ii) peak-peak ripple current through the inductor. iii) peak-peak ripple voltage across the capacitor.	8	K3	3
14. a) i)	A single phase half bridge inverter feeds a resistive load of $R = 7.2 \Omega$ and the dc input voltage of $V_S = 200 \text{ V}$. Determine i) rms value of the fundamental component of the voltage at the output and ii) Output power.	8	K3	4
ii)	Discuss the principle of operation of a three phase bridge inverter with an appropriate circuit diagram.	8	K2	4
	(OR)			
b) i)	A three phase bridge inverter is fed from 400 V dc supply. If the semiconductor switches(transistors) which are used in inverter conducts for 180° duration and the inverter is supplying a star connected resistive load of 10 Ω . Determine i) rms value of the line voltage ii) rms value of load current iii) Power delivered to load and input current. Assume the efficiency of the inverter as 90%.	8	K3	4
ii)	Enumerate the need for voltage and frequency control of inverters. How the pulse width modulation techniques (PWM) will control both voltage and frequency. Explain any one type of PWM technique.	8	K2	4
15. a)	Describe the working of single phase AC voltage controller feeding RL load with neat circuit diagram and necessary waveforms. Derive the expression for RMS output voltage.	16	K3	5
	(OR)			

Q. No	M	BTL	CO
b) Explain the operation of a three phase AC voltage controller with two thyristors arranged in antiparallel is connected to a delta connected load. Illustrate the answers with waveforms of source voltage, gate signals, and line and phase currents. Derive the expression for rms value of the output voltage.	16	K3	5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: IV & VI [Full Time]

Mechanical Engineering

**22ME404 / 18MEPE31 – HYDRAULICS AND PNEUMATICS / APPLIED HYDRAULICS
AND PNEUMATICS**

(Regulations 2022/2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. State any four applications of fluid power system.	2	K2	1
2. How can we avoid pump cavitation?	2	K3	1
3. What is tandem cylinder?	2	K2	2
4. Give the hydraulic symbol for $\frac{3}{4}$ solenoid operated DCV.	2	K1	2
5. State the function of intensifiers.	2	K1	3
6. What is the purpose of synchronized hydraulic circuits?	2	K2	3
7. Mention the role of a quick exhaust valve in pneumatic applications.	2	K2	4
8. How Pneumatic logic circuit is used to control the operation of machinery?	2	K2	4
9. When to use timer and relay?	2	K1	5
10. Define low cost automation.	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) What are the basic components that are required for hydraulic system? Explain their functions?	10	K2	1
ii) Explain any six desirable properties of hydraulic oil used for industrial automation.	6	K3	1
(OR)			
b) i) Explain the working principles of external gear pump with neat sketch and give its advantages and limitations.	10	K3	1
ii) How are pumps classified? Briefly explain the different types.	6	K2	1
12. a) i) With a neat sketch explain the construction and working of cushioning mechanism in cylinder.	12	K3	2

Q. No		M	BTL	CO
	ii) With respect to hydraulic motors, define the terms i)volumetric efficiency ii)mechanical efficiency (OR)	4	K3	2
	b) With a neat sketch explain the working of i) Pressure Relief valve. ii) Pilot operated pressure relief valve.	16	K3	2
13. a)	i) Design a hydraulic sequencing circuit for a milling machine, where one cylinder operates the power vice jaws and the other controls the cutter travel.	10	K3	3
	ii) Discuss the functions of accumulators and its practical applications. (OR)	6	K3	3
b) i)	With a block diagram explain the working of electro-hydraulic servo valve.	8	K3	3
	ii) What are proportional valves? Explain how to control the force and spool position in proportional hydraulic valves.	8	K3	3
14. a)	Describe the working of the regulator and lubricator in a pneumatic FRL unit with a neat sketch. (OR)	16	K4	4
b)	Design a pneumatic circuit using the cascade method to achieve the sequence A+ B+ B- A- C+ C-, where A, B, and C represent double-acting cylinders, and '+' and '-' denote the extension and retraction of the respective cylinders.	16	K4	4
15. a)	i) With a neat sketch, explain the construction and working principle of a programmable logic controller (PLC).	10	K2	5
	ii) Explain the structure and function of a ladder diagram. Construct a ladder diagram for any basic example circuit. (OR)	6	K3	5
b) i)	Draw the schematic layout of a typical hydraulic power pack and explain the functions of its elements.	10	K2	5
	ii) Briefly explain the important factors in the maintenance of hydraulic and pneumatic systems.	6	K3	5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Mechanical Engineering

22MEH103 – ELECTRIC AND HYBRID VEHICLE TECHNOLOGY

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define vehicle performance.	2	K2	1
2. List two major social benefits of using hybrid and electric vehicles.	2	K2	1
3. What is hybrid traction?	2	K2	2
4. Mention any two electric drive-train topologies.	2	K2	2
5. Name any two electric motor types commonly used in electric vehicles.	2	K2	3
6. Define drive system efficiency.	2	K2	3
7. Give any two commonly used energy storage devices in electric vehicles.	2	K2	4
8. What is meant by hybridization of energy storage systems?	2	K2	4
9. How energy management strategy carried out in hybrid and electric vehicles?	2	K2	5
10. Name any two types of energy management strategies used in HEVs.	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Explain the characteristics of different vehicle power sources with examples.	6	K4	1
ii) Analyze the environmental impact of hybrid and electric vehicles compared to conventional vehicles.	10	K4	1
(OR)			
b) i) Analyze the importance of transmission characteristics in vehicle performance. How do they affect acceleration and fuel efficiency?	6	K4	1

Q. No		M	BTL	CO
	ii) Do a comparative study, on the evolution of hybrid and electric vehicles. Include key milestones and their influence on today's automotive industry.	10	K4	1
12. a)	i) Explain the power flow control mechanism in a hybrid drive-train system. How does it enhance vehicle performance?	6	K3	2
	ii) Evaluate the advantages and limitations of various electric drive-train topologies with respect to efficiency, cost, and control complexity.	10	K4	2
	(OR)			
b) i)	Compare the fuel efficiency of series and parallel hybrid drive-train topologies. What are the influencing factors?	6	K3	2
	ii) Design a basic power flow diagram for a plug-in hybrid electric vehicle (PHEV) and explain the flow of energy during acceleration, cruising, and braking.	10	K4	2
13. a)	i) Compare the control mechanisms of DC motor drives and induction motor drives used in electric vehicles.	6	K3	3
	ii) Evaluate the performance characteristics of Switched Reluctance Motors (SRM) in electric vehicles in terms of efficiency, cost, and control complexity.	10	K4	3
	(OR)			
b) i)	Analyze the role of permanent magnet motor drives in enhancing drive system efficiency.	6	K3	3
	ii) Design a comparative chart showing the configuration, control strategy, and efficiency for DC, Induction, Permanent Magnet, and Switched Reluctance Motor drives used in EVs.	10	K4	3
14. a)	i) Explain how energy storage devices are analyzed for use in electric vehicles. What factors are considered?	6	K3	4
	ii) Evaluate the advantages and trade-offs in hybridizing energy storage devices like batteries and super capacitors in hybrid EVs. Provide relevant examples.	10	K4	4
	(OR)			

	b) i)	Analyze the key considerations involved in sizing an electric propulsion motor for a hybrid vehicle.	6	K3	4
	ii)	Design a basic drive system by selecting and matching a suitable electric motor, ICE, and energy storage technology for a plug-in hybrid vehicle meant for urban commuting. Justify your choices.	10	K4	4
15. a)	i)	Compare rule-based and optimization-based energy management strategies in hybrid vehicles.	6	K2	5
	ii)	Evaluate different energy management strategies based on criteria like fuel efficiency, battery life, and computational complexity. Provide a comparative summary.	10	K4	5
(OR)					
b)	i)	Discuss the key implementation issues faced while deploying energy management strategies in EVs.	6	K2	5
	ii)	Design an energy management strategy for a plug-in hybrid vehicle operating in a city traffic scenario. Include modes of operation, switching logic, and performance goals.	10	K4	5



Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Mechanical Engineering

22MEH307 – SURFACE ENGINEERING

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What do you mean by abrasive wear? Specify the types of abrasive wear.	2	K1	1
2. Outline the need for Surface preparation.	2	K2	1
3. Classify the plating process.	2	K2	2
4. Give the benefits and limitations of electro-less plating.	2	K2	2
5. What do you mean by PVD? List the methods for it.	2	K1	3
6. Classify the coating process.	2	K2	3
7. Give the applications of spray fused coatings.	2	K2	4
8. What are the various special surfacing processes available?	2	K1	4
9. Summarize the applications of hard facing.	2	K2	5
10. Identify the surface cleaning methods for welded components.	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Explain the mechanism of fretting wear that takes place in movement of two solid surfaces. Also list the causes and remedial action for fretting wear in detail.	8	K2	1
ii) Analyze the wear modes.	8	K4	1
(OR)			
b) i) Illustrate the methods to measure the adhesive wear properties of materials.	8	K2	1
ii) Analyze in detail the types of wear that takes place in the propeller of a hydroelectric power plant turbines.	8	K4	1

Q. No		M	BTL	CO
12. a)	i) What do you mean by electro-less plating? Explain the working principle and give its applications.	8	K2	2
	ii) Analyze the applicability of plating techniques for improved wear resistance.	8	K4	2
	(OR)			
b) i)	Explain the following processes; Metallizing and Hard anodizing.	8	K2	2
	ii) Examine the characteristic of electroplating and give its applications.	8	K4	2
13. a)	i) Explain Thermal Spraying Processes for thin film coating.	8	K2	3
	ii) Analyze the steps involved in CVD and specify the applications of it.	8	K4	3
	(OR)			
b) i)	Differentiate between Chemical vapour deposition (CVD) and Physical vapour deposition (PVD).	8	K2	3
	ii) Analyze the specifications for ceramic coating on electronic devices.	8	K4	3
14. a)	i) Explain the following; wear tiles, wear sleeves and wear plates with examples.	8	K2	4
	ii) Analyze the characteristics of materials used in Fused carbide cloth ceramic coatings.	8	K4	4
	(OR)			
b) i)	Explain the principles of Rebuilding and surface cements with practical applications.	8	K2	4
	ii) Analyze the features of Electro spark deposition coatings and give their applications.	8	K4	4
15. a)	i) Explain how the Plasma arc welding is employed for surface modification.	8	K2	5
	ii) Analyze the principle of Thermal spray processes and their applications,	8	K4	5
	(OR)			
b) i)	Summarize the role of shielded metal arc welding in hard facing processes.	8	K2	5
	ii) Analyze the weldability and finishing considerations for the Non-fusion deposits.	8	K4	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time]
Metallurgical Engineering

22MT402 – ADVANCED PHYSICAL METALLURGY

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What is the driving force for solidification?	2	K2	1
2. What is super cooling?	2	K1	1
3. How to determine the critical free energy change for solidification?	2	K3	2
4. What is diffusion-controlled growth?	2	K1	2
5. Write down Johnson-Mehl-Avrami equation.	2	K2	3
6. What is meant by interlamellar spacing?	2	K2	3
7. What are the factors that control recrystallization?	2	K2	4
8. What is the difference between warm working and hot working?	2	K2	4
9. What is meant by martensitic transformation?	2	K2	5
10. Give any one example for shape memory alloy and state its application.	2	K3	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain the concept of driving force and activation barrier for solidification and solid-solid transformations.	16	K3	1
(OR)			
b) Explain the process of dendritic solidification in castings and its microstructure.	16	K3	1
12. a) Explain the kinetics of phase transformations with sketches.	16	K2	2
(OR)			
b) Explain the terms transformation rate, nucleation rate and growth rate for homogeneous and heterogeneous type of nucleation.	16	K2	2

Q. No		M	BTL	CO
13. a)	Explain the nucleation and growth of pearlite during eutectoid transformations in steels.	16	K3	3
	(OR)			
b)	Explain the thermodynamics and kinetics of transformations that occur during bainitic transformations.	16	K3	3
14. a)	How do precipitation and particle coarsening mechanisms influence the microstructural evolution and mechanical properties of age hardenable alloys during phase transformation?	16	K4	4
	(OR)			
b)	Compare and contrast the structure and property changes during recovery, recrystallization and grain growth processes.	16	K4	4
15. a)	Explain the crystallographic changes and characteristic features of martensitic transformations in steels.	16	K2	5
	(OR)			
b)	Discuss the kinetics of martensitic transformations that occur in shape memory alloys.	16	K2	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Metallurgical Engineering

18MTE55 – ADDITIVE MANUFACTURING

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What is the three dimensional printing?	2	K1	1
2. Define slicing relevant to CAD.	2	K1	1
3. Give merits of FDM process.	2	K2	2
4. Give the applications of LOM process.	2	K2	2
5. What are the metal properties useful for printing of Aluminum materials?	2	K1	3
6. Give the advantages of SLS process on composite material printing.	2	K3	3
7. State the process flow chart on customized medical implants	2	K1	4
8. List the uses of AM in medical field.	2	K2	4
9. Write two applications of rapid prototyping in aerospace industry.	2	K3	5
10. Write note on the application of analysis and planning in rapid prototyping.	2	K3	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain how rapid prototyping is differs from conventional manufacturing. And discuss the need for AM.	16	K1	1
(OR)			
b) What is rapid tooling? Explain the application of rapid prototype tool in manufacturing and Tooling. Also give its advantages and disadvantages.	16	K1	1
12. a) Explain with a neat sketch the working principle, advantages, disadvantage and applications of stereo lithography process.	16	K2	2

(OR)

Q. No		M	BTL	CO
	b) Explain with a neat sketch the working principle, advantages, disadvantage and applications of Laser Engineered Near shaping process.	16	K2	2
13. a)	Discuss 3D printing process with its properties, advantages and disadvantage of any three polymers.	16	K4	3
	(OR)			
	b) Discuss any three composite materials 3D printing process with its properties, advantages and disadvantage.	16	K4	3
14. a)	Explain design and production of Prosthesis using AM.	16	K2	4
	(OR)			
	b) What is CATE? How it is useful in medical field? Explain it with a neat sketch.	16	K2	4
15. a)	Elaborately discuss 3D printing on any three various Automobile applications.	16	K3	5
	(OR)			
	b) Discuss metal or ceramic direct metal printing of any three Agricultural applications.	16	K3	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations - April/May 2025

Semester: IV [Part Time]

Civil Engineering

22PTCE401/23PTCE404 - ENVIRONMENTAL ENGINEERING - I

(Regulations 2022/2023)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Discuss the factors affecting per capita demand.	2	K2	1
2. Define design period.	2	K2	1
3. Enumerate the importance of infiltration galleries.	2	K2	2
4. What is steady state condition?	2	K1	2
5. Compare gravity conduits with pressure conduits.	2	K2	2
6. List out any two appurtenances in water conveyance system.	2	K2	2
7. Write the maximum acceptable limit for any four Physical or chemical characteristics of drinking water.	2	K1	3
8. List the methods of removing excess Iron and Manganese from Ground water.	2	K2	3
9. Summarize the functions of service reservoir.	2	K2	4
10. Discuss the methods available to find the leakages in pipelines.	2	K2	4

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Elaborate the objectives of public water supply schemes.	16	K3	1
(OR)			
b) The population of a town as per census records is given below. Calculate the population in the year 2020 and 2035 using arithmetical increase method and incremental increase method. Estimate the water demand at 135 LPCD for the year 2035.	16	K3	1

Year	1935	1955	1975	1995	2015
Population	39250	54390	68010	83630	99850

Q. No		M	BTL	CO
12. a)	Enumerate and explain the characteristics of surface water and ground water with their environmental significance.	16	K2	2
	(OR)			
b)	Explain the construction, development and sanitary protection of wells.	16	K2	2
13. a)	List out the factors to be considered in the selection of pipe material for water transmission. Explain any four types of pipe material used for conveyance of water.	16	K3	2
	(OR)			
b)	Categorize the different types of pumps used in water supplies with a neat sketch.	16	K3	2
14. a)	Explain about slow sand filter and rapid sand filter with suitable diagram and also write their advantages.	16	K1	3
	(OR)			
b)	Describe the methods of removing temporary and permanent hardness from water.	16	K1	3
15. a)	Examine the various types of distribution system with their advantages and disadvantages.	16	K4	4
	(OR)			
b)	Discuss Hardy-cross method to analyze complex pipe network.	16	K4	4

Registration Number :

Government College of Engineering, Salem
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M.E. Degree Examinations – April/May 2025

Semester: II [Full Time]

Computer Aided Design

22CDE31 – PRODUCTIVITY MANAGEMENT AND RE-ENGINEERING

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What are the different technology-based productivity improvement techniques?	2	K1	1
2. Two industries manufacture two types of plugs. The standard time per piece is 1.5 minutes, and the output of the two industries is 300 and 200 units respectively per shift of 8 hours. Calculate the productivity of each industry per shift and comment on which industry is more productive based on your result.	2	K2	1
3. Define Productivity Objective Planning (POP).	2	K1	2
4. List any two key features of the Systems Approach to productivity.	2	K1	2
5. What is the purpose of preparing the workforce before re-engineering?	2	K1	3
6. What are the key principles of re-engineering?	2	K1	3
7. State any two components of the LMICIP model.	2	K1	4
8. What does NPRDC stand for in the context of re-engineering models?	2	K1	4
9. Mention two common problems in implementing re-engineering projects.	2	K1	5
10. What is meant by process mapping in re-engineering?	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain the macro and micro factors that affect productivity. Give examples to show how these factors impact the performance of an industry.	16	K2	1

(OR)

Q. No		M	BTL	CO
b)	What different productivity measures are used for international comparisons? Explain how these measures influence cross-country evaluation of industrial performance.	16	K2	1
12. a)	Explain the concept of Management by Objectives (MBO). How can it be applied effectively in a manufacturing environment to improve productivity?	16	K2	2
	(OR)			
b)	What is the systems approach to productivity management? Explain its structure and how it helps different departments in an organization work together more effectively.	16	K2	2
13. a)	Explain the fundamental principles of business process re-engineering (BPR). Illustrate with an example how BPR helps restructure an organization.	16	K2	3
	(OR)			
b)	Explain the following models used in organizational transformation: i) LMI CIP Model ii) DSMC Q Model iii) PMP Model Explain their structure and relevance in real-world applications.	16	K2	3
14. a)	Describe the Moen and Nolan Strategy for process improvement. How can it be applied in both manufacturing and service sectors to enhance efficiency?	16	K2	4
	(OR)			
b)	Explain the PMI model in detail. How does it help in improving productivity in a re-engineering project?	16	K2	4
15. a)	Explain the following four analytical and process tools used in Business Process Re-engineering. Discuss how each tool helps in identifying and solving inefficiencies in an organization: i) Process Mapping ii) Fishbone Diagram (Cause and Effect Diagram) iii) Value Stream Mapping (VSM) iv) Benchmarking	16	K2	5
	(OR)			
b)	Explain the step-by-step procedure to implement a re-engineering project in a manufacturing or service organization.	16	K2	5

Registration Number :

Government College of Engineering, Salem
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M.E. Degree Examinations – April/May 2025

Semester: II [Full Time]
Communication Systems

22COE44 – 5G COMMUNICATION NETWORKS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What is the frequency range of 5G NR?	2	K1	1
2. What is 3GPP standardization?	2	K1	1
3. What is the spectrum needed for eMBB and mMTC?	2	K2	1
4. What are the properties of spectrum tool box?	2	K1	1
5. Differentiate TDMA and CDMA.	2	K2	3
6. What is GFDMA?	2	K1	3
7. Write the algorithmic steps for Harmonic mode selection for proximity communication.	2	K1	4
8. What are the benefits resulting from D2D operation?	2	K2	4
9. List the millimeter wave path losses that are frequency dependent.	2	K2	4
10. Define the capacity of massive MIMO.	2	K1	4

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Explain the 5G standardization activities in ITU, 3GPP and IEEE.	8	K1	1
ii) Detail on the 5G use cases of agriculture sector and factory cell automation with respect to challenges and opportunities.	8	K1	1
(OR)			
b) i) Illustrate a short chronological history of cellular radio system from 1G to 5G.	8	K1	1
ii) Explain the IMT 2020 spider diagram and IMT-A requirements.	8	K1	1
12. a) i) Elaborate on the four possible classification of spectrum access options.	8	K1	1

Q. No		M	BTL	CO
	ii) Brief on map based METIS channel models.	8	K1	2
	(OR)			
b) i)	Discuss in brief innovate technologies to fully populate the spectrum tool box to be used in 5G cellular systems.	8	K1	1
	ii) What are the requirements of 5G channel model?	8	K1	2
13. a) i)	How the performance of CDMA system in asynchronous communication is improved by Interleave division multiple access?	8	K3	3
	ii) Detail the discrete representation of Orthogonal Frequency Division multiplexing (OFDM).	8	K1	3
	(OR)			
b) i)	How single subcarrier signals are individually filtered with prototype pulse in Filter-bank based Multicarrier technology?	8	K3	3
	ii) Explain the transmitter and receiver side of non-orthogonal multiple access at downlink.	8	K1	3
14. a) i)	Elaborate on fundamental techniques of Machine Type Communication that are promising for radio access part.	8	K2	4
	ii) What are the research challenges in D2D communication?	8	K1	4
	(OR)			
b) i)	Detail the basic tool box of radio resource management for mobile broadband D2D.	8	K2	4
	ii) Explain on the design principles and technology components for ultra-reliable low latency Machine type communication.	8	K1	4
15. a) i)	What is beam forming techniques? Explain effective beam finding mechanism in mmWave mechanism.	8	K2	4
	ii) Explain the pilot assisted based channel estimation model in massive MIMO communication.	8	K1	4
	(OR)			
b) i)	Detail on the physical layer techniques of duplex and transmission schemes in mmWave communication.	8	K2	4
	ii) Brief on spatial modulation.	8	K1	4

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

M.E. Degree Examinations – April/May 2025

Semester: II [Full Time]

Power Electronics and Drives

22PEE45 – POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEM

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Sketch a typical P-V curve of a solar PV module.	2	K1	1
2. What is the effect of change in operating temperature with solar PV cell?	2	K2	1
3. Name the components of wind energy conversion system (WECS).	2	K2	2
4. Recall the benefits of autonomous wind energy conversion systems.	2	K1	2
5. Draw the equivalent circuit of the PEM fuel cell.	2	K3	3
6. List the features of Bloom energy technology in power generation.	2	K2	3
7. What are the drawbacks of H5 inverter?	2	K2	4
8. Draw the power circuit of an H-bridge based boosting PV inverter.	2	K1	4
9. A solar PV array is rated at 100 V / 50 A DC. System power losses are 20%. What is the AC power fed into the grid?	2	K3	5
10. What are the grid integration challenges with wind energy conversion system?	2	K3	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Discuss the advantages and challenges of solar photovoltaic energy conversion.	6	K1	1

Q. No		M	BTL	CO
	ii) A solar PV module is to be designed to charge a battery of 12 V. The V_{oc} and V_m of the cell under Standard Test Conditions (STC) are 0.9 and 0.8 respectively. The cell's voltage decreases by 1 mV every degree centigrade rise in temperature. How many cells should be connected in series in this PV module? If the cell temperature under operation is 60°C. Make a drawing of designed PV module.	10	K1	1
	(OR)			
b) i)	Explain the working of a solar cell. Draw the schematic of solar cell I-V curve with its parameters.	6	K1	1
	ii) What is the need for Maximum Power Point Tracking (MPPT)? Explain Perturb and Observe (P&O) algorithm based MPPT of solar PV system with neat flow chart.	10	K1	1
12. a)	Explain the mathematical description of the self-excitation process using the steady state model of a Self-Excited Induction Generator (SEIG) driven by wind turbine.	16	K4	2
	(OR)			
b)	Explain with suitable diagram, the construction and working principle of Permanent Magnet Synchronous Generator (PMSG) in variable speed wind energy conversion scheme.	16	K4	2
13. a) i)	Draw and explain the schematic diagram of a complete electrical energy generation system using a fuel cell stack with Proton Exchange Membrane Fuel Cells.	10	K3	3
	ii) Explain the aspects of hydrogen as fuel.	6	K2	3
	(OR)			
b) i)	Describe briefly about commercial and manufacturing issues of fuel cells.	10	K3	3
	ii) State the advantages and disadvantages of fuel cells.	6	K2	3
14. a) i)	With neat diagrams of power circuit and switching states, explain the operation of HERIC inverter topology. State its main features and drawbacks.	10	K1	4
	ii) Draw a generic control structure for a PV inverter with boost stage. State its PV specific functions.	6	K2	4
	(OR)			

Q. No		M	BTL	CO
b)	i) Show a typical structure and switching states of a Neutral Point Clamped (NPC) half-bridge inverter, and explain its operation.	10	K1	4
	ii) Recall the features of 'Two-level back-to-back PWM inverter' and 'Three-level back-to-back PWM inverter'.	6	K2	4
15. a)	Explain in detail the grid synchronization of single phase grid-connected converters using	16	K2	5
	i) Discrete Fourier Transform, and			
	ii) Phase-Locked Loop.			
	(OR)			
b)	Interpret a technical note on	16	K2	5
	i) Control structure of wind energy system, and			
	ii) Influence of active and reactive power injection by wind energy system.			

Registration Number :

Government College of Engineering, Salem
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M.E. Degree Examinations – April/May 2025

Semester: II [Full Time]

Structural Engineering

22STE44 – SUBSTRUCTURE DESIGN

(Regulations 2022)

(IS 2911(Part-1/Sec-1 to 3)-2010, IS802 (Part-1/Sec2)-2015, IS6403-1981-Code books may be Permitted)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
1.	List the types of shallow foundation.	2	K1	1
2.	What type of foundation is suitable for underwater structure?	2	K2	1
3.	Sketch the contact pressure distribution diagram below rigid footing and flexible footing on clay.	2	K2	2
4.	When strap beam is preferred in sub structures?	2	K2	2
5.	Which codal provision for design and construction of pile foundations Driven Cast In-situ Concrete Piles?	2	K1	3
6.	What is tension piles?	2	K1	3
7.	Define the impact factor in design of bridge loading.	2	K2	4
8.	What is the criteria of frequency ratio in machine foundation?	2	K2	4
9.	How the safety of tower foundation is checked against uplift?	2	K1	5
10.	Write down any two points to be considered in the design of anchors.	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
11.	a) Explain the purpose of soil investigation report for the design of foundation structure.	16	K3	1
	(OR)			
	b) Describe the methods of computing loads in designing the reinforced concrete foundation.	16	K3	1
12.	a) Proportion a rectangular combined footing for two columns 4m apart. The exterior column of size 0.4 m x 0.4 m carries a load of 500 kN and interior column of size 0.5 m x 0.5 m carries a load of 1000 kN. The allowable soil pressure is 100 kN/m ² .	16	K3	2

(OR)

Q. No		M	BTL	CO
	b) A building consists of 10 columns 300 mm × 300 mm sizes arranged in 2 rows of five each. The distance between the columns is 5.0 m each. The load carried by four corner columns is 400 kN each, that carried by exterior column is 450 kN each and that carried by interior column is 800 kN each. The allowable soil pressure is 50 kN/m ² . Design the raft foundation.	16	K3	2
13.	a) A group of 12 piles was driven into soft clay extending to a large depth. The diameter and length of the piles were 60 cm and 10 m. if the unconfined compression strength of 20 kN/m ² and pile spacing 1m, c/c. Bearing resistance may be neglected for the piles. Determine the ultimate load capacity of the group. Adhesion factor is 0.6.	16	K4	3
	(OR)			
	b) A pile cap consisting of 6 piles of 400 mm × 400 mm is to be designed to support a reinforced concrete 600 mm × 600 mm carrying a load of 400 kN. The piles are located parallel to the column faces with their centers located 500 mm from the center to the column. Using M20 grade concrete and Fe415 HYSD Bars, design the pile cap and sketch the details of reinforcements.	16	K4	3
14.	a) An open caisson, 10 m deep, is of cylindrical shape, with external and internal diameters of 9 m and 7 m, respectively. If the water level is 3 m below the top of the caisson. Solve for the minimum thickness of the seal required. Check for perimeter shear also. Assume $\sigma_c = 2400 \text{ kN/m}^2$ and $\gamma_c = 24 \text{ kN/m}^3$, for concrete. Allowable perimeter shear stress = 650 kN/m ² .	16	K4	4
	(OR)			
	b) Elaborate the principle, planning and design of machine foundation with illustration.	16	K4	4

Q. No**M BTL CO**

15. a) Formulate a suitable tower foundation for a double circuit 144 kV transmission line for the following specifications. The foundation is to be located in dense sand with $\phi = 40^\circ$, $\gamma = 17.5 \text{ kN/m}^3$, allowable bearing pressure as 250 kN/m^2 . The water table is located at a depth of 3m below the existing GL.

Nature of load	Actual load (KN)	
	N.C	B.W.C
Downward	450	600
Uplift	200	300
Shear in transverse direction	5	20
Shear in longitudinal condition	0	20

(OR)

- b) Determine the horizontal component of ground anchors Factored Design Load T_{hi} , and reaction, R , that provides equilibrium of horizontal forces above point, O for walls with a single level of anchors, take moments about point O to determine T_{h1} , where for walls with H_1 less than or equal to $H/2$, point O is located at the bottom of wall. For walls with H_1 greater than $H/2$, point O is located $H/2$ below the level of the ground anchors.

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

M.E./ Ph.D Degree Examinations – April/May 2025

Semester: II [Full Time]

Thermal Engineering/Mechanical Engineering

22THE32 – REFRIGERATION SYSTEMS

(Regulations 2022)

(Refrigeration tables with chart to be Permitted)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. State Unit of refrigeration.	2	K1	1
2. Outline the significance of Montreal and Kyoto Protocols towards environmental protection.	2	K2	1
3. Illustrate the T-S and p-h diagram for vapour compression refrigeration systems.	2	K2	2
4. List the advantages of vapour absorption refrigeration system over vapour compression refrigeration systems.	2	K1	2
5. State the functions of solenoid valves and defrost controllers in a refrigeration system.	2	K1	3
6. What is the function of an expansion device in a refrigeration system? Name any two types.	2	K1	3
7. What is sensitivity analysis in the context of refrigeration systems? Explain its significance briefly.	2	K1	4
8. Explain the role of system simulation in determining balance points in a refrigeration system.	2	K2	4
9. What is the importance of acoustics and noise control in refrigeration systems? Briefly explain the methods used to reduce noise.	2	K2	5
10. What is a relay, and what is its role in a refrigeration system?	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
11. a)	Discuss the thermodynamic, chemical, and physical requirements of an ideal refrigerant. Explain how these properties influence the selection and performance of refrigerants in refrigeration systems.	16	K3	1
	(OR)			
b)	Discuss the alternatives to CFC-12 (CF ₁₂) used in domestic refrigeration. Explain their properties and environmental significance.	16	K3	1
12. a)	A refrigeration system using a simple saturation cycle with refrigerant R12 is designed to handle a cooling load of 10 tons. The evaporator operates at -10°C, and the condenser at 30°C, with a required temperature difference of 5°C for heat transfer. Based on these conditions, calculate the following: i) The mass flow rate of the refrigerant. ii) The power required by the compressor in kilowatts (kW), considering ideal compression and the effect of volumetric efficiency. iii) The dimensions of a single-cylinder, single-acting compressor, assuming a length-to-diameter ratio of 1.2, operating at 300 RPM with a volumetric efficiency of 0.9.	16	K3	2
	(OR)			
b)	Model the Li-Br absorption refrigeration system and explain its working principle with a neat sketch.	16	K3	2
13. a)	Compare top feed and bottom feed arrangements in a direct expansion evaporator and states its advantages, disadvantages.	16	K3	3
	(OR)			
b)	Contrast air-cooled and water-cooled condensers with neat sketches. Explain their working principles, constructional features, and highlight the differences in terms of performance, cost, and application suitability.	16	K3	3
14. a)	Using graphical methods, discuss the performance characteristics of: a) Condenser Unit b) Compressor-Capillary Tube Unit	16	K3	4
	(OR)			

Q. No		M	BTL	CO
b)	Explain the following aspects of a refrigeration system with respect to system performance and efficiency:	16	K3	4
	a) System Balance			
	b) Increase or Decrease in Evaporator Capacity			
	c) Increase or Decrease in Condensing Unit Capacity			
15. a)	Explain the working principles of three-phase and single-phase induction motors along with their construction, providing labeled drawings for each.	16	K2	5
	(OR)			
b)	Explain the methods used to control room conditions at part load in refrigeration or air conditioning systems. Discuss the advantages and limitations of each method.	16	K2	5

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Government College of Engineering, Salem
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M.E./Ph.D. Degree Examinations – April/May 2025
Semester: II [Full Time]
Welding Technology/Metallurgical Engineering
22WTE41 – MATERIALS CHARACTERIZATION
(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. How high resolution can be achieved in light microscopy (LM)?	2	K2	1
2. Give the mathematical correlation between depth of focus and depth of field in LM.	2	K2	1
3. Classify X-ray diffraction methods.	2	K2	2
4. Write down the relationship between plane spacing of cubic crystal and its lattice parameter 'a'.	2	K2	2
5. What is the role of monochromatic filter in X-ray diffractometer?	2	K2	3
6. What are the three main methods of quantitative analysis in X-ray diffractometry studies?	2	K2	3
7. What are the three main types of electron sources used in TEM?	2	K1	4
8. What are the probe materials used in STM and AFM respectively?	2	K1	4
9. Why heat flux DTA is termed as quantitative DTA?	2	K3	5
10. How decomposition of materials are examined by TG technique?	2	K3	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Compare the two modes of interference in light microscopy and based on this explain about phase contrast microscopy with relevant sketches.	10	K2	1
ii) Compare bright field microscopy and dark field microscopy.	6	K2	1
(OR)			
b) i) Illustrate polarized light microscopy with neat sketches.	10	K2	1
ii) Outline the procedure for carrying out hot mounting process.	6	K2	1

Q. No		M	BTL	CO
12. a)	i) Compare laue method and rotating crystal method of diffraction.	10	K4	2
	ii) Analyse the physical principles of characteristic X-ray generation with relevant sketches.	6	K4	2
	(OR)			
b) i)	Analyse the importance of structure extinction in the calculation of diffraction intensity.	10	K4	2
	ii) Explain the theoretical background of diffraction.	6	K4	2
13. a)	i) How quantitative analysis is carried out in X-ray powder diffractometry?	8	K2	3
	ii) Detail the procedure of crystal phase identification using ICDD database for samples tested in X-ray diffractometer.	8	K2	3
	(OR)			
b) i)	Explain about system aberrations in x-ray powder diffractometry.	8	K2	3
	ii) Compare the examination of powder samples and crystalline aggregate samples in terms of (i) sample preparation and (ii) data acquisition in X-ray powder diffractometry.	8	K2	3
14. a)	i) What are the major components in TEM? Describe briefly the working of any two components.	8	K4	4
	ii) How samples are prepared by (i) electrolytic thinning and (ii) ion milling processes for TEM examination?	8	K4	4
	(OR)			
b) i)	How topographic contrast is generated for samples being examined in SEM? Discuss with suitable sketches.	8	K4	4
	ii) Briefly describe about static and dynamic mode of operations in AFM.	8	K4	4
15. a)	i) Explain the process setup and procedure for optical Emission spectroscopy.	12	K3	5
	ii) List the advantages and disadvantages of x-ray fluoroscopy.	4	K3	5
	(OR)			
b) i)	How chemical elements of samples are identified in AES studies. Explain the mechanism with adequate theory relating kinetic energy and shells / subshells of electrons involved. Also draw AES spectra for oxidized aluminium surface.	12	K3	5
	ii) Draw a DTA curve for a typical polymer sample under constant heating rate.	4	K3	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time]

Mechanical Engineering

12MA401 – NUMERICAL METHODS

(Regulations 2012)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

1. Write down the order of convergence and the condition of convergence of fixed-point iteration method.
2. Give the sufficient condition of convergence of Gauss Seidel method.
3. State Newton's forward interpolation formula.
4. Write down the properties of cubic splines.
5. When does Simpson's $1/3^{\text{rd}}$ rule give exact of result?
6. State two point Gaussian quadrature formula.
7. Find $y(1.2)$ if $y' = x + y$, $y(1) = 0$ by Euler's method with $h = 0.2$.
8. Write down the Milne's predictor and corrector formulas.
9. Write the diagonal five-point formula for solving the two-dimensional Laplace equation $\nabla^2 u = 0$.
10. State Crank-Nicholson's difference scheme.

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q.No

M

11. a) i) Find the real root of the equation $\cos x = 3x - 1$ by Newton-Raphson method correct to four places of decimals. (8)
- ii) Solve the following equation by Gauss Elimination method: (8)
 $10x - 2y + 3z = 23$; $2x + 10y - 5z = -33$; $3x - 4y + 10z = 41$.
- (OR)**
- b) i) Find the inverse of $\begin{pmatrix} 2 & 0 & 1 \\ 3 & 2 & 5 \\ 1 & -1 & 0 \end{pmatrix}$ using Gauss Jordan method. (8)
- ii) Solve by Gauss Siedel method: (8)
 $27x + 6y - z = 85$; $6x + 15y + 2z = 72$; $x + y + 54z = 110$.

Q.No**M**

12. a) i) Find the value of $f(5)$ using Lagrange's interpolation for the following data: (8)

x	0	1	2	3
$y = f(x)$	2	3	12	147

- ii) Using Newton's forward interpolation formula, find $f(5)$. : (8)

x	4	6	8	10
y	1	3	8	10

(OR)

- b) i) Find the value of y at $x = 4$ from the data given below. (8)

x	0	1	2	3
y	1	2	1	10

- ii) Use Newton's divided difference formula to find $f(x)$ from the following data : (8)

x	1	2	7	8
$y = f(x)$	1	5	5	4

13. a) i) From the following table, obtain the value of $\frac{d^2y}{dx^2}$ at $x = 0.96$ (8)

x	0.96	0.98	1.00	1.02	1.04
$y = f(x)$	0.7825	0.7739	0.7651	0.7563	0.7473

- ii) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ with $h = 0.2$ by Trapezoidal rule. (8)

(OR)

- b) i) Evaluate $\int_0^2 \frac{dx}{4x+3}$ with 8 subintervals by Simpson's $1/3^{\text{rd}}$ rule. (8)

- ii) Apply three-point Gaussian quadrature formula to evaluate $\int_0^1 \frac{\sin x}{x} dx$. (8)

14. a) i) Using Taylor series method to find $y(0.1)$ if $\frac{dy}{dx} = x + y^2$, $y(0) = 1$. (8)

- ii) Using R-K method of fourth order, Solve : $\frac{dy}{dx} = x + y^2$ with $y(0) = 1$; find $y(0.2)$ with $h = 0.2$. (8)

(OR)

- b) i) Using modified Euler's method, find $y(0.1)$ for the given equation (8)
 $\frac{dy}{dx} = x^2 - y^2$, given that $y(0) = 1$.

- ii) Given $\frac{dy}{dx} = x^2(y+1)$, $y(1) = 1$, $y(1.1) = 1.233$, $y(1.2) = 1.548$, (8)
 $y(1.3) = 1.979$; find $y(1.4)$ by Adam's-Bashforth method.

15. a) Solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$, given that $u(0, t) = u(5, t) = 0$, (16)
 $u(x, 0) = x^2(25 - x^2)$, find u in the range taking $h = 1$ up to 5 seconds by using Bender-Schmidt recurrence equation.

(OR)

- b) Solve the equation $\nabla^2 u = 0$ in $0 \leq x \leq 1, 0 \leq y \leq 1$ given that (16)
 $u(0, y) = 10$, $u(1, y) = 10$, $u(x, 0) = 20$ and $u(x, 1) = 20$ by taking $h = 0.25$.
Obtain the result correct to three decimal places.

Register Number :

Government College of Engineering :: Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV (Part Time)

Civil Engineering

16PTCE402 – MECHANICS OF SOILS

(Regulations 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. List two common soil-related problems in civil engineering.
2. Calculate the Liquidity Index and Consistency Index for Natural water content = 36%; Plasticity Index = 30%; Plastic limit = 20%
3. What assumption does Boussinesq make about soil?
4. Write the principle behind Newmark's influence chart.
5. Define quicksand condition.
6. A soil has a coefficient of permeability of 1.2×10^{-5} m/s and a hydraulic gradient of 0.3. Calculate the discharge velocity.
7. List the factors affecting compaction.
8. Distinguish between normally consolidated and over consolidated soil.
9. Discuss the disadvantages of direct shear test.
10. What are the types of tri-axial test based on drainage condition?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A soil sample has the following properties from laboratory testing: (16)
- Mass of wet soil = 2.20 kg ; Mass of dry soil = 1.80 kg ;
Volume of the soil sample = 1.10×10^{-3} m³ ;
Specific gravity of soil solids, $G = 2.70$;
Liquid Limit = 45% ; Plastic Limit = 20%
Sieve analysis results:
60% passing 4.75 mm sieve ;
30% passing 75micron sieve
Determine the following:
- i) Water content ii) Bulk density iii) Dry density
 - iv) Void ratio v) Degree of saturation vi) Plasticity Index
 - vii) Group symbol using BIS classification system

(OR)

- b) Define Atterberg's limits. How are they determined in the lab? Explain the significance of consistency indices. (16)

12. a) A granular soil deposit is 7 m deep over an impermeable layer. The ground water table is 4 m below the ground surface. The deposit has a zone of capillary rise of 1.2 m with a saturation of 50%. Plot the variation of total stress, pore water pressure and effective stress with the depth of deposit, $e = 0.6$ and $G_s = 2.65$. (16)

(OR)

- b) A concentrated load of 40 kN is applied vertically on a horizontal ground surface. Determine the vertical stress intensities of the following points. (16)

- i) At a depth of 2 m below the point of application of load
- ii) At a depth of 4 m below the point of application of load
- iii) At a depth of 1 m and at a radial distance of 3 m from the line of action of load
- iv) At a depth of 1 m and at a radial distance of 4 m from the line of action of load

Use both Boussinesq and Westergaard method and compare the results.

13. a) A constant head permeability test on a soil sample of 12 cm long and 50 cm² cross-sectional area gave 500 ml of water in 10 minutes under a head of 30 cm. The same soil has a dry density of 1.8 g/cc and specific gravity of 2.50. Compute the following (16)
- i) Coefficient of permeability
 - ii) Co-efficient of percolation
 - iii) Discharge velocity
 - iv) Seepage velocity.

(OR)

- b) What is a flow net? Describe its construction, procedure, properties, and applications. (16)

14. a) A consolidation test on a 20 mm thick sample gave 50% consolidation in 6 minutes. (16)
- i) Determine the coefficient of consolidation.
 - ii) Estimate the time required for 90% consolidation.
 - iii) Estimate the time required for 50% consolidation for signal drainage system.

(OR)

- b) A building column has a footing area of 2 m x 3 m and transmits a pressure increment of 150 kN/m² at its base embedded 1.6 m below ground level. Assuming a pressure distribution of two vertical to one horizontal, determine the consolidation settlement at the middle of the clay layer of thickness 4 m with saturated unit weight of 20 kN/m³ and initial void ratio 0.6 with compression index 0.5 underlies fine sand deposit of 5 m thickness. The water table is at a depth of 2 m ground level. The degree of saturation above the water table is 30%. Take the specific gravity of fine sand as 2.65 and the porosity is 40%. (16)

15. a) A cylindrical specimen of dry sand was tested in a triaxial test. Failure occurred under a cell pressure of 1.2 kg/cm² and at a deviator stress of 4 kg/cm². Find (16)

- Angle of shearing resistance of the soil.
- Normal and shear stresses on the failure plane.
- The angle made by the plane with the minor principal plane.
- The maximum shear stress on any plane in the specimen at the instant of failure.

(OR)

- b) Direct shear test was conducted on compacted sand shear box dimensions 60mm x 60 mm. The readings are listed below. (16)

Normal Load (N)	120	240	360
Peak Shear Load (N)	90	190	296
Ultimate Shear Load (N)	66	138	198

Examine the angle of shearing resistance in

- Dense compacted state
- Loose state

Register Number :

Government College of Engineering :: Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Part Time]

Civil Engineering

16PTCEE20 – REPAIR AND REHABILITATION OF STRUCTURES

(Regulation 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. List any four causes of structural deterioration.
2. Distinguish between repair and rehabilitation.
3. Define quality assurance in concrete construction.
4. Identify two causes of concrete cracks and suggest repair methods.
5. How does vacuum concrete help in improving durability of industrial floors?
6. Compare gunite and shotcrete based on application techniques and effectiveness
7. Explain how deflection can affect a structural member.
8. How would you repair a structural member weakened by corrosion due to marine exposure?
9. Name a type of equipment used in mechanical demolition.
10. Mention one safety consideration in engineered demolition.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain in detail the different types of maintenance in civil engineering. (16)
Discuss their importance with suitable examples.
(OR)
b) Explain the common causes of deterioration in concrete structures and (16)
describe how these factors affect structural performance.
12. a) Illustrate how corrosion of reinforcement occurs in concrete. What factors (16)
accelerate this process, and how does it affect structural safety?
(OR)
b) Assess how concrete strength, permeability, and thermal properties affect (16)
structural performance in extreme weather conditions.

13. a) Explain the properties and uses of polymer concrete, Sulphur-infiltrated concrete, and fiber-reinforced concrete. (16)

(OR)

- b) Describe corrosion protection methods for reinforced concrete, including coatings, inhibitors, corrosion-resistant steel, and cathodic protection. (16)

14. a) Analyze repair strategies for weathering and wear in concrete pavements and industrial floors, including preventive maintenance. (16)

(OR)

- b) Analyze the effects of low member strength and suggest repair and strengthening methods. (16)

15. a) Explain the different engineered demolition techniques used for dilapidated structures with examples. (16)

(OR)

- b) Compare mechanical and explosive demolition techniques with examples of their advantages and limitations. (16)

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: V [Part Time]

Electrical and Electronics Engineering

16PTEEE04 - BIO-MEDICAL INSTRUMENTATION

(Regulations 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Specify the nature of cancer cells.	2	K2	1
2. Classify the two major divisions of nervous system.	2	K2	1
3. List the advantages of isolation amplifiers.	2	K1	2
4. Name the electrodes used for EEG measurement.	2	K1	2
5. Differentiate Internal and External Pacemaker.	2	K3	3
6. Mention the elements of intensive care monitoring.	2	K1	3
7. Why angiography is necessary?	2	K2	4
8. List the benefits of Radiography and fluoroscopy.	2	K2	4
9. Suggest few devices to protect against electrical hazards.	2	K3	5
10. Mention the nuclear imaging techniques.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Elaborate the concept of resting and action potential and represent its effectiveness.	16	K3	1
(OR)			
b) Illustrate the different types of Electrodes in biomedical instrument systems.	16	K3	1
12. a) Explain in detail about the medical pre amplifier design and its use in bio-signal analysis.	16	K2	2
(OR)			
b) Describe in detail with the principle involved of electrodes used for measurement of ECG, EMG.	16	K2	2
13. a) Explain the various kinds of diathermy and their uses.	16	K3	3
(OR)			
b) Illustrate the pulmonary analyzers and blood gas analyzers with a neat diagram.	16	K3	3

Q. No		M	BTL	CO
14. a)	Explain in detail the working and applications of X-ray machine.	16	K4	4
	(OR)			
b)	Specify the elements of Bio-telemetry systems and explain the design of a biotelemetry system.	16	K4	4
15. a)	Discuss the physiological effects due to 50 Hz current passage and differentiate Micro Shock and Macro shock.	16	K3	5
	(OR)			
b)	Illustrate the difference between an ultrasonic imaging system and a magnetic resonance imaging system.	16	K3	5

Register Number :

Government College of Engineering :: Salem
(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: VI [Part Time]

Mechanical Engineering

16PTMEE10 - ENTREPRENEURSHIP DEVELOPMENT

(Regulation 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

(10 x 2 = 20 Marks)

Part A

Answer ALL Questions

1. What are the different types of entrepreneurs?
2. Distinguish between entrepreneur and intrapreneur.
3. Give your understanding on Thematic Apperception Test?
4. What is the meaning of self-rating?
5. Why is a project report important?
6. Write down the stage in project formulation.
7. Distinguish between CPM and PERT.
8. What is a tax holiday?
9. Outline the stages of growth in SSI.
10. State the advantages of subcontracting.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the factors affecting the growth of entrepreneurship in India. (16)
(OR)
b) Briefly explain various characteristics of successful entrepreneur and elaborate the role of intrapreneur in organizational growth. (16)
12. a) What is entrepreneurial stress? Write notes on symptoms of stress. (16)
How can an entrepreneur deal with entrepreneurial stress.
(OR)
b) What is achievement motivation? Elaborate, how an entrepreneurial development programme can be helpful for an entrepreneur. (16)
13. a) i) What is project appraisal? Discuss the methods of project appraisal in detail. (8)
ii) Describe various sources of business information. (8)

(OR)

- b) i) What is meant by ownership structure? Discuss various types of ownership structure with examples. (8)
- ii) Discuss different steps involved in setting up a business. (8)
14. a) i) Discuss the role state financial institutions in entrepreneurship development. (8)
- ii) Explain the concept of break-even-analysis. (8)
- (OR)**
- b) i) Write detailed note on working capital management. (8)
- ii) Discuss Government tax policy towards SSI. (8)
15. a) What do you mean by growth strategy? Outline various growth strategies that can be taken for an automobile ancillary unit. (16)
- (OR)**
- b) How would you define a Sick Unit? Discuss the various symptoms of sickness and elaborate various corrective measures towards sickness of an industry. (16)

Register Number :

Government College of Engineering :: Salem
(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: VII [Full Time]

Civil Engineering

18MEOE03 – TOTAL QUALITY MANAGEMENT

(Regulation 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

(10 x 2 = 20 Marks)

Part A

Answer ALL Questions

1. What are the elements of TQM?
2. Compare appraisal and failure costs.
3. List the benefits of teamwork.
4. Compare Reward & Recognition.
5. Distinguish between variables and attributes with examples.
6. Enumerate the importance of process capability.
7. What are the parts of house of quality?
8. Mention the stages of FMEA.
9. Analyze the requirements of ISO 14001.
10. Name any two generic ISO standards. Why it is called generic Standard?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Describe Deming's philosophy for quality management. (16)
(OR)
b) Enumerate the quality statements and discuss in detail with respect to the service-based industry. (16)
12. a) What is PDCA cycle? Illustrate PDCA cycle as an effective tool for continuous improvement with an example. (16)
(OR)
b) How would you show your understanding on framing 5S for a manufacturing company and classifying them? (16)
13. a) Discuss about the stages of six-sigma in process improvement. (16)
(OR)
b) Examine the new seven tools of quality management. (16)

14. a) Explain the concept of Taguchi's Quality loss function in detail with an example. (16)

(OR)

- b) Analyze the three main types of benchmarking. In what circumstances would each type be more appropriate? (16)

15. a) Explain about the various processes used in ISO 9001 quality management system. (16)

(OR)

- b) Elucidate the implementation of quality audit in a textile industry. (16)

Registration Number:

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: V [Full Time]/VI [Part Time]

Civil Engineering

22CE503/18CE503/22PTCE602 – WATER RESOURCES ENGINEERING

(Regulations 2022/2018/2018A)

Time: 3 Hours

Maximum Marks: 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define the hydrological cycle.	2	K1	1
2. Name the main components of a hydrograph of discharge against time.	2	K1	1
3. What are the most important physical characteristics of a reservoir?	2	K1	2
4. List the factors to be considered in the selection of a site for the reservoir.	2	K1	2
5. Write the governing equation for groundwater flow.	2	K1	3
6. State any two properties of the aquifer.	2	K1	3
7. List the classification of canals.	2	K1	4
8. Interpret the application of GIS in the distribution system.	2	K2	4
9. Name the various drainage systems.	2	K1	5
10. What are the causes and effects of water logging?	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
11. a)	i) List the different types of evaporation and explain the factors affecting evaporation in detail.	8	K2	1
	ii) The ordinates of the storm hydrograph of a particular catchment are given below. Determine the ordinates of unit hydrograph and rainfall excess. Take the catchment area as 50 km ² .	8	K3	1

[illegible]

Q. No		M	BTL	CO
	(OR)			
b) i)	Explain in detail about the synthetic unit hydrograph method.	8	K2	1
ii)	What is a dimensionless unit hydrograph? How is it useful in constructing a synthetic unit hydrograph of a basin?	8	K3	1
12. a) i)	Explain in detail about physical characteristics of the reservoir.	8	K2	2
ii)	Discuss on storage capacity of the reservoir. List out and explain various storage zones of the reservoir with neat sketch?	8	K2	2
	(OR)			
b) i)	How is GIS associated with the determination of site selection for a reservoir?	8	K2	2
ii)	Illustrate in detail of the storage capacity reservoir from the mass curve method.	8	K2	2
13. a) i)	A 30 cm diameter well completely penetrates an unconfined aquifer of saturated depth 40 m. After a long period of pumping at a steady rate of 1500 lpm, the drawdown in two observation wells are located at 25 m and 75 m from the pumping well were found to be 3.5 m and 2 m respectively. Determine the transmissibility of the aquifer.	8	K3	3
ii)	Draw a neat sketch and show the various types of aquifers, confining units, wells and interfaces in them along with their equivalent terminology.	8	K2	3
	(OR)			
b) i)	A 20 cm diameter tube well taps an artesian aquifer. Find the yield for a drawdown of 3 m at the well. The length of the strainer is 30 m and the coefficient of permeability of the aquifer is 35 m per day. Assume the radius of influence as 300 m. If all other conditions remain the same, find the percentage change in yield under the following cases. i) The diameter of the well is 40 cm. ii) The drawdown is 6 m. The permeability is 17.25 m/day.	8	K3	3
ii)	Explain the various methods of determining the aquifer parameters using the pumping test data.	8	K2	3

Q. No		M	BTL	CO
14. a)	i) Explain the types of canal cross-sections with neat sketches.	8	K2	4
	ii) Outline the step-by-step design procedure for an efficient irrigation channel suitable for agricultural purposes. Describe the key considerations, such as slope calculations, flow rate determination, soil type analysis, and the selection of appropriate lining materials.	8	K2	4
	(OR)			
b)	i) Reflecting on the evolution of irrigation systems and their technological advancements, trace the historical progression of canal lining techniques used to minimize water seepage in ancient civilizations to modern times.	8	K2	4
	ii) Explain the application of GIS in the distribution system.	8	K2	4
15. a)	i) Discuss the multifaceted issue of waterlogging in agricultural lands, detailing comprehensive remedial measures to mitigate its adverse effects.	8	K2	5
	ii) Explore the different drainage systems and discuss their advantages.	8	K2	5
	(OR)			
b)	i) Discuss specific GIS-based tools or models used to assess the extent of waterlogging, predict flood risks, and facilitate effective water management strategies.	8	K2	5
	ii) Explain in detail on rivers and their behaviours.	8	K2	5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)
B.E. Degree Examinations – April/May 2025
Semester: V [Full Time]
Computer Science and Engineering
22CS504 – PRINCIPLES OF COMPILER DESIGN
(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Indicate the phase of a compiler that can detect each of the following errors: a. Operators with incompatible types b. Not reachable statements	2	K2	1
2. Show the interactions between lexical analyzer and the parser.	2	K1	1
3. How does a handle pruning get significant in bottom-up parser? Also, find the handle in each of the following right-sentential forms for the grammar, given the input string "000111" $S \rightarrow 0S1 \mid 01$	2	K3	2
4. Consider the grammar and apply Left Factoring: $S \rightarrow iEtSeS \mid iEtS \mid a$ $E \rightarrow b$	2	K3	2
5. Translate the arithmetic expression $w = (a + b) * (c + d) - (a + b + c)$ into quadruples and triples.	2	K2	2
6. Write down syntax directed definition of a simple desk calculator.	2	K3	3
7. Construct a Directed acyclic graph for the basic block given below: $d = b * c$ $e = a + b$ $b = b * c$ $a = e - d$	2	K3	3
8. Differentiate intermediate code and target code.	2	K1	1
9. Apply possible local optimization on the following code. $a := x ** 2$ $b := 3$ $c := x$ $d := c * c$ $e := b * 2$	2	K3	2
10. What is a flow graph? Give example.	2	K1	3

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
11. a)	i) For calculating the income tax, the following formula is used by a concern. If salary > 500000 then Tax = salary * 0.20 Else Tax = salary * 0.10 End if where, salary could be either integer or floating-point number. Elaborate on how this statement is converted into a machine language format while passing through the six phases of the compiler. Explain the above process by writing the output. Write the uses of symbol table and error handling phase.	8	K3	1
	ii) The North American Numbering Plan defines how North American telephone numbers are formatted. As per the plan, telephone numbers are made up of a three-digit area code and then a seven-digit number (which is formatted as a three-digit prefix followed by a hyphen and a four-digit line number). Any digits may be used in a phone number with two exceptions: The first digit of the area code and the first digit of the prefix may not be 0 or 1. The area code is often enclosed within parentheses, and is often separated from the actual phone number by a hyphen. Write the regular expression for North American telephone numbers. Example Matches: a. (555) 555-5555 b. (555)555-5555 c. 555-555-5555	8	K3	1

(OR)

Q. No

M BTL CO

- b) i) Construct the NFA obtained from the given NFA with ϵ transitions using Thompson Construction. Shown in Fig.1

8 K3 1

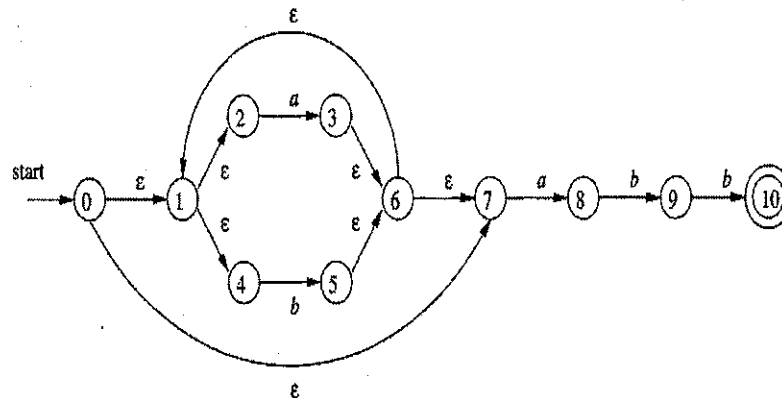


Fig.1

- ii) Determine whether the given DFA is minimized one or not? Shown in Fig.2

8 K3 1

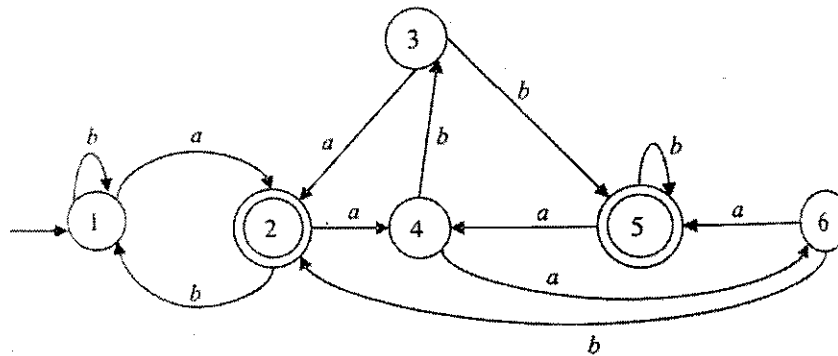


Fig.2

12. a) i) What are the advantages of operator precedence parsing over the shift reduce parsing? Write an algorithm of operator precedence parsing. Consider the following grammar.

8 K3 1

$$E \rightarrow E + E$$

$$E \rightarrow E * E$$

$$E \rightarrow id$$

And trace the operator precedence parsing algorithm for the input expression: $id + id + id$.

- ii) Construct the predictive parsing table for the following grammar:

8 K3 1

$$S \rightarrow a \mid \uparrow \mid (T)$$

$$T \rightarrow T, S \mid S$$

Is the parser LL (1)? Show the actions of the parser for the input string (a, a)

(OR)

Q. No

M BTL CO

- b) i) Construct the SLR parser for the grammar:

8 K3 2

$$S \rightarrow L = R$$

$$S \rightarrow R$$

$$L \rightarrow * R$$

$$L \rightarrow id$$

$$R \rightarrow L$$

What sequence of moves does the parser follow for the sentence "**id = *id**," and what conclusions can be drawn from the above parsing table?

- ii) Construct the CLR parsing table for the following grammar:

8 K3 1

$$S \rightarrow CC$$

$$C \rightarrow aC \mid d$$

Is the grammar CLR (1)? Describe the steps involved in construction of the parsing table. How does the parser use the information in the parsing table for its action? Illustrate with an example.

13. a) i) Consider the SDT:

8 K3 2

$$S \rightarrow a A f b \quad \{ \text{Printf}("M"); \}$$

$$A \rightarrow c S \quad \{ \text{Printf}("RU"); \}$$

$$A \rightarrow d \quad \{ \text{Printf}("GA"); \}$$

$$B \rightarrow e B \quad \{ \text{Printf}("FO"); \}$$

$$B \rightarrow f \quad \{ \text{Printf}("TE"); \}$$

$$A \rightarrow B \quad \{ \text{Printf}("TE"); \}$$

What is the output generated by the Syntax-Directed Translation (SDT) for the string "**acadbfbfb**"?

- ii) Consider the following expression:

8 K2 2

$$(a + b) - (e - (c + d))$$

- Construct three address code for the above expression
- For the above three address code constructed, generate the instruction code with the use of only two registers R_0 and R_1

(OR)

Q. No		M	BTL	CO
b) i)	Represent the following C code of matrix multiplication as a three-address code.	8	K3	2

```

for (i = 0; i < 5; i++) {
    for (j = 0; j < 5; j++) {
        a[i][j] = i + j;
        b[i][j] = i * j;
        c[i][j] = 0;
    }
}

for (i = 0; i < 5; i++) {
    for (j = 0; j < 5; j++) {
        for (k = 0; k < 5; k++) {
            c[i][j] += a[i][k] * b[k][j];
        }
    }
}

```

ii)	Generate intermediate code for the following code segments along with the required syntax directed translation scheme:	8	K2	2

```

int a,b;
float c;
a=10;
switch(a){
    case 10:c=1;
    case 20:c=2;
    case 30:c=3;
    default:c=30;
}

```

14. a) i)	Write a simple code generation algorithm. Mention the status of register and address descriptor after execution of the following statement:	8	K2	2

$$d := (a - b) + (a - c)$$

ii)	List the steps involved in building control flow graph. Construct control flow graph for the following code fragment:	8	K2	2

```

fact(x) {
    int f = 1;
    for (int i = 2; i <= x; i++) {
        f = f * i;
    }
}

```

(OR)

Q. No		M	BTL	CO
b) i)	Discuss the various allocation strategies used in run-time storage environment.	8	K2	2
ii)	Discuss the issues in code generation with examples.	8	K2	2
15. a)	Write short notes on the following:	16	K2	3
i.	Common Subexpressions			
ii.	Dead-Code Elimination			
iii.	Constant Folding			
iv.	Strength reduction			
	(OR)			
b)	Find the ud-chain for the variables in the following code segment. Use Data flow analysis, Identify available expressions, reaching definitions and live variables at points A & B.	16	K2	3

```

i= m-1;
j= n;
a=u1;
do
  i= i+1;
  j=j-1;
  if e3 then
    a = u2;
  else begin
    i = u3;
    break;
  end
while e2;

```



```

graph TD
    A((A)) --> i_plus[i= i+1;]
    B((B)) --> j_minus[j=j-1;]

```


Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: V [Full Time] / IV [Part Time]

Electrical and Electronics Engineering

22EE504/22PTEE404 – ELECTRICAL DRIVES AND CONTROL

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Give an example of constant torque and variable torque loads drive system.	2	K2	1
2. List two advantages of using chopper drives for DC motors compared to traditional control methods.	2	K2	1
3. What are the advantages of dc chopper drives over rectifier controlled devices?	2	K2	2
4. What are the four quadrants of dc drives?	2	K1	2
5. What are the different methods of speed control of Induction Motor Drives?	2	K1	3
6. What are the three regions in the speed-torque characteristics of the induction motor drive?	2	K1	3
7. What type of motor is applicable for rotor resistance control?	2	K2	4
8. What are the different types of slip power recovery systems?	2	K1	4
9. How does a Brushless DC (BLDC) motor differ from a conventional brushed DC motor?	2	K2	5
10. What are the basic principles of operation for a Switched Reluctance Motor (SRM)? How does it generate torque?	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain the operation of chopper for forward motoring and braking control of separately excited dc motor with aid of diagram, waveforms and speed torque curves.	16	K2	1
(OR)			
b) Discuss the principle of armature voltage control of separately excited DC motor for varying speed. Include its operation, advantages, limitation and practical application.	16	K2	1

Q. No		M	BTL	CO
12. a)	Draw the circuit diagram of four quadrant chopper and explain the operation of four quadrant chopper in details.	16	K4	2
	(OR)			
b)	Draw the block diagram of Closed loop control of DC drive and explain the importance of current controller and speed control loop in the system.	16	K4	2
13. a)	Explain the open loop and closed loop V/F control strategy for the inverter fed induction motor drive system with relevant diagram.	16	K4	3
	(OR)			
b)	Analyze the variation of torque-speed characteristics of an Induction motor when there are changes in applied voltage and frequency. Discuss the effects.	16	K4	3
14. a)	Draw and explain the slip power recovery scheme applicable for three phase induction motor drive system. What are the advantages and disadvantages of slip power recovery scheme?	16	K4	4
	(OR)			
b)	Explain using power circuit how static rotor resistance control serves to vary the speed of a three phase slip ring induction motor. Also compare slip power recovery scheme with rotor resistance control.	16	K4	4
15. a)	What are the common methods for implementing torque control in SRM drives? Discuss one method in detail. Also Analyze the challenges associated with torque control in SRM drives, particularly regarding torque ripple and efficiency.	16	K4	5
	(OR)			
b)	Describe the principle of operation of a BLDC motor and Analyze, how is the rotation generated without brushes? Also Explain the significance of PWM (Pulse Width Modulation) in controlling the speed of BLDC motors.	16	K4	5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: V[Full Time]/IV [Part Time]

Mechanical Engineering

22ME504/18ME504/22PTME404/23PTME404 – DYNAMICS OF MACHINERY

(Regulations 2022/2018/2018A/2023)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define D'Alembert's principle.	2	K1	1
2. List out the reasons for windup in camshaft.	2	K1	1
3. Outline the significance of reference plane in balancing.	2	K2	2
4. Define tractive force.	2	K1	2
5. Compare longitudinal vibration and transverse vibration.	2	K2	3
6. Write in short about 'Vibration Isolation'.	2	K1	3
7. Contrast node with anti-node in torsional vibration.	2	K2	4
8. Outline the functions of FFT analyser.	2	K2	4
9. Define hunting of governor.	2	K1	5
10. Write the expression for height in the case of Watt Governor.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) The length of the crank and connecting rod of a vertical reciprocating engine are 300 mm and 1.5 m respectively. The crank is rotating at 200 rpm clockwise. Determine analytically (i) acceleration of the piston (ii) velocity of the piston (iii) Angular acceleration of the connecting rod when the crank has turned through 40° from the top dead center and the piston is moving downwards.	16	K4	1

(OR)

Q. No		M	BTL	CO
b)	The areas above and below the mean torque line for an IC engine are -25, +200, -100, +150, -300, +150 and -75 mm ² taken in order. The scale for the turning moment diagram is 1mm vertical scale = 10 Nm and 1 mm of the horizontal scale = 1.5°. The mass of the rotating parts are 45 kg with a radius of gyration of 150 mm. If the engine speed is 1500 rpm. Find the coefficient of the fluctuation of speed.	16	K4	1
12. a)	A Shaft carries four rotating masses A, B, C and D which are completely balanced. The masses B, C and D are 50 kg, 80 kg and 70 kg respectively. The masses C and D make angles of 90° and 195° respectively with mass B in the same sense. The masses A, B, C and D are concentrated at radius 75 mm, 100 mm, 50 mm and 90 mm respectively. The plane of rotation of masses B and C are 250 mm apart. Determine (i) the magnitude of mass A and its angular position (ii) the position of planes A and D.	16	K4	2
(OR)				
b)	The following data refer to two cylinder locomotive with cranks at 90°: Reciprocating mass per cylinder = 300 kg; Crank radius = 0.3 m; Driving wheel diameter = 1.8 m; Distance between cylinder centre lines = 0.65 m; Distance between the driving wheel central planes = 1.55 m. Determine the following, (i). The fraction of the reciprocating masses to be balanced, if the hammer blow is not to exceed 46 kN at 96.5 km.p.h.; (ii). The variation in tractive effort; and (iii).The maximum swaying couple.	16	K4	2
13. a)	A shaft 1.5 m long, supported in flexible bearings at the ends carries two wheels each of 50 kg mass. One wheel is situated at the centre of the shaft and the other at a distance of 375 mm from the centre towards left. The shaft is hollow of external diameter 75 mm and internal diameter 40 mm. The density of the shaft material is 7700 kg/m ³ and its modulus of elasticity is 200 GN/m ² . Find the lowest whirling speed of the shaft, taking into account the mass of the shaft.	16	K4	3

(OR)

Q. No	M	BTL	CO
b) A machine of mass 100 kg is supported on openings of total stiffness 800 KN/m and has a rotating unbalanced element which results in a disturbing force of 400 N at a speed of 300 rpm. Assuming the damping ratio as 0.25, Determine the following, (i). The amplitude of vibrations due to unbalance; and (ii). The transmitted force.	16	K4	3
14. a) A steel shaft 1.5 m long is 95 mm in diameter for the first 0.6 m of its length, 60 mm in diameter for the next 0.5 m of the length and 50 mm in diameter for the remaining 0.4 m of its length. The shaft carries two flywheels at two ends. The first having a mass of 900 kg and 0.85 m radius of gyration located at the 95 mm diameter end and the second having a mass of 700 kg and 0.55 m radius of gyration located at the other end. Determine the location of the node and the natural frequency of free torsional vibration of the system. The modulus of rigidity of shaft material may be taken as 80 GN/m ² . (OR)	16	K4	4
b) Examine the working principle of vibrometer and accelerometers with their advantages and disadvantages.	16	K4	4
15. a) The lengths of the upper and lower arms of a porter governor are 200 mm and 250 mm respectively. Both the arms are pivoted on the axis of rotation. The central load is 150 N, the weight of the each ball is 20 N and the friction of the sleeve together with the resistance of the operating gear is equivalent to a force of 30 N at the sleeve. If the limiting inclinations of the upper arms to the vertical are 30° and 40°, taking friction in to account, find the range of speed of the governor. (OR)	16	K4	5

Q. No

M BTL CO

- b) In a Hartnell governor the lengths of ball and sleeve arms of a bell crank lever are 120 mm and 100 mm respectively. The fulcrum of the bell crank lever is located at 140 mm from the governor axis; each governor ball is 4 kg. The governor runs at 5 rps with ball arms vertical and sleeve arms horizontal the sleeve movement is found to be 10 mm (upwards) for an increase of speed of 4%. Find:

- (i) Maximum speed if the total sleeve movement is limited to 20 mm
- (ii) the spring stiffness
- (iii) sensitiveness of governor
- (iv) required spring stiffness for isochronous at 300 rpm.

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: I [Part Time]

Electrical and Electronics Engineering

23PTEE101 – ELECTRIC CIRCUIT ANALYSIS

(Regulations 2023)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. State Ohm's Law. Also write the limitations of Ohm's Law.	2	K1	1
2. Two resistors 100Ω and 400Ω are connected in series to a 50 DC voltage source. Calculate the current from source and voltage across each resistance.	2	K3	1
3. State maximum power transfer theorem for AC circuit.	2	K1	2
4. Draw Thevenin's and Norton's equivalent circuits and comment on duality.	2	K2	2
5. Illustrate DOT rule.	2	K1	3
6. Define co-efficient of coupling.	2	K1	3
7. Distinguish between transient response and sinusoidal response of a circuit.	2	K2	4
8. A DC Voltage of 100 Volts is applied to Series RL Circuit with $R=25\Omega$. Calculate the value of current in which time constant is twice.	2	K3	4
9. If one of the star supply lines is open circuited, estimate the total power of the circuit.	2	K3	5
10. In two wattmeter method of power measurement, calculate the power factor of the system if first watt meter shows positive and the second shows zero.	2	K3	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Find the current in the 3Ω resistor in the network shown in Fig.1.	8	K4	1

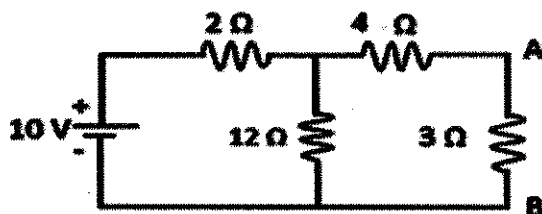


Fig.1

Q. No

M BTL CO

- ii) Explain series RLC circuit with a phasor diagram and derive the expression for impedance, current and power factor.

8 K2 1

(OR)

- b) i) Find the current passing through each resistor for the circuit below in Fig.2.

8 K4 1

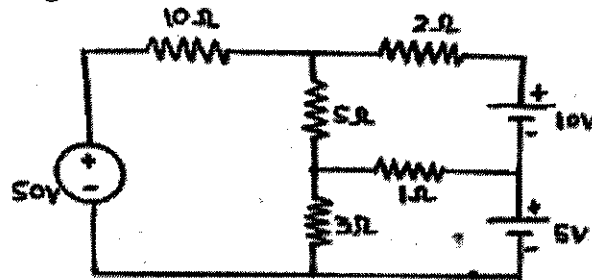


Fig.2

- ii) Find the form factor of the half wave rectified sine wave shown in Fig.3.

8 K2 1

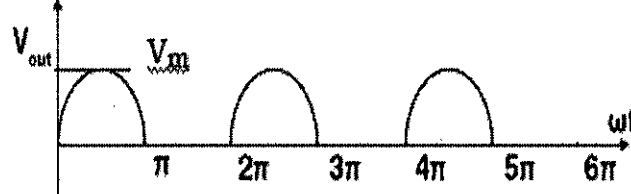


Fig.3

12. a) Illustrate the conversion of a DC Star - Delta and Delta - Star in detail to obtain equivalent from one to another.

16 K4 2

(OR)

- b) i) Find the current passing through 3Ω Resistor for the circuit shown below in Fig.4 by using Superposition Theorem.

8 K4 2

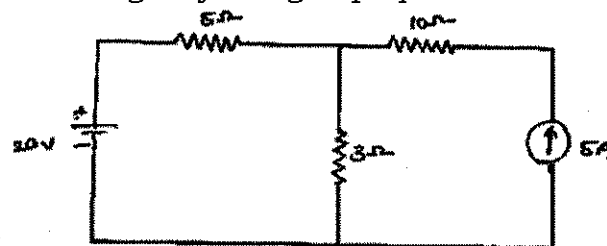


Fig.4

- ii) Determine the Norton's equivalent circuit for the circuit shown in Fig.5.

8 K4 2

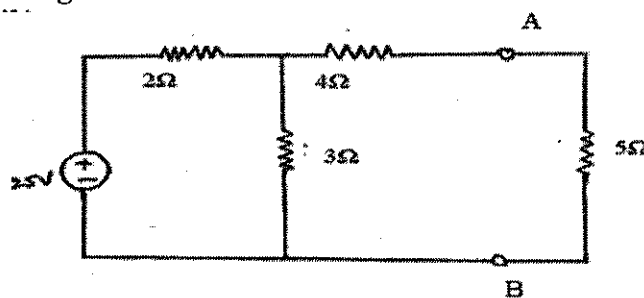
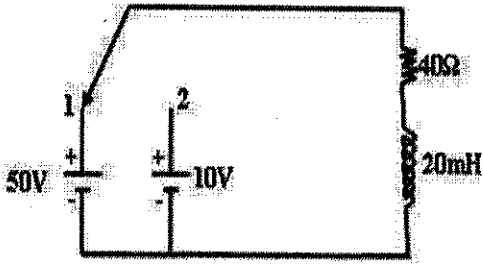


Fig.5

Q. No		M	BTL	CO
13. a)	A series RLC circuit has $R=10\Omega$, $L=0.5H$ and $C=40\mu F$. The applied voltage is 100V. Find a) Resonant frequency & Quality factor of a coil b) Bandwidth c) Upper and lower Half power frequencies d) Current at resonance & current at half power points e) Voltage across inductance & voltage across capacitance at resonance.	16	K4	3
	(OR)			
b) i)	Derive the expression for equivalent inductance when the coupled inductors are connected in Parallel aiding and parallel opposition.	8	K4	3
	ii) Discuss Double Tuned Amplifier with neat diagram and derive the expression for its bandwidth.	8	K4	3
14. a) i)	A series RC circuit with $R=5 K\Omega$ and $C=20 \mu F$ as a constant voltage source of 100V applied at $t=0$; there is no initial charge on the capacitor. Examine the current i and charge q for $t > 0$.	8	K4	4
	ii) In the circuit given in Fig.6, the switch has been in position 1 for sufficient time to establish steady state conditions. The switch is then moved to position 2. Show the current transient.	8	K4	4
				
	Fig.6			
	(OR)			
b)	A sinusoidal voltage of $10\sin 100t$ is connected in series with a switch and $R = 10\Omega$ and $L = 0.1H$. If the switch is closed at $t = 0$, Determine the transient current $i(t)$.	16	K4	4

Q. No		M	BTL	CO
15. a)	A balanced Star connected load of $(4+j3)$ Ohm /Phase is connected to a 3-Phase, 230 V, 50 Hz Supply. Evaluate	16	K2	5
	a) Line Current			
	b) Power Factor			
	c) Reactive volt Amperes			
	d) Power in VA			
	(OR)			
b)	Explain three phase power measurement using two wattmeter method with a circuit and phasor diagrams.	16	K2	5

Register Number :

Government College of Engineering :: Salem
(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: IV [Part Time]

Civil Engineering

16PTCE403 – STRUCTURAL ANALYSIS - II

(Regulations 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

(10 x 2 = 20 Marks)

Part A

Answer **ALL** Questions

1. State Castigliano's second theorem.
2. Write Muller's Breslau's principle and its applications.
3. How do you determine the final moments in any indeterminate flexural frame by slope deflection method?
4. Write down the Slope Deflection equation for a two span continuous beam with simply supported ends.
5. How do you determine Distribution factor?
6. Define Carryover factor.
7. Distinguish between Static and Kinematic indeterminacy.
8. Write down the element flexibility matrix (f) for a beam element.
9. What is the relation between flexibility and stiffness matrix?
10. What is the equilibrium condition used in the stiffness method?

Part B

(5 x 16 = 80 Marks)

Answer **ALL** Questions

11. a) A fixed beam ACB is fixed at A and B and is provided with an internal hinge at C, 4 m from A. Draw Influence line diagrams for (16)
 - i. Reaction at A
 - ii. Reaction at B
 - iii. Bending Moment at A
 - iv. Bending Moment at D, the mid point of span AC
 - v. Bending Moment at E, 2 m from B

(OR)

b) i) Write short notes on Thermal Stresses. (8)

ii) Determine the vertical and horizontal deflection for the joint C of the Pin jointed truss shown in Fig.1. The area of the horizontal member is 140 mm^2 and members AC and BC are 200 mm^2 . Assume $E = 200 \text{ kPa}$.

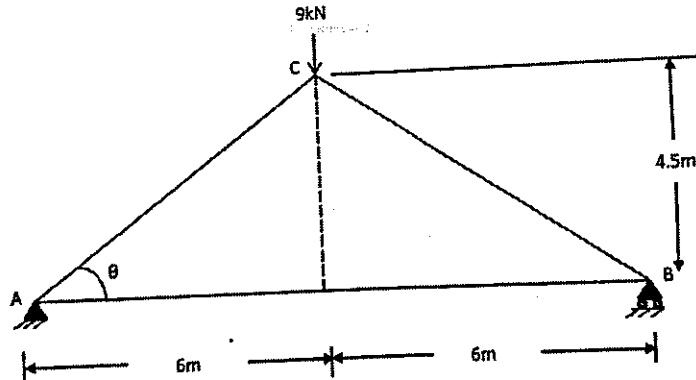


Fig.1

12. a) Draw Shear Force and Bending Moment diagram for the beam shown in Fig.2 using slope deflection method. The flexural rigidity is constant. (16)

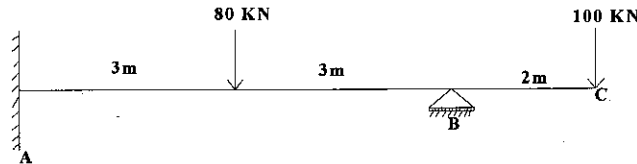


Fig.2

(OR)

b) Draw Shear Force and Bending Moment diagram for the portal frame carrying a uniformly distributed load of 10 kN/m in the span BC as shown in Fig.3 using slope deflection method. The flexural rigidity EI is constant. (16)

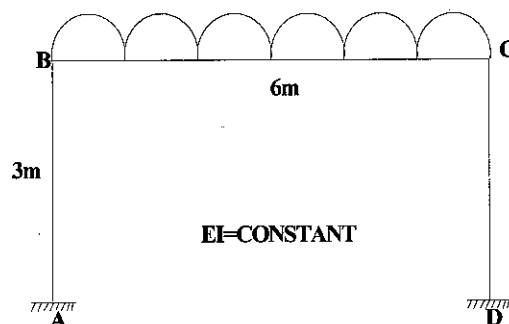


Fig.3

13. a) Draw SFD and BMD for the continuous beam shown in Fig.4. Use (16)
Moment Distribution method.

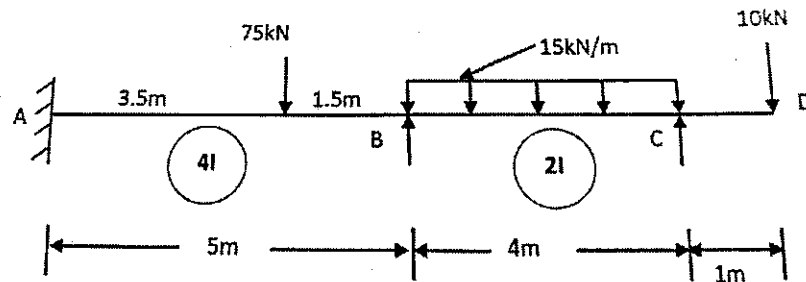


Fig.4

(OR)

- b) Using Moment Distribution method, analyze the Portal Frame shown (16)
in Fig.5 and draw BMD.

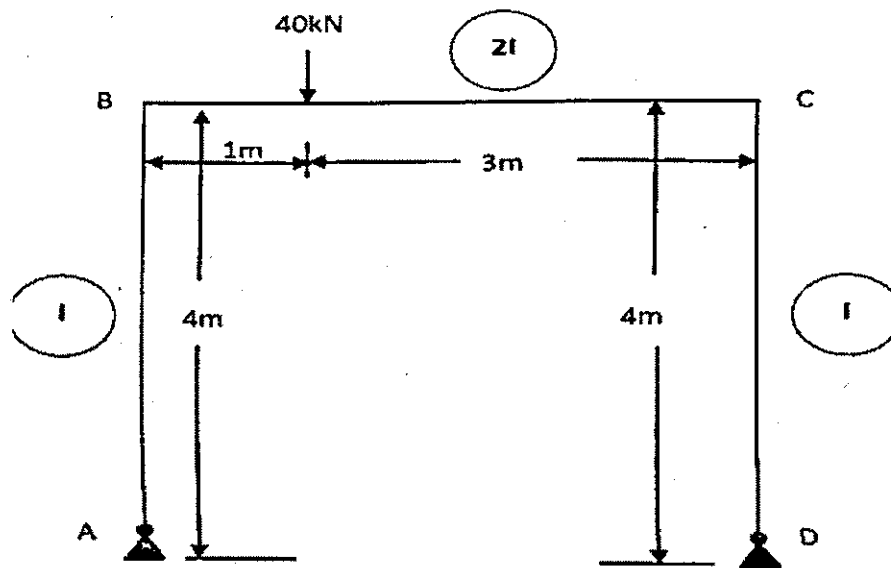


Fig.5

14. a) Determine the flexibility matrix for the beam shown in Fig.6. (16)

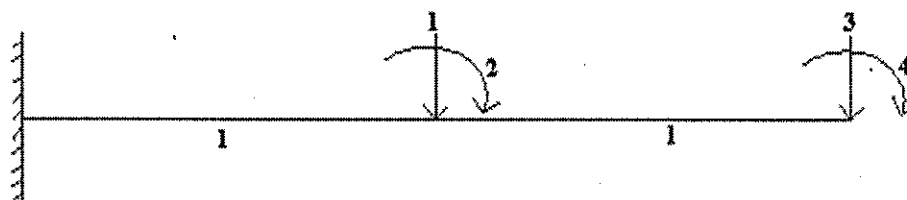


Fig.6

(OR)

- b) Analyse the Frame shown in Fig.7 using Matrix Flexibility Method. (16)

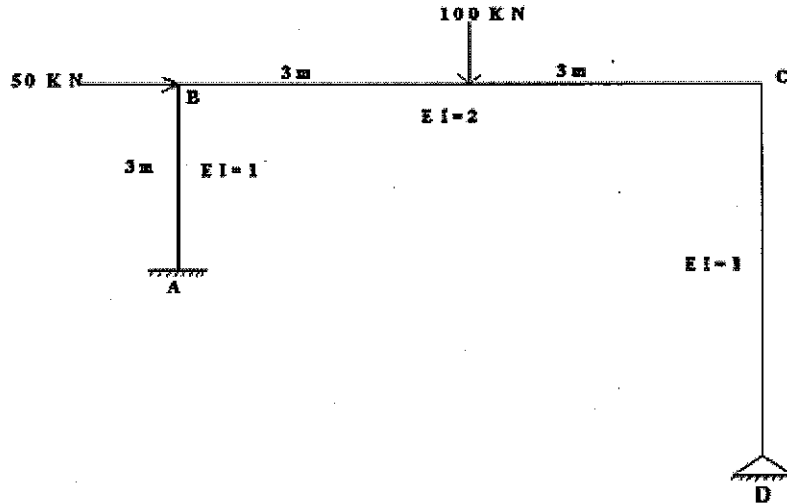


Fig.7

15. a) A continuous beam ABC of span 12 m is rigidly fixed at A & C and propped at the same level at B. The spans of AB = 6 m and BC = 6 m. The beam carries a uniformly distributed load of 20 kN/m over the entire span AB and a concentrated load of 120 kN at 9 m from the left support A. Analyse the continuous beam by matrix stiffness method and draw the Bending Moment Diagram. Assume EI as constant throughout. (16)

(OR)

- b) A two span continuous beam ABC is fixed at A and simply supported over the supports B and C. AB = 6 m and BC = 6 m. The moments of inertia is constant throughout. The beam carries a udl of 15 kN/m in span AB and a clockwise couple of 40 kN.m at mid point of span BC. Analyse the continuous beam by matrix stiffness method and draw the Bending Moment Diagram. Assume EI as constant throughout. (16)

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: IV [Part Time]

Electrical and Electronics Engineering

16PTEE401 – LINEAR INTEGRATED CIRCUITS

(Regulations 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Name the popular IC packages available.	2	K2	1
2. Inductors are difficult to fabricate in ICs. Justify the statement.	2	K2	1
3. Name the key parameters that define the performance of a differential amplifier.	2	K2	2
4. Write the ideal characteristics of an operational amplifier.	2	K2	2
5. What is the importance of high CMRR in instrumentation amplifiers?	2	K1	3
6. An 8 bit DAC has a resolution of 20 mV/bit. What is the analog output voltage for the digital input code 00110110?	2	K2	3
7. Mention the role of voltage-controlled oscillator in a PLL.	2	K2	4
8. Draw the pin diagram of 555 IC.	2	K2	4
9. Compare linear regulator and switching regulator.	2	K3	5
10. List the applications of opto-coupler.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Discuss the classification of ICs in terms of their scale of integration and fabrication technology.	8	K4	1
ii) Explain the epitaxial growth process in IC fabrication.	8	K2	1
(OR)			
b) i) Describe the process of masking and etching in IC fabrication.	8	K4	1
ii) Explain the different types of IC packaging techniques. Compare their advantages and disadvantages.	8	K2	1

Q. No		M	BTL	CO
12. a)	i) With neat circuit explain the working of integrator and differentiator using op-amp.	8	K2	2
	ii) Briefly explain the AC and DC performance characteristics of operational amplifier.	8	K2	2
	(OR)			
b) i)	Discuss the frequency response characteristics of an op-amp.	8	K2	2
	ii) Write the frequency compensation techniques adopted in operational amplifiers.	8	K2	2
13. a)	Describe the working of Successive Approximation type A/D converter and D/A converter.	16	K3	3
	(OR)			
b)	Describe the operational characteristics of instrumentation amplifier using three op-amps and derive the expression for overall gain.	16	K3	3
14. a)	Draw the functional blocks and explain the working of IC 566 voltage controlled oscillator. Derive the expression for the output frequency.	16	K4	4
	(OR)			
b)	Analyze the working of IC 555 timer in the astable mode. Derive the expression for its frequency.	16	K4	4
15. a)	Describe the working of IC 723 as low voltage regulator and high voltage regulator.	16	K3	5
	(OR)			
b)	Describe the working of LM380 power amplifier. Write notes on opto electronic ICs.	16	K3	5

Register Number :

Government College of Engineering :: Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Part Time]

Mechanical Engineering

16PTMEE13 - MAINTENANCE ENGINEERING

(Regulation 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Compare preventive and predictive maintenance with example.
2. List any two benefits of a good maintenance system.
3. Define maintenance economics.
4. Classify various methods of inventory control.
5. Define the significance of bath tub curve.
6. Write the expression for Mean Time between Failures (MTBF).
7. Outline the objectives of computer aided maintenance management.
8. Write in short about 'Job sequencing files'.
9. Compare On-load testing and Off-load testing used in condition monitoring.
10. List out various methods of shock monitoring.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the objectives of organization design and types of organization with respect to maintenance policies. (16)
(OR)
b) Discuss about different types of availability and various approaches to increase equipment availability. (16)
12. a) Elaborate about the systematic method of maintenance plans and schedules for production machines with some real time examples. (16)
(OR)
b) Illustrate the need of spare parts management and various approaches to cost reduction for spares with suitable industrial example. (16)

13. a) Summarize about the failure modes and reliability in terms of hazard rate and failure density with some industrial applications. (16)

(OR)

- b) A data sample is taken from a number of pieces of equipment operating in the field. Eight times-to-failure were recorded. These data in rank order are 215, 44.2, 71.2, 87.1, 105.4, 142.1, 162.1, 180.1 and 197.1 hr. Fit a Weibull distribution and evaluate the shape parameter β and the scale parameter a . Estimate the reliability for a similar piece of equipment for a mission of 100 hr. (16)

14. a) Explain the basic components of CMMS along with its approaches and effectiveness for industrial maintenance models. (16)

(OR)

- b) With a case study, Illustrate the Preventive, repair and breakdown maintenance planning. (16)

15. a) Summarize about leakage monitoring and explain some of the leakage mediums used for condition monitoring with suitable examples. (16)

(OR)

- b) Discuss the significance of thermal monitoring and various thermal monitoring systems along with thermographs used in industries. (16)

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Civil Engineering

22CEPE07 – AIRPORTS, DOCKS AND HARBOURS ENGINEERING

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. How ICAO classified the airports?	2	K1	1
2. What are the assumed conditions considered for Basic runway length?	2	K2	1
3. What is a Buffer Zone?	2	K1	2
4. What are the factors to be considered for an efficient airport vehicular circulation?	2	K2	2
5. What is parallel runway marking?	2	K1	3
6. What is Landing Direction Indicator?	2	K1	3
7. List the important requirements of Harbour.	2	K1	4
8. Define sounding. Name some of the equipment used for sounding.	2	K1	4
9. Distinguish between Harbour and Port.	2	K1	5
10. State the differences between Pier and Quay.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Determine the best runway orientation and calculate total wind coverage for the following wind data.	16	K3	1

Wind Direction	Percentage of Winds		
	7-24 kmph	26-37 kmph	39-76 kmph
N	2.3	0.3	-
NNE	2.4	0.4	-
NE	5.1	1.1	0.1
ENE	6.3	3.3	0.1
E	7.3	7.6	0.4
ESE	4.4	2.3	0.2

SE	2.6	0.9	-
SSE	1.6	0.2	-
S	3.2	0.4	0.1
SSW	1.9	0.3	0.1
SW	5.8	2.6	0.2
WSW	5	2.4	0.2
WSW	7.8	4.9	0.3
WNW	4.8	1.3	0.1
NW	3.6	0.8	-
NNW	1.7	0.2	-

(OR)

- b) It is proposed airport site has an elevation of 380 m above MSL. The mean of maximum and mean of average temperature of the hottest month are 43.50C and 25.30C respectively. The difference in elevation along the proposed profile of runway is 5.6 m. Length of a runway at mean sea level, standard temperature and zero gradients is 1390 m. Determine the actual length of the runway at the site by assuming all relevant data. 16 K3 1
12. a) Explain the 'Approach zone profile' and 'Clearance over Highways and Railways' for an Instrument Landing System Runway with clear sketches. 16 K2 2
- (OR)
- b) Draw a typical layout of International Airport and explain its salient features with provision of all basic and desirable amenities provision. 16 K2 2
13. a) Explain the various markings provided in Runway and Taxiway with neat sketches. 16 K3 3
- (OR)
- b) Discuss the necessity of Air Traffic Control (ATC) and list the various features involved in the Air Traffic Control network system. 16 K3 3
14. a) State the various factors considered while selecting the Harbour site location and explain the significance of each factor. 16 K4 4
- (OR)
- b) Discuss the effects of Tides and Waves and their action on Harbour structures. 16 K4 4
15. a) Explain Briefly about Littoral drift? How does it affect the location of Harbour? 16 K1 5
- (OR)
- b) What is Breakwater? Explain its classification with neat sketches. 16 K1 5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Civil Engineering

22CEPE03 - DYNAMICS AND EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. List the effects of vibration.	2	K1	1
2. Define damping ratio.	2	K1	1
3. Write the criteria for normal mode of vibration.	2	K1	2
4. Compare periodic force from impulsive force.	2	K2	2
5. List the factors causing earthquake.	2	K1	3
6. What is seismogram?	2	K1	3
7. Define liquefaction of soil.	2	K1	4
8. Name the ways to introduce ductility in RC structures.	2	K1	4
9. Draw the typical beam column detailing as per IS 13920:1993.	2	K3	5
10. Write the expression to formulate design horizontal seismic coefficient.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) A simply supported rectangular beam has a span of 1.5 m. It is 8 mm wide and 12 mm. It is connected at midspan of a beam by means of a linear spring having stiffness of 125 kg/cm and mass of 320 kg is attached to other end spring. Assuming $E = 2.1 \times 10^6$ kg/cm ² .	10	K3	1
ii) Compare static loading with dynamic loading.	6	K3	1

(OR)

Q. No		M	BTL	CO
b) i)	A mass of 5 kg is supported by a spring having a stiffness of 420 N/m. The mass is displaced downward from its equilibrium position by a distance of 0.05 m. Find	10	K3	1
	1. Natural frequency of the system.			
	2. Total response of the system.			
	3. Total energy of the system.			
	4. Equation of motion of the system.			
ii)	Write a note on the types of damping.	6	K2	1
12. a) i)	A simply supported rectangular beam has a span of 1 m. it is 100 mm wide and 10 mm deep. It is connected at mid span of a beam by means of a linear spring having a stiffness of 150 kg/cm and a mass of 500 kg is attached at the other end of spring. Determine the natural frequency of the system. Take $E = 2.1 \times 10^6 \text{ kg/cm}^2$.	10	K3	2
ii)	Explain on the concept of mode shape.	6	K2	2
	(OR)			
b) i)	Determine the characteristic equation for the frame shown in Fig.1.	10	K3	2

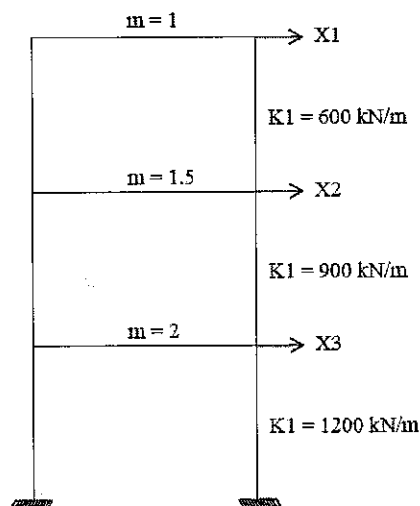


Fig. 1

ii)	Illustrate the concept of mode superposition.	6	K2	2
13. a) i)	Describe the types of seismic waves with neat sketches.	8	K2	3
ii)	Sketch the different stages in elastic rebound theory.	8	K2	3
	(OR)			
b) i)	How is an earthquake measured? Explain.	8	K2	3
ii)	Distinguish between magnitude and intensity of an earthquake.	8	K2	3

Q. No		M	BTL	CO
14. a)	Enumerate on how does structures respond to earthquake.	16	K2	4
	(OR)			
b)	Explain in detail methods of introducing ductility into RC structures.	16	K2	4
15. a)	A three storied symmetrical special moment resisting reinforced concrete frame building situated in Coimbatore has the following data. Plan dimension: 10 m Storey height: 4 m Total weight in the terrace floor: 850 kN Total weight of each floor: 2500 kN Type of soil: Hard rock Damping : 2 % Calculate the total base shear and lateral load distribution at each floor level using seismic coefficient method.	16	K4	5
	(OR)			
b)	With the help of neat sketches, Comment on the plan irregularities and vertical irregularities of buildings for aseismic design of structures.	16	K4	5



Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Computer Science and Engineering

22CSPE303 – BIG DATA ANALYTICS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Distinguish between Big data processing and distributed processing.	2	K2	1
2. In what way does predictive analysis differ from prescriptive analytics in real-time applications?	2	K2	1
3. Compare RDBMS with the Hadoop File System.	2	K2	2
4. List any four real-time application platforms that use the Hadoop File System for efficient storage.	2	K1	2
5. State any four design goals of HDFS.	2	K1	2
6. Why is a HAR file required for implementing HDFS-based applications?	2	K2	2
7. State any four features of the MapReduce framework.	2	K1	2
8. What is the need for the Record Reader API in the MapReduce framework?	2	K2	2
9. Name the command used to run a Pig script. Give an example.	2	K1	2
10. Why is Big SQL required to handle large datasets?	2	K2	2

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Examine the role of the 3 V's in the context of big data.	8	K1	1
ii) Enumerate the various types of digital data collected from multiple sources that contribute to effective decision-making.	8	K2	1

(OR)

Q. No		M	BTL	CO
	b) i) Summarize the key challenges faced by organizations in implementing big data analytics.	8	K1	1
	ii) Interpret how various storage technologies help in storing and enabling quick access to big data in real-time applications?	8	K2	1
12. a)	i) Enumerate the key challenges faced by distributed systems in handling complex applications.	8	K2	2
	ii) Outline the major vendors of the Hadoop environment and compare the distinct features offered by each.	8	K4	2
	(OR)			
b) i)	Explain the components of Hadoop eco system with the neat diagram.	8	K2	2
	ii) Describe how users and applications interact with the Hadoop Eco system.	8	K4	2
13. a)	A hospital is developing a health monitoring application to track the health conditions of multiple patients using IoT technologies, supported by the Hadoop ecosystem. Identify the various types of interfaces required, outline the data flow, and suggest an efficient data ingestion technique that minimizes memory overhead.	16	K3	2
	(OR)			
b)	Discuss about the design principle of Hadoop Distributed file system.	16	K3	2
14. a)	Describe the architecture of Map Reduce framework in Hadoop.	16	K4	2
	(OR)			
b)	How does the MapReduce framework handle customer feedback that spans multiple lines?	16	K4	2
15. a)	Interpret the functionalities of Pig commands used for data transformation and analysis of large datasets.	16	K2	2
	(OR)			
b)	Examine the key services provided by Apache Hive for querying, managing, and analyzing large datasets in the Hadoop ecosystem.	16	K2	2

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations - April/May 2025

Semester: VI [Full Time]

Electronics and Communication Engineering

22ECPE612 - COMPUTER NETWORKS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. List the function of a router and a switch.	2	K1	1
2. Compare star topology and bus topology.	2	K2	1
3. State the purpose of gateway.	2	K1	2
4. Compare byte-stuffing and bit-stuffing.	2	K2	2
5. List the parameter used in identifying the best path for routing protocol.	2	K1	3
6. Define VPN.	2	K1	3
7. Mention various techniques used to improve the Quality of Service.	2	K1	4
8. List any two essential elements of transport protocols.	2	K1	4
9. Define MIME.	2	K1	5
10. Mention the function of HTTP.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain the responsibility of each layer of ISO-OSI model and illustrate the communication mechanism between two end systems.	16	K2	1
(OR)			
b) Explain in detail about the various types of transmission media with suitable example. Discuss the characteristics, advantages and limitations of guided and unguided media.	16	K2	1

Q. No		M	BTL	CO
12. a)	Explain in detail about HDLC protocol, different frames and its configuration modes with diagram.	16	K2	2
	(OR)			
b)	Explain the MAC frame format, function, access method and topology of following protocol IEEE802.3, IEEE802.4 and IEEE802.5 in detail with suitable application.	16	K2	2
13. a)	i) Compare and contrast IPV4 and IPV6.	8	K2	3
	ii) With suitable example, explain distance-vector routing in detail.	8	K3	3
	(OR)			
b) i)	Explain in detail about packet switching and message switching.	8	K2	3
	ii) Illustrate the function of link state routing protocol with an example.	8	K3	3
14. a)	Discuss the architecture and working of the transfer control and user datagram protocol in detail.	16	K3	4
	(OR)			
b)	With a detailed diagram, summarize the various congestion control mechanism in TCP and quality of service in packet-switched networks.	16	K3	4
15. a)	i) Explain domain name space and describe how name resolution works.	8	K2	5
	ii) Illustrate IMAP with its state transition diagram and explain SMTP with suitable example.	8	K2	5
	(OR)			
b) i)	Explain the operation of SNMP protocol and elements of network management in detail.	8	K2	5
	ii) With a neat diagram, explain the working of FTP in data transfer.	8	K2	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VII [Full Time]

Electrical and Electronics Engineering

18EE606 – ENERGY MANAGEMENT SYSTEM AND SCADA

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What are the components of an energy management program?	2	K1	1
2. Recall the significance of 'Energy Use Index'.	2	K2	1
3. What is the use of 'Time-of-Use' rate?	2	K1	2
4. State the disadvantages of using natural gas as a fuel.	2	K2	2
5. What is the significance of energy systems maintenance?	2	K3	3
6. Recall the necessity for balanced phase voltages in 3-phase motors.	2	K1	3
7. List the SCADA applications.	2	K1	4
8. What is the primary role of a SCADA server?	2	K2	4
9. Why is SCADA used in Substation?	2	K1	5
10. What is the role of gateway interoperability list in substation system?	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) State and explain the basic components of an energy audit.	10	K1	1
ii) Summarize the HVAC system modifications for energy conservation.	6	K2	1
(OR)			
b) i) Explain briefly the time value of money concepts.	10	K1	1
ii) What are the load demand control techniques? Describe briefly any one technique.	6	K2	1
12. a) i) Explain the different categories of Electric utility rate structures.	8	K3	2
ii) Explain briefly about 'Cogeneration and buy-back rates'.	8	K4	2
(OR)			

Q. No		M	BTL	CO
b) i)	Describe briefly the following: (1) Residential rate schedules. (2) Large industrial rate schedules.	8	K3	2
	ii) Illustrate the calculation of monthly energy bill with two examples.	8	K4	2
13. a)	Outline the development of a maintenance program for use in energy management.	16	K1	3
	(OR)			
b)	Define the term: 'Cogeneration system'. Explain the features of basic cogeneration systems based on prime movers.	16	K1	3
14. a) i)	State and explain the functional requirements and major components of SCADA systems.	10	K2	4
	ii) Draw and explain briefly the IED (Intelligent Electronic Devices) functional block diagram.	6	K3	4
	(OR)			
b) i)	Explain briefly about SCADA hierarchical concept and SCADA architecture.	10	K2	4
	ii) What are the components of Human-Machine Interface in a SCADA system? Explain the features of any one component.	6	K3	4
15. a)	Illustrate the SCADA application functions in power generating plant with neat block diagram.	16	K4	5
	(OR)			
b)	Write detailed technical note on the following:	16	K4	5
	(i) The main features of IEC 61850 protocol in substation automation communication.			
	(ii) Substation Automation System cubicle concepts.			

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Electrical and Electronics Engineering

22EEPE36- MEMS and NEMS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. How do MEMS and NEMS differ in terms of scale?	2	K2	1
2. List down the properties of materials that change at nano-scale.	2	K2	1
3. What are the advantages of LIGA over other micro-fabrication techniques?	2	K1	2
4. Highlight the primary advantage of surface micromachining?	2	K1	2
5. Specify few challenges in the fabrication of capacitive sensors?	2	K2	3
6. Compare the power consumption of piezoelectric actuators to traditional electromagnetic actuators.	2	K2	3
7. Mention few potential applications of NEMS sensors in healthcare?	2	K1	4
8. How does the fabrication defect impact the performance of NEMS devices?	2	K2	4
9. List few examples of a wearable Bio-MEMS device.	2	K1	5
10. How do Smart Sensors enhance environmental monitoring?	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain the design flow in synthesis of MEMS and NEMS. Outline the problems that must be resolved in the design of high-performance MEMS and NEMS.	16	K1	1
(OR)			
b) Explain the important properties of polymers as industrial material and discuss polymers as a substrate material for MEMS.	16	K1	1
12. a) i) Explain the steps involved in photolithography?	10	K2	2
ii) Write short notes on micro-manufacturing.	6	K2	2

(OR)

Q. No		M	BTL	CO
b)	i) Discuss with neat diagram about Chemical Mechanical Polishing (CMP).	10	K2	2
	ii) Write short notes on micro-machining.	6	K2	2
13. a)	Explain in detail about working and the fabrication of Piezo-resistive Pressure Sensor.	16	K1	3
	(OR)			
b)	Explain in detail about the fabrication process of micro Actuators	16	K1	3
14. a)	Explain the principles behind atomic scale precision engineering and its significance in nanofabrication techniques.	16	K2	4
	(OR)			
b)	Describe the operating principles of NEMS sensors and actuators and how their performance is influenced by the fabrication techniques used.	16	K2	4
15. a)	Discuss the working principle of micro motors in MEMS and NEMS.	16	K1	5
	(OR)			
b)	Explain the concept of smart sensors in MEMS and NEMS, and discuss recent trends in sensor design, integration and miniaturization.	16	K1	5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Mechanical Engineering

18MEPE65 – DESIGN OF PRODUCTION TOOLING

(Regulations 2018/2018A)

(PSG Design data book is to be Permitted)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Write the importance of form tool.	2	K1	1
2. Write any two specific application of broach cutter.	2	K2	2
3. Define cutting speed and feed.	2	K1	2
4. How chip formation occurs in metal cutting	2	K2	2
5. What is meant by duplicate locating?	2	K3	3
6. List out any four clamping methods.	2	K2	3
7. What is primary function of drill bushing?	2	K2	4
8. List out the different types of standard jig feet.	2	K2	4
9. Write down the formula for calculating drawing force required in drawing operations.	2	K1	5
10. Compare the compound and progressive dies.	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain the importance and functions of different tool angles associated with the geometry of a single point cutting tool with neat sketch.	16	K2	1
(OR)			
b) Draw a Merchant's circle diagram and derive expressions to show relationships among the different forces acting on the cutting tool and coefficient of friction.	16	K2	1
12. a) i) Explain basic elements in metal cutting with a neat sketch.	8	K1	2

Q. No		M	BTL	CO
	ii) In an orthogonal turning operation, cutting speed is 86mm/min, cutting force 25kg, feed force 9kg, rake angle 10°, feed 0.3mm/rev and chip thickness 0.3mm. Determine the shear angle, workdone in shear and shear strain.	8	K3	2
	(OR)			
b) i)	During orthogonal cutting a bar of 90mm diameter is reduced to 87.6mm. If the mean length of the cut is 88.2mm and rake angle is 15°, calculate: (a) Cutting ratio (b) Shear angle.	8	K3	2
	ii) Explain work done in metal cutting process.	8	K1	2
13. a)	Discuss the following in detail with suitable illustrations	16	K2	3
	a) Welding fixture			
	b) Facing fixture for grinding			
	(OR)			
b)	Discuss any two methods of clamping with suitable sketches.	16	K2	3
14. a) i)	Explain the various point to be consider in the design of drill jigs.	8	K4	4
	ii) Explain the design of leaf / latch jig with a neat sketch.	8	K2	4
	(OR)			
b) i)	Design and draw a suitable drill jig to drill 4 holes of 5mm dia with 70 PCD on 120mm diameter and 60mm thickness mild steel plate.	8	K4	4
	ii) Explain the design of box jig with a neat sketch.	8	K2	4
15. a)	Write short notes on	16	K2	5
	(a) Die block			
	(b) Punch holder			
	(OR)			
b)	Explain the step by step procedure for the computation of press capacities and tonnage requirements for cutting and drawing operations.	16	K2	5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Mechanical Engineering

22MEPE37- SOLAR ENERGY TECHNOLOGY

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. State the importance of solar energy in the present-day energy crisis.	2	K1	1
2. List the parameters affecting the performance of a solar collector.	2	K1	1
3. What are the main components of a flat plate solar collector?	2	K1	2
4. Explain the solar azimuth angle and zenith angle.	2	K1	2
5. What is a solar tracking system?	2	K1	3
6. Define extraterrestrial and terrestrial solar radiation.	2	K1	3
7. Write short notes on solar distillation	2	K1	4
8. State PV effect.	2	K1	4
9. List the different applications of solar PV systems in the rural India.	2	K1	5
10. What is the equivalent circuit for a solar PV panel?	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Explain the environmental impact of solar power.	8	K2	1
ii) Explain the working principle of an evacuated-tube solar collector with a neat sketch.	8	K2	1
(OR)			
b) i) Explain the role of solar energy in promoting sustainability.	8	K2	1
ii) Explain the working principle of parabolic dish collectors with a neat sketch.	8	K2	1

Q.No		M	BTL	CO
12. a)	i) A flat-plate solar collector with an area of 4 m^2 receives an average solar radiation of 700 W/m^2 for 6 hours. The collector efficiency is 60%. Calculate the total useful heat collected (in MJ) if the amount of hot water is heated from 25°C to 65°C . (Assume water specific heat = 4.18 kJ/kgK)	8	K3	2
	ii) Describe a power plant operated with a solar pond. (OR)	8	K2	2
b)	i) A solar water heating system has 6 m^2 of flat plate collectors with an efficiency of 55%. The system operates for 5 hours per day under average solar radiation of 800 W/m^2 . The total useful energy collected per day is 47.52 MJ, and the system stores the heat in a 300-liter insulated tank. Calculate the final temperature of the water if the initial temperature is 30°C (Specific heat of water = 4.18 kJ/kgK ; 1 liter = 1 kg).	8	K3	2
	ii) Describe the Solar Position Algorithm (SPA). Explain its significance in solar energy systems	8	K2	2
13. a)	Explain in detail the different types of solar radiation measuring instruments. (OR)	16	K2	3
b)	Explain direct and diffuse solar radiation. Also, explain the solar constant with a neat diagram.	16	K2	3
14. a)	i) A solar PV panel of area 10 m^2 and efficiency 18% is used to power a 2-ton (7 kW) air conditioner. If solar radiation is 900 W/m^2 , how many hours can the AC run in a day?	8	K3	4
	ii) Explain in detail solar space cooling. (OR)	8	K2	4
b)	i) An air-type solar collector heats the air from 20°C to 40°C . The airflow rate is 1.5 kg/min . For 4 hours of operation, calculate the total energy delivered. (Specific heat of air = 1.005 kJ/kgK)	8	K3	4
	ii) Explain in detail about a solar air-drying system.	8	K2	4
15. a)	Explain in detail about the photovoltaic energy conversion. (OR)	16	K2	5
b)	Explain with a neat sketch the working principle of off-grid and grid-tied solar PV systems.	16	K2	5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Metallurgical Engineering

22MTPE34 – FOUNDRY METALLURGY

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. Compare the effect of thermal undercooling with constitutional undercooling.	2	K2	1
2. What is the effect of cooling rate on microstructure of metals?	2	K2	1
3. List the any four elements that promote the graphite formation in cast iron.	2	K1	2
4. What is Malleable Cast Iron?	2	K2	2
5. How does sulphur affect the quality of steel?	2	K3	3
6. How does Al addition refine the grain size of plain carbon steel castings?	2	K3	3
7. What is dross? How do you control it?	2	K2	4
8. Name any two cast Ni-base alloys as per ASTM standard.	2	K2	4
9. What are the advantages of inoculation treatment?	2	K2	5
10. Give chemical reaction of oxidation process during melting.	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) i) Discuss the effect of undercooling and cooling on the morphology of solidification modes of metals with a sketch.	8	K2	1
ii) Give a detailed account of solidification of pure metals and alloys with diagrams.	8	K2	1
(OR)			
b) i) Discuss any two methods to determine the fluidity of molten metal as per standards and discuss the factors affecting the fluidity of metals.	8	K2	1
ii) Discuss the methods to eliminate the shrinkage of castings with suitable examples.	8	K2	1

Q. No		M	BTL	CO
12. a)	Explain the various characteristics of graphite in grey cast iron with respect to (i) Class, (ii) Shape and distribution, and (iii) Size.	16	K3	2
	(OR)			
b)	Explain the chemical composition, microstructure and properties of the following cast irons:	16	K3	2
	i) High carbon high chromium cast iron			
	ii) Ni-resist cast iron			
	iii) Ni hard cast iron			
	iv) High Silicon cast iron			
13. a)	Discuss in detail about the effect of alloying elements on (i) microstructure, (ii) transformation temperature, (iii) Eutectoid carbon content and (iv) grain refinement of steels.	16	K2	3
	(OR)			
b)	Give a detailed account of melting practice of carbon steel castings and discuss the importance of desulphurization and dephosphurization of stainless steel castings.	16	K2	3
14. a)	Explain the classifications and temper designations of aluminum alloys. Describe the importance of modification treatment for Al-Si alloys	16	K2	4
	(OR)			
b)	Discuss about the melting practice of the following non ferrous alloys:	16	K2	4
	i) Ni-base alloys			
	ii) Mg-base alloys			
15. a)	Discuss in detail any FOUR methods of Mg treatment for ductile iron castings with a neat sketch.	16	K3	5
	(OR)			
b)	Explain the mechanisms and methods for degassing of liquid metal during Al alloy castings.	16	K3	5

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Government College of Engineering, Salem
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B.E. Degree Examinations - April/May 2025

Semester: III & II [Part Time]

Civil Engineering

22PTCE302/23PTCE201 - SURVEYING

(Regulations 2022/2023)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. What are the two main principles of surveying?	2	K2	1
2. Differentiate contour interval and horizontal equivalent.	2	K2	1
3. What are the temporary adjustments of theodolite?	2	K2	2
4. Length of line is 100 m, bearing is 80°. Determine latitude and departure.	2	K2	2
5. Differentiate between fixed hair method and movable hair method.	2	K2	3
6. What is meant by subtense bar? What its use?	2	K2	3
7. State the principle of least square.	2	K2	4
8. List the sources of errors.	2	K1	4
9. State the working principle of total station.	2	K2	5
10. Define GPS.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) Discuss in detail, the classification of surveying.	16	K3	1

(OR)

b) A levelling work was carried out and following observation were taken. Find the RL of the points. Take RL of last station as 150 m.	16	K3	1

Sl.No	BS	IS	FS	RL
1	1.305			
2	0.485		2.560	
3	2.350		1.090	
4		0.785		
5	1.635		0.285	
6	2.875		0.990	
7	2.335		1.065	
8			1.025	150 (BM)

Q. No	M	BTL	CO
12. a) i) Explain in detail, the temporary and permanent adjustments of a theodolite.	8	K3	2
ii) Discuss the methods of measurement of horizontal angles.	8	K3	2
(OR)			
b) i) Define closing error. Explain methods of distribution.	8	K3	2
ii) Calculate the length and bearing of line EA, for the following closed traverse ABCDE	8	K3	2

Line	Length (m)	Bearings
AB	200	80° 30'
BC	220	30° 30'
CD	190	280°
DE	180	220°
EA	?	?

13. a) Find the gradient from A to B from the following observations made with a tacheometer fitted with an anallatic lens. 16 K4 3

Instrument at	Sight to	Bearing	Stadia hair readings	Vertical angle
O	A	15°	1.000, 1.900, 2.800	+ 15°
	B	105°	0.800, 2.400, 4.000	+ 10°

(OR)

- b) Explain the tangential method of tacheometry. The following observations were taken with a transit theodolite. 16 K4 3

Instrument Station	Staff Station	Target	Vertical angle	Staff reading
O	A	lower	4° 30'	1 m
O	A	upper	6° 30'	2 m

Calculate the horizontal distance between the instrument station and staff. Also calculate the RL of staff station A, if RL of instrument axis = 100 m.

Q. No		M	BTL	CO
14. a)	The following are mean values observed in the measurements of three angles A, B and C at one station. $A = 76^{\circ} 42' 46.2''$ weight 4, $A+B = 134^{\circ} 36' 32.6''$ weight 3, $B+C = 185^{\circ} 35' 24.8''$ weight 2 $A+B+C = 262^{\circ} 18' 10.4''$ weight 1, Calculate the most probable value of each angle by method of normal equation.	16	K4	4
	(OR)			
b)	Find the most probable value of angles A, B and C of a triangle ABC, from the following observed equations by method of correlates. $\angle A = 68^{\circ} 42' 36''$ $\angle B = 53^{\circ} 46' 12''$ $\angle C = 58^{\circ} 01' 16''$	16	K4	4
15. a)	i) Explain the fundamental parameter and parts of total station.	8	K2	5
	ii) Describe the required steps for the initial setting of a total station for a field work.	8	K3	5
	(OR)			
b)	i) Explain the working principle of global positioning system.	8	K3	5
	ii) What are the advantage, disadvantages and application of GPS?	8	K2	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: II [Part Time]

Electronics and Communication Engineering

23PTEC202 – ELECTROMAGNETIC FIELDS

(Regulations 2023)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. State Gauss law for electric fields.	2	K1	1
2. Give the relation between electric field intensity and electric flux density.	2	K2	1
3. State Stoke Theorem.	2	K1	2
4. What is the energy stored in a magnetic field in terms of field quantities?	2	K2	2
5. Generalize the continuity equation in integral and differential form.	2	K2	3
6. Examine the expression of energy stored in an inductor.	2	K2	3
7. What is the difference between conduction current and displacement current?	2	K3	4
8. Express Poynting theorem in point form and integral form.	2	K1	4
9. Derive the expression for transmission and reflection coefficient for normal incidence at plane conducting boundary.	2	K2	5
10. Point out the difference between attenuation constant and phase constant.	2	K3	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) A circular disc of radius "a" m is charged uniformly with a charge density of "o" c/m ² . Find the Electric field at a point "h" m from the disc along its axis.	16	K3	1
(OR)			
b) Derive an expression for the electric field intensity at any point due to a uniformly charged sheet with density r_s c/m ² .	16	K3	1

Q. No	M	BTL	CO
12. a) Derive an expression for magnetic field intensity due to a linear conductor of infinite length carrying current I at a distant point P. Assume R to be the distance between conductor and point P, Use BiotSavarts law. And also derive the expression for magnetic field intensity on the axis of circular wire of radius "a" carrying current I.	16	K3	2
(OR)			
b) Derive the magnetic field intensity developed in a circular loop carrying steady current I in a uniform field. Using Ampere circuital law derive the magnetic field intensity due to a co-axial cable carrying a steady current I.	16	K3	2
13. a) i) Deduce the expression for joint capacitance of two capacitors C1 and C2 when connected in series and parallel.	8	K3	3
ii) Calculate the capacitance of a parallel plate capacitor having a mica dielectric, $\epsilon_r=6$, a plate area of 10 inch ² , and a separation of 0.01inch.	8	K4	3
(OR)			
b) i) Derive the boundary conditions of the normal and tangential components of electric field at the Interface of two media with different dielectrics.	8	K3	3
ii) Estimate the capacitance of a conducting sphere of 2 cm in diameter, covered with a layer of polyethylene with $\epsilon_1=2.26$ and 3 cm thick.	8	K4	3
14. a) Derive the Maxwell's equation for a time varying fields from fundamental laws of electric and magnetic fields.	16	K3	4
(OR)			
b) Illustrate with necessary fundamentals, the equation of continuity of current in differential form. Also prove that the modified Ampere's law is consistent with the time varying field.	16	K3	4
15. a) Derive the electromagnetic wave equation in phasor form with necessary equations.	16	K2	5
(OR)			
b) Determine the intrinsic impedance, wavelength, attenuation, phase, and propagation constant for electromagnetic waves in any medium.	16	K2	5

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B.E. Degree Examinations – April/May 2025

Semester: V & IV [Part Time]

Electrical and Electronics Engineering

22PTEEE14/23PTEE403 – BIOMEDICAL INSTRUMENTATION

(Regulations 2022/2023)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Draw the structure of a cell.	2	K1	1
2. Mention the purpose of transducers in bio medical instruments.	2	K1	1
3. With the help of ECG wave, mention the key components that represent the electrical activity of heart.	2	K2	2
4. Why drift compensation is required in operational amplifiers?	2	K2	2
5. State the principle behind the operation of radiation detectors.	2	K1	3
6. List any two application of radiography.	2	K1	3
7. Differentiate microwave and ultrasonic diathermy.	2	K2	4
8. What is the purpose of oxymeter? Whether they are invasive or non invasive.	2	K2	4
9. What are the physiological effects due to 50 Hz current passage?	2	K1	5
10. How certain devices can protect against electrical hazards?	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Discuss about resting, action and bio electric potentials.	16	K1	1
(OR)			
b) Discuss about design and various components of bio medical instruments.	16	K1	1
12. a) Elaborate about the design, working and application of any two physiological signal amplifiers.	16	K2	2
(OR)			
b) Elaborate about characteristics of Electroencephalography (EEG) and Electromyography (EMG) recording system.	16	K2	2

Q. No		M	BTL	CO
13. a)	Explain about photometers and colorimeters with necessary sketch. Also discuss about their application.	16	K3	3
	(OR)			
b)	Explain about X-ray tube, X-ray machine and application of X-ray examination with neat sketch.	16	K3	3
14. a)	Illustrate the principle, operation and application of pacemakers with necessary diagram.	16	K3	4
	(OR)			
b)	Discuss about working principle and application of ventilators with neat sketch.	16	K3	4
15. a)	Explain about the operation of nuclear imaging technique with necessary block diagram.	16	K1	5
	(OR)			
b)	Explain about ultrasonic and magnetic resonance imaging system with neat sketch.	16	K1	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: III [Full Time]

Mechanical Engineering

12ME305 – KINEMATICS OF MACHINERY

(Regulations 2012)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

1. State the kutzbach criterion.
2. What is pantograph?
3. What are the two components of acceleration?
4. Define rubbing velocity.
5. What do you understand by number synthesis?
6. Define Body Guidance in relation with synthesis.
7. Distinguish radial and cylindrical cams
8. Write about gravity cam.
9. List out the applications of epicyclic gear train.
10. Write a short note on Gyroscope.

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

M

11. a) Sketch and explain any three kinematic inversion of a four bar chain. (16)
- (OR)**
- b) Define kinematic pair and discuss various types of kinematic pair with examples. (16)
12. a) A four bar chain mechanism ABCD with its dimensions is shown in Fig.1 (16)
It is driven by the crank AB which rotates at 600 rpm in clockwise direction. The link AD is fixed. Find the absolute velocity of point C and angular velocity of links CB and CD.

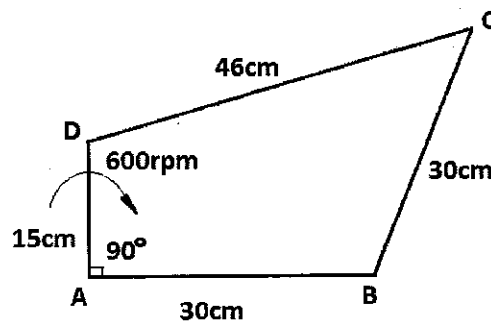


Fig.1

(OR)

Q. No

M

13. a) Synthesize a slider crank mechanism so that the displacement of the slider is proportional to the square of the crank rotation in the interval $45^\circ < \theta < 135^\circ$. Use three precision points with chebyshev's spacing. (16)

(OR)

- b) A four bar mechanism is to be designed, by using three precision points, to generate the function $y = x^{1.5}$, for the range $1 < x < 4$. Assuming 30° starting position and 120° finishing position for the input link and 90° starting position and 180° finishing position for the output link, find the values of x , y , θ and ϕ corresponding to the three precision points. (16)

14. a) The following data relate to cam operating an oscillating roller follower: (16)

Minimum radius of cam = 44 mm,

Diameter of roller = 14 mm,

Length of the follower arm = 40 mm,

Distance of fulcrum center from cam center = 50 mm,

Angle of ascent = 75° ,

Angle of descent = 105° ,

Angle of dwell for follower in the highest position = 60° ,

Angle of oscillation of follower = 28° .

Draw the profile of the cam if the ascent and descent both take place with SHM.

(OR)

- b) A disc cam is to give uniform motion to knife edge follower during outstroke of 50 mm during the first half of the cam revolution. The follower again returns to its original position with uniform motion during the next half of the revolution. The minimum radius of cam is 50 mm and the diameter of the cam shaft is 35 mm. Draw the profile of cam when
(i) The axis of follower passes through the axis of the cam shaft, and
(ii) The axis of follower is offset by 20 mm from the axis of cam shaft. (16)
15. a) Two mating involute spur gears of 20° pressure angle have a gear ratio of 2. The number of teeth on the pinion is 20 and its speed is 250 revolutions per minute. The module pitch of the teeth is 12 mm. If the addendum on each wheel is such that the path of approach and the path of recess on each side are half the maximum possible length each, find
(i) the addendum for pinion and gear wheel, (ii) the length of arc contact, (iii) the maximum velocity of sliding during approach and recess. Assume pinion to be driver. (16)
- (OR)**
- b) The turbine rotor of a ship has a mass of 2000 kg and rotates at a speed of 3000 r.p.m clockwise when looking from a stern. The radius of gyration of the rotor is 0.5 m. Determine the gyroscope couple and its effect upon the ship when the ship is steering to the right in a curve of 100 m radius at a speed of 1855 m/hr. Calculate also the torque and its effect when the ship is pitching in simple harmonic motion, the bow falling with its maximum velocity. The period of pitching is 50 seconds and the total angular displacement between the two extreme positions of pitching is 12° . Find the maximum acceleration during pitching motion. (16)

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: V [Part Time]

Civil Engineering

16PTCEE04 - HYDROLOGY

(Regulations 2016/2016A)

Time: 3 Hours

Maximum Marks: 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What is the importance of hydrology?	2	K2	1
2. Enlist the three types of recording type rain gauge?	2	K1	1
3. What is meant by infiltration index?	2	K2	2
4. Define evapotranspiration.	2	K1	2
5. Distinguish between hyetograph and hydrograph	2	K2	3
6. Define synthetic hydrographs.	2	K1	3
7. State the types of flood routing	2	K2	4
8. Write short notes on Gumbel's method	2	K2	4
9. What is mean by Aquifer parameters	2	K2	5
10. What is rainwater harvesting?	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain "Hydrological cycle" with neat sketch.	16	K1	1
(OR)			
b) What are the various types of precipitation and how do you measure rain falls?	16	K1	1
12. a) Explain with neat sketches how to evaporation is measured using evaporation pan.	16	K3	2
(OR)			
b) Describe how infiltration capacity rate can be measured using double ring infiltrometre. How is better than a tube infiltrometre.	16	K3	2

Q. No		M	BTL	CO
13.	a) Explain a procedure of deriving a synthetic unit hydrograph for a catchment by using Snyder's method	16	K3	3
	(OR)			
	b) Elaborate components of hydrograph also explain in detail about factors affecting hydrograph.	16	K3	3
14.	a) What are flood control measures? Mention some of the flood control measures to mitigate the effect of floods.	16	K2	4
	(OR)			
	b) Describe the Muskingum method of channel routing. Assume the values of the coefficients K and X for the reach.	16	K2	4
15.	a) Explain with neat sketches various types of aquifers.	16	K4	5
	(OR)			
	b) How is the pump test conducted for evaluation of aquifer parameters?	16	K4	5

Register Number:

Government College of Engineering :: Salem
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B.E. Degree Examinations – April/May 2025

Semester: VII [Part Time]

Mechanical Engineering

16PTMEE26 – PROFESSIONAL ETHICS AND HUMAN VALUES

(Regulation 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

(10 x 2 = 20 Marks)

Part A

Answer ALL Questions

1. List any four personal ethics.
2. Distinguish between self-respect and self-esteem.
3. State Gilligan's theory.
4. What is the need to study ethics?
5. Define engineering ethics.
6. What are the roles of codes of ethics?
7. Define the term risk.
8. What is the need for protection to IPR?
9. Define globalization.
10. What are the issues in computer ethics?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Discuss the role of yoga for professional excellence and stress management. (16)
- (OR)
- b) State and explain the elements benefits of empathy and compare empathy with sympathy. (16)
12. a) What is meant by moral autonomy? Discuss the factors influencing person concern and the skills required to improve moral autonomy? (16)
- (OR)
- b) i) Discuss in brief the various ethical theories and their uses. (8)
- ii) Describe the professional roles played by an engineer. (8)
13. a) How can engineer become a responsible experimenter? Highlight the code of ethics for engineers. (16)

(OR)

- b) Discuss the problems associated with laws in engineering and enumerate the proper role of law engineering. (16)
14. a) Explain how the risks are reduced and discuss the concept of "Risk-Benefit Analysis". (16)
- (OR)
- b) Discuss in detail about the employee rights and its role in the organizations. (16)
15. a) State and explain the categories of ethical problems and the unethical acts computer as an instrument of unethical behavior. (16)
- (OR)
- b) i) Describe in brief about the global issues of weapon development. (8)
- ii) Explain the role of engineers as consultant and expert witness. (8)

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV & V [Full Time]

Civil Engineering

22CE403/18CE502 – MECHANICS OF SOILS

(Regulations 2022/2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Differentiate between plasticity and consistency.	2	K2	1
2. A soil has void ratio of 0.65 and specific gravity 2.80. Determine dry unit weight of soil take unit weight of water as 10 kN/m ³ .	2	K3	1
3. Write the assumptions made in the Boussinesq theoretical solutions.	2	K1	2
4. What is capillary rise? Mention the factors affecting it.	2	K3	2
5. Define coefficient of permeability.	2	K1	3
6. Write the Laplace equation for 2D flow.	2	K1	3
7. List the stages of consolidation.	2	K1	4
8. State the difference between compaction and consolidation.	2	K2	4
9. Show the coulomb's expression for shear strength.	2	K2	5
10. Outline the merits of triaxial test.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain Indian Standard soil classification system.	16	K2	1
(OR)			
b) Discuss about the grain size distribution of soil by i) Sieve analysis. ii) Sedimentation analysis	16	K2	1
12. a) A soil sample is taken from a depth of 5 m below the ground surface. The water table is at 2 m depth. Determine the total stress, pore water pressure, and effective stress at the sampling point. (Given: unit weight of soil = 18 kN/m ³ above water table and 20 kN/m ³ below water table, $\gamma_w = 9.81 \text{ kN/m}^3$).	16	K3	2

(OR)

Q. No		M	BTL	CO
	b) A concentrated load of 2000 kN is applied at the ground surface. Determine the vertical stress at a point p which is 6m directly below the load. Also calculated the vertical stress at a point which is at a depth of 6m but at a horizontal a depth of 5m from the axis of the load.	16	K3	2
13.	a) Derive Darcy's law with assumption and explain procedure of constant hard test.	16	K3	3
	(OR)			
	b) A falling head permeability test was performed on a sample of clean, uniform sand. One minute was required for the initial head of 100 cm to fall to 50 cm in the stand pipe of cross-sectional area 1.50 cm ² . If the sample was 4 cm in diameter and 30 cm long, Analyze the coefficient of permeability of sand also derive the expression for permeability for falling head test.	16	K3	3
14.	a) Illustrate with a neat sketch the procedure of Standard Proctor compaction test.	16	K2	4
	(OR)			
	b) Discuss the Terzaghi's theory of consolidation, state the various assumptions and their validity.	16	K2	4
15.	a) An unconfined compression test was conducted on an undisturbed clay sample. The sample had a diameter of 37.5 mm and length 80 mm. Load at failure measured by proving ring was 28 N and the axial deformation at failure point was 13 mm. Determine the unconfined compressive strength and the undrained shear strength of clay. Examine and plot all the results on Mohr's Circle.	16	K3	5
	(OR)			
	b) In a triaxial test, a soil specimen was consolidated under a cell pressure of 200 kPa and simultaneously a back pressure of 100 kPa is applied to saturate the specimen. Thereafter, with drainage prevented, the cell pressure was raised to 250 kPa resulting in an increased pore pressure of 149 kPa. Maintaining the same cell pressure of 250 kPa, now the deviator stress was increased to 170 kPa and pore pressure of 220 kPa was observed. Identify the pore pressure parameters A and B.	16	K3	5

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B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time]

Computer Science and Engineering

22CS402 – THEORY OF COMPUTATION

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define: ϵ -closure of a state.	2	K1	3
2. Let L be a language accepted by a nondeterministic finite automaton (NFA) with N states. What is the maximum number of states in an equivalent deterministic finite automaton (DFA) that accepts L?	2	K4	1
3. Recall the term "Regular Expression." Give a Regular Expression for any language containing symbols (0,1) and strictly ends with '1'.	2	K2	3
4. Consider the two regular expressions $r = 0^* + 1^*$ $s = 01^* + 10^* + 1^*0 + (0^*1)^*$ Find the string in r and not in s.	2	K4	2
5. Which class of languages is recognized by a Pushdown Automaton (PDA), and what is corresponding grammar type?	2	K1	3
6. Draw the DFA for the regular grammar $S \rightarrow aA \mid bB$ $A \rightarrow aC \mid bB$ $B \rightarrow bD$ $C \rightarrow bD \mid b$ $D \rightarrow bD \mid b$	2	K3	3
7. Explain whether the finiteness problem for CFLs is decidable. Justify your answer.	2	K4	1
8. What are the applications of Turing Machine?	2	K3	2
9. When is a language L recursively enumerable?	2	K2	2
10. Write the significance of NP problems.	2	K2	2

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Using Thompson's construction, convert the following regular expressions into NFA with ϵ -transitions:	8	K2	1

- $r_1 = (0+1)^* 1 (0+1)$
- $r_2 = (0+1)^* (00+11) (0+1)^*$

ii) Explain the procedure for converting a nondeterministic finite automaton (NFA) into an equivalent deterministic finite automaton (DFA). Describe the key steps involved in the conversion process. Then, apply this procedure to convert the given Fig.1 NFA into its equivalent DFA:	8	K3	1

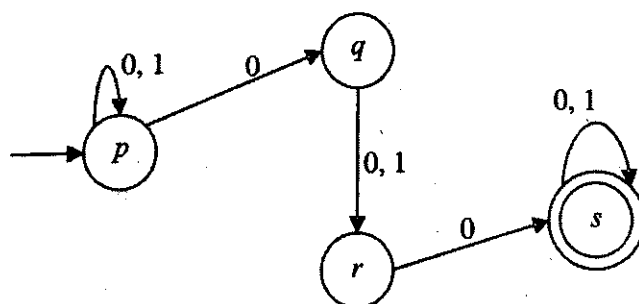


Fig.1

(OR)

b) i) Given the following transition table, draw the corresponding transition diagram.	8	K2	1

Symbols → States ↓	0	1
→ q_0	q_2	q_1
q_1	q_3	q_0
q_2	q_0	q_3
* q_3	q_1	q_2

- Determine the state of the finite automaton after processing the input string **10100**.
- Finally, check whether the string is accepted by the automaton.

ii) Construct a DFA for the below languages:

8 K3 1

- $L_1 = \{a^n b^m \mid n, m \geq 1\}$
- $L_2 = \{a^n b^m \mid n \geq 1, m \geq 0\}$
- $L_3 = \{a^n b^m \mid n \geq 0, m \geq 1\}$
- $L_4 = \{a^n b^m \mid n, m \geq 0\}$

12. a) i) Elaborate the steps to convert below Fig.2 DFA into Regular expression.

8 K4 2

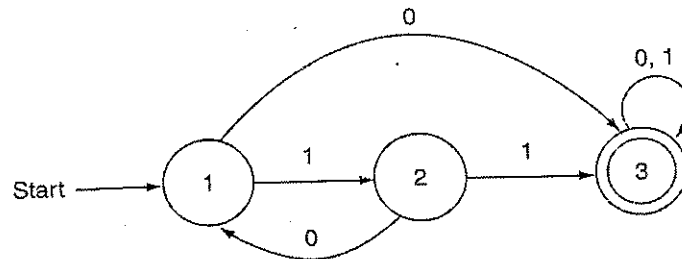


Fig.2

ii) Find out whether the given Fig.3 DFA is minimized or not.

8 K4 2

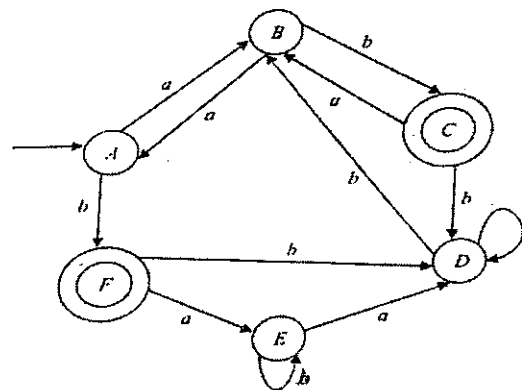


Fig.3

(OR)

b) i) Write a regular expression for each of the following sets of binary strings. Use only the basic operators.

8 K4 2

- 0 or 11 or 101
- Only 0's
- All binary strings
- All binary strings except empty string
- Odd length
- Contains the substring 110
- Has at least 3 characters, and the third character is 0.
- Starts and ends with the same character

Q. No		M	BTL	CO
	ii) State and prove pumping lemma for regular languages. Show that the language $L = \{0^p 1^m 2^p \mid p \text{ and } m \text{ are arbitrary integers}\}$ is not regular.	8	K4	2
13. a)	i) Consider the grammar G which has the productions: $A \rightarrow a \mid Aa \mid bAA \mid AAb \mid AbA$ ▪ What is the start symbol of G? ▪ Is aaabb in L(G)? ▪ Is aaaabb in L(G)? ▪ Show that abb is not in L(G).	8	K3	1
	ii) Design a PDA to accept the language L of strings with some number of 0's followed by equal number of 1's, represented as $L = \{0^n 1^n \mid n \geq 0\}$.	8	K2	1
	(OR)			
b)	i) What are the steps involved in the construction of Chomsky Normal Form. Convert the following grammar to be in CNF. $\begin{aligned} S &\rightarrow AaA \\ A &\rightarrow aaBa \mid CDA \mid CD \\ B &\rightarrow bB \\ C &\rightarrow Ca \mid D \\ D &\rightarrow bD \mid \epsilon \end{aligned}$	8	K3	1
	ii) State Pumping Lemma for CFL's. Prove that the language $L = \{a^n b^n c^n \mid n > 0\}$ is not a CFL.	8	K2	1
14. a)	i) How does the Chomsky hierarchy classify formal languages, and what are the key differences between its four types?	8	K2	3
	ii) Explain the closure properties of context free languages.	8	K2	3
	(OR)			
b)	i) Discuss about the techniques for constructing the various types of Turing Machine.	8	K2	3
	ii) Design a Turing Machine to compute function $f(n) = 1 + 2 + 3 + \dots + n$	8	K2	3
15. a)	i) State and prove the Halting problem.	8	K4	2
	ii) With proper examples, explain P and NP problems.	8	K3	2
	(OR)			
b)	i) Prove that CLIQUE is NP-complete.	8	K4	2

Q. No

M BTL CO

- ii) State whether the instances of Post Correspondence Problem (PCP) have a solution. The following are the instances with $\Sigma = \{0,1\}$.

Index	List A	List B
1	10	01
2	110	011
3	110	01
4	000	00
5	10	010

In case the PCP has a solution, describe the post-correspondence solution with justification.

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B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time]

Electronics and Communication Engineering

22EC402 – MICROPROCESSORS AND MICROCONTROLLERS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. List any four addressing modes of 8086 microprocessor.	2	K1	1
2. What is the purpose of segment registers in 8086?	2	K2	1
3. Distinguish between Programmed I/O and Interrupt I/O.	2	K3	2
4. What is the function of the 8255 PPI?	2	K1	2
5. Define bit-addressable and byte-addressable areas in 8051.	2	K1	3
6. Mention any two differences between 8051 and 8086.	2	K3	3
7. List the steps involved in interfacing a 16x2 LCD to 8051.	2	K2	4
8. What is the function of timers in 8051 microcontroller?	2	K1	4
9. Name any two features of PIC microcontroller.	2	K1	5
10. What is the use of EEPROM in PIC microcontroller?	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) With a neat diagram, explain the internal architecture of 8086 microprocessor.	16	K1	1
(OR)			
b) Describe the different types of addressing modes in 8086 with examples.	16	K1	1
12. a) Construct the interfacing of 8086 with 8255 PPI and write the control word format with neat diagram.	16	K2	2
(OR)			
b) Construct the interfacing of 8086 with 8279 keyboard/display controller with relevant diagram.	16	K2	2

Q. No		M	BTL	CO
13. a)	i) Explain the architecture of 8051 microcontroller with a neat block diagram.	8	K1	3
	ii) Describe the memory organization and special function registers in 8051.	8	K1	3
	(OR)			
b) i)	Categorize the various addressing modes of 8051 with suitable examples.	8	K1	3
	ii) Write a short note on I/O port structure and pin functions of 8051.	8	K1	3
14. a)	Build an interface for a stepper motor and DAC with 8051 microcontroller with necessary diagrams.	16	K2	4
	(OR)			
b)	Develop the serial port programming and interrupt priority structure in 8051.	16	K2	4
15. a)	Examine the instruction set of PIC microcontroller with examples.	16	K3	5
	(OR)			
b)	Dissect the timer module in PIC and its role in real-time applications.	16	K3	5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time] / II [Part Time]

Electrical and Electronics Engineering

22EE403/23PTEE203 – ANALOG AND DIGITAL INTEGRATED CIRCUITS

(Regulations 2022/2023)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Draw the equivalent circuit.	2	K1	1
2. Why the open loop op-amp configurations are not used in linear applications?	2	K2	1
3. Interpret the need for an instrumentation amplifier.	2	K2	2
4. Draw the block diagram of IC 555 timer.	2	K1	2
5. Convert the given expression into canonical SOP form. $Y = AC + AB + BC$	2	K3	3
6. Determine the exact number of half adders and full adders required for performing the addition of two binary numbers of 4 bits length each.	2	K3	3
7. Construct the truth table and state diagram of D flip flop.	2	K2	4
8. Compare Mealy and Moore circuit model.	2	K5	4
9. Differentiate between fundamental mode and pulse mode sequential circuits.	2	K2	5
10. How can a race in digital circuits can be avoided?	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain the function of inverting and non-inverting amplifier configurations in op-amps and how feedback determines their closed-loop gain.	16	K2	1
(OR)			
b) Discuss the effect of input bias current in an operational amplifier. How the input bias current can be compensated? List the causes of Slew Rate and explain its significance in applications.	16	K2	1

Q. No	M	BTL	CO
12. a) What are the internal blocks of Phase Locked Loop (PLL)? Explain the operation of basic PLL along with its operating ranges.	16	K1	2
(OR)			
b) Define the voltage-to-current converter and explain how it works for both floating and grounded loads.	16	K1	2
13. a) i) Design a 4 x 2 priority encoder using logic gates.	8	K3	3
ii) Design and implement the circuit using multiplexer which has 3 inputs (A, B, C) and one output Z. The output is HIGH, when the input is less than 3, otherwise 0.	8	K3	3
(OR)			
b) i) Demonstrate on a 2-bit magnitude comparator with $A > B$, $A = B$ and $A < B$ outputs.	8	K3	3
ii) Write a simplified maxterm Boolean expression for $\Pi(0, 4, 5, 6, 7, 10, 14)$ using the Karnaugh mapping method.	8	K3	3
14. a) Examine the transition behavior and excitation requirements of T flip-flops in the design of a synchronous decade counter.	16	K4	4
(OR)			
b) A sequential circuit with 2D flip-flops A and B with input X and output Y is specified by the following next state and output equations. $A(t+1) = AX + BX$ $B(t+1) = A'X$ $Y = (A+B) X'$ (1) Obtain the logic diagram of the circuit (2) Derive the state table, and (3) Derive the state diagram.	16	K4	4
15. a) Design an asynchronous sequential circuit that has two inputs A and B and one output Y. When $A = 0$, the output Y is 0. The first change in B that occurs while A is 1 will cause output Y to be 1. The output Y will remain 1 until A returns to 0.	16	K4	5
(OR)			
b) An asynchronous sequential circuit is described by the following excitation and output functions $Y = AB + (A+B) Y$ $Z = Y$ (1) Draw the logic diagram of the circuit (2) Derive the transition table and the output map (3) Describe the behaviour of the circuit.	16	K4	5

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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Electrical and Electronics Engineering

18EEP10 – UTILIZATION OF ELECTRICAL ENERGY

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Which is the major conventional power source contributing for electric power generation in India?	2	K1	1
2. Define the load duration curve.	2	K1	1
3. What are the basic requirements for a good illumination system?	2	K1	3
4. Define luminous efficiency.	2	K1	3
5. Classify the heating methods as per the principle of heat transfer.	2	K2	4
6. What are the salient features of electric welding?	2	K1	4
7. What are the supply systems employed in traction system?	2	K1	5
8. Mention the most familiar speed control scheme for induction motor control in traction systems.	2	K2	5
9. Mention the advantages of electric drives.	2	K1	6
10. Define load equalization in drives.	2	K1	6

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) With neat diagram, explain the electric power generation system using tidal power.	8	K2	1
ii) An industrial consumer having a maximum demand of 120 kW, maintain a load factor of 65 %. The tariff rates are Rs. 950/kVA of maximum demand per annum plus Rs. 2/kWh of energy consumed. If the average pf is 0.707 lagging, determine the following: i) the total energy consumed per annum, ii) the annual electricity bill and iii) the overall cost per kWh consumed.	8	K3	2

(OR)

Q. No		M	BTL	CO
b) i)	Detail the site selection of thermal and nuclear power stations.	8	K2	1
ii)	A generating station has the following daily load cycle : Time (Hours) 0—6 6—10 10—12 12—16 16—20 20—24 Load (MW) 40 50 60 50 70 40 Draw the load curve and find i) maximum demand ii) units generated per day iii) average load and iv) load factor.	8	K3	2
12. a) i)	The luminous intensity of a source is 600 candela is placed in the middle of a $10 \times 6 \times 2$ m room. Calculate the illumination: i) At each corner of the room ii) At the middle of the 6-m wall.	8	K3	3
ii)	Describe the working principle of a fluorescent lamp. (OR)	8	K2	3
b) i)	What are the requirements of good lighting? Discuss the lighting schemes.	8	K3	3
ii)	Explain the construction and working principle of the mercury vapour lamp.	8	K2	3
13. a) i)	Elaborate on the temperature control of resistance heating.	8	K2	4
ii)	Discuss the principle of operation of Ajax-Wyatt induction furnace. (OR)	8	K2	4
b) i)	Explain the operating principle of spot and seam weldings.	8	K2	4
ii)	Compare the carbon and metallic arc weldings. Give their relative merits and demerits.	8	K2	4
14. a)	What are the requirements of ideal traction system? Explain the mechanism of train movement. (OR)	16	K2	5
b)	Detail the recent trends employed in traction systems (electrification, motor control, etc) in India.	16	K2	5
15. a) i)	Compare group drives and individual drives.	8	K2	6
ii)	Discuss the various factors that govern the size and the rating of a motor for particular service. (OR)	8	K2	6
b) i)	What are the modern speed-control methods of DC drives? Explain any one.	8	K2	6
ii)	Explain the process of regenerative braking using SCR in DC drives.	8	K2	6

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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Mechanical Engineering

22ME403 – METAL CUTTING AND MACHINE TOOLS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. What is meant by machinability?	2	K2	1
2. Write any two functions of cutting fluids.	2	K1	1
3. State any two application of a capstan lathe.	2	K1	2
4. Mention any two types of operations performed on a shaper.	2	K1	2
5. Write the significance of rake angle in a drill bit.	2	K1	3
6. What is the function of a bond in a grinding wheel?	2	K2	3
7. What is the use of a stub tooth cutter in milling?	2	K2	4
8. Define gear shaping.	2	K1	4
9. What is Laminated Object Manufacturing (LOM)?	2	K2	5
10. Mention any two applications of 3D printing in the medical field.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) In an orthogonal cutting test with a tool of rake angle 10° , the following observations were made: Chip thickness ratio = 0.3 Horizontal component of the cutting force = 1290 N Vertical component of the cutting force = 1650 N From Merchant's theory, calculate the various components of the cutting forces, and the coefficient of friction at the chip tool interface.	16	K3	1

(OR)

Q. No	M	BTL	CO
b)	16	K3	1
- In a metal cutting experimentation, the tool life varies with cutting speed in the following manner:

Cutting speed, V, m/min	Tool Life, T, min
100	120
130	50

Derive Taylor's tool life equation for this operation and estimate the tool life at a speed of 2.5 m/s. Also, estimate the cutting speed for a tool life of 80 minutes.

12. a)	16	K2	2
What are the various types of automatic lathes in the multi-spindle category? Explain their differences and applications. Is the productivity of multi-spindle machines higher compared to single spindle automatic lathe? Explain.			
(OR)			
b)	16	K2	2
Describe the operation of the quick return motion in a mechanical shaper and the methods of holding the work pieces in shapers.			
13.a)	16	K2	3
Describe the different types of broaching machines. Compare broaching with other machining processes and discuss its advantages and disadvantages.			
(OR)			
b)	16	K2	3
Discuss the different types of grinding machines used in manufacturing processes. Select any three types and explain their working principles, construction details, applications, and advantages with neat sketches.			
14.a)	16	K3	4
Compare the compound indexing and differential indexing and state their relative merits.			
(OR)			
b)	16	K3	4
Compare the gear shaping and gear hobbing, giving the process and product requirements.			
15.a)	8	K2	5
i) Explain the basic principal of AJM with a neat sketch.			
	8	K3	5
ii) Discuss the factors that should be considered in selecting the abrasive in AJM.			
(OR)			
b)	8	K2	5
i) Explain the principle of the Electric Discharge Machining (EDM) with neat sketch.			
	8	K3	5
ii) What are the important parameters that control the material removal rate in EDM? Explain any two factors.			

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time]

Metallurgical Engineering

22MT401 – MECHANICAL BEHAVIOUR AND TESTING OF MATERIALS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. State Hollomon's equation and explain its relevance in strain hardening behaviour.	2	K1	1
2. Define necking and describe its role during tensile testing.	2	K2	1
3. What is the need for Instrumented Charpy test? How does it differ from ordinary Charpy test?	2	K2	2
4. What is nano-indentation? List the methods used to measure hardness in nanomaterials.	2	K1	2
5. Give the reason why FCC materials do not exhibit a ductile-to-brittle transition temperature?	2	K2	3
6. State the significance of J integral in fracture mechanics.	2	K3	3
7. What is Fatigue? Mention the factors responsible for fatigue in major applications.	2	K3	4
8. Mention the need for Low Cycle fatigue analysis in industrial applications.	2	K2	4
9. Coarse material is preferred at high temperatures. Justify.	2	K3	5
10. Write down the use Larson-Miller parameter in predicting creep behavior of alloys.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) What is the need for Stress Strain curve? Also, explain the curve with a neat diagram.	8	K3	1
ii) Explain the importance of ASTM standards in material testing. List standard ASTM codes for commonly used mechanical tests.	8	K3	1

(OR)

Q. No		M	BTL	CO
12. a)	b) i) Define notch sensitivity and describe the standard procedure to evaluate it.	8	K3	1
	ii) Describe the step-by-step procedures for conducting a bend test and a shear test. Highlight their industrial applications.	8	K3	1
	i) Compare and analyze the Rockwell and Brinell hardness tests in terms of procedure, accuracy, precautions, advantages, and limitations.	8	K4	2
	ii) Examine various microhardness testing methods. Analyze their working principles, advantages, and limitations in different material applications.	8	K4	2
(OR)				
13. a)	b) i) Evaluate different testing techniques for determining material toughness. Identify the most suitable method and justify with reasoning.	8	K4	2
	ii) Analyze the working principles of the Explosion crack starter test and Crack Arrest Test. Discuss their effectiveness in assessing material behavior under fracture conditions.	8	K4	2
	i) What is the Ductile-to-Brittle Transition Temperature (DBTT)? Explain the importance of the transition temperature curve and describe the metallurgical factors influencing DBTT.	8	K2	3
	ii) Describe Griffith's theory of brittle fracture in solids. Also, explain how Orowan modified this theory to account for real materials.	8	K2	3
(OR)				
b)	i) Define the fracture toughness value K_{IC} . Explain, in simple terms, the steps involved in determining K_{IC} under plane strain conditions.	8	K2	3
	ii) Explain the concept of Crack Opening Displacement (COD) and illustrate it with required diagram to show how it occurs during fracture.	8	K2	3

Q. No		M	BTL	CO
14. a)	i) Analyze the concept of fatigue limit and compare the fatigue behavior of ferrous and non-ferrous alloys using fatigue curves.	8	K4	4
	ii) Examine how mean stress influences fatigue life with the help of the Goodman and Haig - Soderberg diagrams.	8	K4	4
	(OR)			
b)	i) Identify and explain the structural changes that occur during fatigue. Analyze how these micro structural features evolve throughout the fatigue life of a material.	8	K4	4
	ii) State Paris law. Analyze the effect of fracture toughness on fatigue crack propagation in materials.	8	K4	4
15. a)	i) List the three stages of a typical creep curve and explain the curve with a neat sketch. Also, explain Andrade's analysis.	8	K1	5
	ii) State the structural changes that occur during the creep process and explain in detail.	8	K1	5
	(OR)			
b)	i) Compare Creep test and Stress rupture test. Also, explain the procedure of creep testing with a neat sketch.	8	K1	5
	ii) What is creep-fatigue interaction? Explain in detail and recall its significance in material behaviour.	8	K1	5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV [Part Time]

Civil Engineering

22PTCE402/23PTCE403 – MECHANICS OF SOILS

(Regulations 2022/2023)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. The natural water content of a saturated soil is 30%. If the specific gravity of solids of the soil is 2.7. Find its porosity.	2	K2	1
2. Define Density Index.	2	K1	1
3. Define Isobars.	2	K1	2
4. Outline the assumptions of Boussinesq's solution.	2	K2	2
5. State Darcy's Law.	2	K2	3
6. List the applications of flow net.	2	K1	3
7. List various factors affecting compaction.	2	K1	4
8. Define preconsolidation pressure. In what way it is important in soil engineering?	2	K1	4
9. Write down the Mohr's-Coulomb Failure envelope equation.	2	K1	5
10. UCC strength of a clay was observed as 110 kN/m ² . What is its shear strength?	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) A soil has a liquid limit of 45%, plastic limit of 20% and flow index of 50%. Determine its toughness index. If the natural water content is 25%, find its consistency index and comment on the state of its consistency. Also, classify the soil as per BIS if the fraction passing through 75-micron sieve is 60%.	8	K3	1
ii) Briefly explain about the I.S Soil Classification system.	8	K2	1

(OR)

Q. No	M	BTL	CO
b) i) A soil sample is found to have the following properties. Classify the soil according to I.S. Classification system. Passing 75 μ sieve = 10%; Passing 4.75 mm Sieve = 70%; Uniformity Coefficient = 8; Coefficient of Curvature = 2.8; Plasticity Index = 4.	8	K3	1
ii) What are Atterberg's limits? Explain.	8	K2	1
12. a) A 12 m thick layer of clay is underlined by a 4 m thick layer of sand. The water table is at a depth of 5 m from the ground surface. The unit weight of clay above the water table is 17 kN/m ³ and below the water table is 20 kN/m ³ . Unit weight and sand is 19.1 kN/m ³ . Draw the variation of total stress, pore water pressure and effective stress distribution diagrams with depth.	16	K3	2
(OR)			
b) A concentrated point load of 200 kN acts at the ground surface. Find the intensity of vertical pressure at a depth of 10 meters below the ground surface, and situated on the axis of the loading. What will be the vertical pressure at a point at a depth of 5 m and at a radial distance of 2 m from the axis of loading? Use Boussinesq analysis.	16	K3	2
13. a) A permeameter of 82 mm diameter contains a sample of soil of length 350 mm. It can be used either for constant-head or falling-head tests. The standpipe used for the latter has a diameter of 25 mm. In a constant head test the loss of head was 1150 mm, measured on a length of 250 mm. When the rate of flow was 2.73×10^3 mm ³ /s. Find the coefficient of permeability of the soil in cm/s. If the falling-head test were made on the same soil, find what time would be taken for the head to fall from 1500 mm to 1000 mm. Assume Darcy's law is valid.	16	K3	3

(OR)

Q. No		M	BTL	CO
b)	A flow net analysis was performed for estimating the seepage loss through the foundation of a coffer dam, results of the flow net analysis gave a number of flow line 'Nf' = 6 and number of drops 'Nd' = 16. The head of water lost during seepage was 5m. Assume the co-efficient of permeability of the soil is ' k ' = 4×10^{-5} m/min. Estimate the seepage loss per meter length of the coffer dam per day. Also estimate the exit gradient if the average length of the last flow field is 0.9 m.	16	K3	3
14. a)	How will you determine maximum dry density and optimum moisture content in the laboratory? Explain (OR)	16	K2	4
b)	Derive the equation for Terzaghi's theory of one dimensional consolidation with a neat sketch	16	K2	4
15. a)	Explain direct shear test with neat sketch. Mention its advantages and limitations (OR)	16	K2	5
b)	Explain triaxial compression test. What are the advantages of triaxial test?	16	K2	5



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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV [Part Time]

Electronics and Communication Engineering

23PTEC403 – EMBEDDED SYSTEMS

(Regulations 2023)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Classify the types of processors in Embedded System.	2	K1	1
2. Interpret Target Hardware debugging.	2	K2	1
3. Recall the concept of RS232 standard.	2	K1	2
4. Draw the write byte format and read byte format of I2C.	2	K1	2
5. Mention different models used for the development of an embedded system.	2	K1	3
6. Point out the features of object oriented model.	2	K1	3
7. Justify the use of a thread in a process.	2	K2	4
8. Compare pre-emptive and non pre-emptive scheduling.	2	K3	4
9. Illustrate the function of timer device in an Automotive application.	2	K2	5
10. Name the software units needed to design Digital Camera.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Elaborate about Structural unit of Embedded Processor including processor architecture and advanced processor architecture.	16	K1	1
(OR)			
b) Discuss in detail about Timer and counting devices for Embedded systems with neat diagram.	16	K1	1
12. a) i) Describe the functions of a I/O interface with a neat diagram and explain the classification of I/O devices.	10	K1	2
ii) Write a short note on Data frame format in CAN bus.	6	K1	2
(OR)			
b) i) Explain with all necessary sketches to enable intra communication among peripherals using I2C bus.	10	K1	2
ii) Illustrate about the Independent slave configuration in SPI bus.	6	K1	2

Q. No		M	BTL	CO
13. a)	Evaluate functional description about the different phases of Embedded Design Life Cycle Method.	16	K1	3
	(OR)			
b)	Illustrate the following type of computational state model	16	K1	3
	i) Data Flow Graph Type Model.			
	ii) State machine Type Model.			
14. a)	i) Describe the Real Time Operating Systems (RTOS). Compare its features with window based real time operating systems.	12	K2	4
	ii) Discuss critical section service by a pre-emptive scheduler.	4	K1	4
	(OR)			
b)	i) Show the appropriate diagrams explain Task Communication and Synchronization.	12	K2	4
	ii) Explain about multiprocessing & multitasking.	4	K1	4
15. a)	Discuss the role of embedded systems in ATM machines with examples of hardware and software used.	16	K2	5
	(OR)			
b)	Describe the digital camera used in automotive embedded systems, including the relevant hardware and software components.	16	K2	5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Part Time]

Mechanical Engineering

22PTME601– ENGINEERING ECONOMICS AND FINANCIAL MANAGEMENT

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define economics.	2	K1	1
2. List the different situations deserving elementary economic analysis.	2	K1	1
3. Define value engineering.	2	K1	2
4. Identify the application areas of value engineering.	2	K2	2
5. Give the principle of the annual equivalent method of comparison of alternatives.	2	K1	3
6. Differentiate between cost dominated cash flow diagram and revenue/profit-dominated cash flow diagram.	2	K2	3
7. Give the methods of appraising project profitability.	2	K1	4
8. What is the need for management of working capital?	2	K2	4
9. What is journal entry? List the ways to do it.	2	K1	5
10. Summarize the significance of financial statements.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Alpha Associates has the following details: Fixed cost = Rs. 20,00,000 Variable cost per unit = Rs. 100 Selling price per unit = Rs. 200 Find (i) The break-even sales quantity, (ii) The break-even sales (iii) If the actual production quantity is 60,000, find the contribution; and the margin of safety.	16	K3	1

Q. No		M	BTL	CO
	(OR)			
b)	Two alternatives are under consideration for a tapered fastening pin. Either design will serve the purpose and will involve the same material and manufacturing cost except for the lathe and grinder operations. Design A will require 16 hours of lathe time and 4.5 hours of grinder time per 1,000 units. Design B will require 7 hours of lathe time and 12 hours of grinder time per 1,000 units. The operating cost of the lathe including labour is Rs. 200 per hour. The operating cost of the grinder including labour is Rs. 150 per hour. Which design should be adopted if 100000 units are required per year and what is the economic advantage of the best alternative?	16	K3	1
12. a)	i) Explain the steps of value engineering.	10	K2	2
	ii) Illustrate the symptoms favouring the applications of value engineering.	6	K2	2
	(OR)			
b)	i) Summarize the various criteria for make or buy decisions.	10	K2	2
	ii) Explain any one of the approaches available for make or buy decisions with a suitable example.	6	K2	2
13. a)	i) An automobile company recently advertised its car for a down payment of Rs. 1, 50,000. Alternatively, the car can be taken home by customers without making any payment, but they have to pay an equal yearly amount of Rs. 25,000 for 15 years at an interest rate of 18%, compounded annually. You are asked to advise the best alternative for the customers based on the present worth method of comparison.	8	K3	3
	ii) A person invests a sum of Rs. 2, 00,000 in a business and receives equal net revenue of Rs. 50,000 for the next 10 years. At the end of the 10th year, the salvage value of the business is Rs. 25,000. Find the rate of return of the business.	8	K3	3

Q. No**M BTL CO****(OR)**

- b) i) A company provides a car to its chief executive. The owner of the company is concerned about the increasing cost of petrol. The cost per litre of petrol for the first year of operation is Rs. 21. He feels that the cost of petrol will be increasing by Re.1 every year. His experience with his company car indicates that it averages 9 km per litre of petrol. The executive expects to drive an average of 20,000 km each year for the next four years. What is the annual equivalent cost of fuel over this period of time? If he is offered similar service with the same quality on rental basis at Rs. 60,000 per year, should the owner continue to provide company car for his executive or alternatively provide a rental car to his executive? Assume $i = 18\%$. If the rental car is preferred, then the company car will find some other use within the company.
- 8 K3 3
- ii) A company is trying to diversify its business in a new product line. The life of the project is 10 years with no salvage value at the end of its life. The initial outlay of the project is Rs. 20, 00,000. The annual net profit is Rs. 3, 50,000. Find the rate of return for the new business.
- 8 K3 3
14. a) Explain the sources of Long Term Finance and Short Time finance.
- 16 K2 4
- (OR)**
- b) Explain the scope, objectives, limitations, and types of Financial management
- 16 K2 4
15. a) Analyze the significance of Trail balance by preparing the same for M/s Multiplying enterprise as on 31st December, 2014.
- 16 K4 5

<i>Accounts</i>	<i>Balances</i> (₹)	<i>Accounts</i>	<i>Balances</i> (₹)
Cash in hand	2,500	Debtors	18,200
Cash at Bank	14,500	Creditors	16,600
Capital	70,000	Opening stock	8,700
Drawing	9,000	Wages	6,700
Purchases	60,000	Rent	5,000
Sales	82,000	Salary	8,400
Machine	35,000	Bills Payable	11,400
Furniture	12,000		

Q. No

M BTL CO

(OR)

- b) What is ratio analysis? Analyze the different types of ratios with examples.

16 K4 5

Registration Number :

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M.E. Degree Examinations – April/May 2025

Semester: II [Full Time]

Computer Aided Design

22CDC23 – SOLID FREEFORM MANUFACTURING

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What is SFM process chain?	2	K1	1
2. Give any four applications of bio printing.	2	K2	1
3. Mention any four data formats used for AM.	2	K1	2
4. Why support generation, is needed?	2	K2	2
5. What is photo polymerization in SLA?	2	K1	3
6. In the LOM systems, list the materials used.	2	K2	3
7. What are process variables in FDM?	2	K1	4
8. Why surface deviation occurs in SLS?	2	K2	4
9. List the advantages and limitations of LENS.	2	K1	5
10. What are the strength and weakness of 3DP?	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Explain the following: i) Food Printing ii) Electronics printing	8	K2	1
ii) Explain the hierarchical structure of SFM.	8	K2	1
(OR)			
b) i) Explain AM supply chain.	8	K2	1
ii) Classify SFM systems and list their applications.	8	K2	1
12. a) i) Discuss the design and generation of support structure for AM applications.	8	K3	2
ii) Discuss various aspects of tool path generation.	8	K3	2
(OR)			
b) i) Discuss the role of DFAM for part quality improvement.	8	K3	2
ii) Explain about data formats and data interfacing.	8	K3	2

Q. No		M	BTL	CO
13. a)	Analyze the principle of working, materials and applications of LOM.	16	K4	3
	(OR)			
b)	Analyze the principle of working, materials and applications of SLA.	16	K4	3
14. a)	Describe the process of SLS and list the factors that affect the part quality.	16	K3	4
	(OR)			
b)	Describe the process of FDM and list the factors that affect the part quality.	16	K3	4
15. a)	Analyze the need of a support structure in MJT. Contrast MJT's support structure needs with a process that has the opposite need.	16	K4	5
	(OR)			
b)	Analyze the post processing types of LENS with suitable example for each.	16	K4	5

Registration Number :

Government College of Engineering, Salem
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M.E. Degree Examinations – April/May 2025

Semester: II [Full Time]

Communication Systems

22COE31 – WIRELESS AND MOBILE COMMUNICATION

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Identify the main factors that determine the performance of a wireless communication system.	2	K2	1
2. Clarify the concept of network slicing in 5G.	2	K2	1
3. Name two types of channel assignment strategies.	2	K1	2
4. Mention the main factors that influence the coverage and capacity of cellular systems.	2	K2	2
5. Outline the significance of the knife edge diffraction model.	2	K2	3
6. List two factors affecting indoor signal propagation.	2	K2	3
7. State the effect of Doppler shift on smallscale fading.	2	K2	4
8. Elucidate the role of shape factors in system design.	2	K2	4
9. Define equalization in communication systems.	2	K1	5
10. How do GSM and USDC codecs differ?	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Analyze the impact of mobile radio systems around the world on modern communication systems.	8	K3	1
ii) Describe the features advantages and limitations of 2G networks.	8	K2	1
(OR)			
b) i) Examine the trends in cellular radio and personal communications.	8	K3	1
ii) Discuss the major features and goals of 4G technology. Explain how it differs from previous generations.	8	K2	1

Q. No		M	BTL	CO
12. a)	i) Explain the concept of frequency reuse in cellular systems. How does it help improve system capacity?	8	K3	2
	ii) Compare combined linear modulation techniques with constant envelope modulation techniques.	8	K4	2
	(OR)			
b) i)	Describe the different channel assignment strategies and outline their advantages.	8	K3	2
	ii) Analyze the principles and advantages of spread spectrum modulation techniques in cellular networks.	8	K4	2
13. a) i)	Define radio wave propagation and explain the factors that affect it in wireless communication systems.	8	K2	3
	ii) Describe the of the two ray ground reflection model and obtain the path loss.	8	K3	3
	(OR)			
b) i)	Outline the steps involved in designing a practical link budget using path loss models.	8	K2	3
	ii) Compare the Okumura and Hata models for outdoor propagation. Which is more suitable for urban environments?	8	K3	3
14. a) i)	Explain the impulse response model of a multipath channel and analyze how it helps in understanding fading.	8	K3	4
	ii) Compare and contrast Rayleigh and Rician fading with examples.	8	K4	4
	(OR)			
b) i)	Analyze the Clarke's model used for flat fading channels.	8	K3	4
	ii) Explore how shape factors such as angular spread impact signal fading.	8	K4	4
15. a) i)	Compare and contrast linear and nonlinear equalization techniques, highlighting their advantages and disadvantages.	8	K4	5
	ii) Explain the working of a RAKE receiver with a neat block diagram.	8	K3	5
	(OR)			
b) i)	Examine the significance of space diversity and its practical applications.	8	K4	5
	ii) Discuss the principles of speech coding and the operation of vocoders.	8	K3	5

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Government College of Engineering, Salem
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M.E. Degree Examinations – April/May 2025

Semester: II [Full Time]

Power Electronics and Drives

22PEE34 – SPECIAL ELECTRICAL MACHINES AND DRIVES

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
1.	What are the differences between mechanical and electronic commutators?	2	K1	1
2.	What are the relative merits of the brushless dc motor drives?	2	K2	1
3.	Clearly explain the difference between synchronous reluctance motor and PM synchronous motor.	2	K2	2
4.	What are the different types of rotors available in PMSM motor?	2	K2	2
5.	Why rotor position sensors are essential for the operation of switched reluctance motor?	2	K1	3
6.	What is the step angle of a three phase SRM having 12 stator poles and 8 rotor poles and also find the commutation frequency at each phase at the speed of 6000 rpm.	2	K3	3
7.	What are the different types of converters used in BLDC motor control?	2	K1	4
8.	What is the advantage of C-dump converter?	2	K2	4
9.	What are the different current sensing techniques used in power electronic systems based on the placement of the current sensor in the power path?	2	K3	5
10.	What is the purpose of Quadrature Encoder in motor control systems?	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
11. a)	What are the different types of rotor position sensors used in the operation of BLDC motors? Explain each type in detail with the help of clear diagram.	16	K3	1

Q. No		M	BTL	CO
	(OR)			
	b) Analyze the phase advance angle control and position sensor less control techniques used in PM BLDC motors. Compare their working principles, advantages, and limitations.	16	K3	1
12. a)	Explain the vector control of an Interior Permanent Magnet Synchronous Motor (IPMSM) in detail, with a clear block diagram.	16	K3	2
	(OR)			
	b) Draw the equivalent circuit of PMSM motor and derive the equation for torque and power.	16	K3	2
13. a)	Describe in detail the construction and working principle of a Switched Reluctance Motor (SRM), with the help of diagrams.	16	K3	3
	(OR)			
	b) What are the different current control schemes used in Switched Reluctance Motor (SRM) drives? Explain each method in detail.	16	K3	3 ○
14. a)	What is meant by dead time in converter operation? Discuss its impact on system performance and explain the various methods used to compensate for dead time effects.	16	K2	4
	(OR)			
	b) What are the different types of power converters used for special electrical machines? Briefly describe the operation of each type with the diagrams.	16	K2	4
15. a)	Discuss in detail the interfacing of current sensors with a Digital Signal Controller (DSC), and illustrate the process with diagrams.	16	K1	5
	(OR)			
	b) Illustrate the interfacing of position and speed sensors with a Digital Signal Controller (DSC), using appropriate diagrams.	16	K1	5 ○

Registration Number :

Government College of Engineering, Salem
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M.E. Degree Examinations – April/May 2025

Semester: II [Full Time]

Structural Engineering

22STE32 – DESIGN OF FORMWORK

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define seasoning in timber.	2	K1	1
2. Summarize the merits of aluminum in construction.	2	K2	1
3. Define the term 'formwork pressure'.	2	K1	2
4. Mention two factors that influence the design of formwork for beams.	2	K2	2
5. Name two types of special structures that require unique formwork designs.	2	K2	3
6. List two challenges encountered in designing formwork for domes.	2	K1	3
7. What is 'flying formwork'?	2	K1	4
8. Mention two advantages of using tunnel formwork in construction.	2	K2	4
9. List two common causes of formwork failure.	2	K2	5
10. State two preventive measures to avoid formwork collapse during construction.	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain the properties and advantages of aluminium and its products.	16	K2	1
(OR)			
b) Explain the requirements for good formwork.	16	K2	1

Q. No		M	BTL	CO
12. a)	Describe the step-by-step procedure for designing formwork for a reinforced concrete slab.	16	K3	2
	(OR)			
b)	Explain the design considerations for formwork used in columns. How do design requirements differ from those for walls and foundations?	16	K3	2
13. a)	Discuss the challenges and solutions in formwork design for shell and folded plate structures.	16	K4	3
	(OR)			
b)	Explain the formwork system used in constructing a natural draft cooling tower.	16	K4	3
14. a)	Differentiate between table form and tunnel form systems in terms of structure, application, and construction efficiency.	16	K2	4
	(OR)			
b)	What is slip formwork? Describe its working principle and common applications in high-rise or continuous concrete structures.	16	K2	4
15. a)	List and explain five common causes of formwork failure. Provide at least one real-world case study to support your answer.	16	K2	5
	(OR)			
b)	Discuss the formwork-related issues typically encountered in multi-story building construction and how they can be mitigated.	16	K2	5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

M.E. Degree Examinations – April/May 2025

Semester: II [Full Time]

Structural Engineering

22STE36 – DESIGN OF STEEL-CONCRETE COMPOSITE STRUCTURES

(Regulations 2022)

(Use of IS 11384-1984, EN 1994-1-1 (2004) only tables, Steel table, IS 800:2007 may be Permitted
Assume suitable data if found necessary)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What is the basic principle involved in the design of composite structures?	2	K1	1
2. How will you prevent the vertical separation of the concrete slab from steel beam in composite construction?	2	K2	1
3. What are the failure modes of composite beams?	2	K1	3
4. What type of truss is normally adopted in composite trusses? Why?	2	K2	3
5. Name the factors considered in the design of connectors.	2	K1	2
6. Outline the load bearing mechanism of shear connectors.	2	K2	2
7. What are the different loads to be considered while designing a box girder bridges?	2	K1	2
8. Write the different erection methods employed in the construction of box girder bridges.	2	K1	4
9. When do you prefer steel-concrete composite construction for multi-storied buildings?	2	K2	5
10. What are the basic concepts in seismic design of composite section?	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Discuss in detail about the elastic behaviour of composite beam considering no interaction case.	10	K2	1
ii) Discuss briefly the various types of composite construction with neat sketches.	6	K2	1
(OR)			
b) i) Explain the behaviour and design features of steel-concrete-steel sandwich construction.	10	K2	1

Q. No		M	BTL	CO
	ii) Write a note on materials used in steel concrete composite construction.	6	K2	1
12. a)	Design a simply supported composite beam with 12 m span spaced at 2.5 m c/c. The thickness of the slab is 120 mm. The floor is to carry an imposed load of 3 kN/m ² , partition load of 1 kN/m ² and a floor finish of 0.5 kN/m ² . Adopt M20 grade concrete.	16	K3	3
	(OR)			
b)	Design a composite floor with 10m span beams spaced at 3 m centres. The thickness of RCC slab is 125 mm. The floor is to carry an imposed load of 3.0 kN/m ² , partition load of 1.5 kN/m ² and a floor finish of 0.5 kN/m ² . The floor will not be propped during construction. Use M30 grade concrete. Need not design the shear connectors.	16	K3	3
13. a)	Design the shear connection at the interface of a composite RC slab and steel beam for the following data: Span of the beam : 8 m Spacing of beams : 4 m Thickness of slab : 125 mm Steel beam section : ISMB 400 Adopt M30 grade of concrete.	16	K3	2
	(OR)			
b)	A slab of thickness 100 mm is supported on ISMB 250. The steel beam of 5.0m span are spaced at 4 m interval. The slab is subjected to a super imposed load of 2 kN/m ² . Design suitable connectors between steel beam and RC Slab to ensure full interaction.	16	K3	2
14. a)	Briefly describe with sketches the data required, analysis procedure and the design of composite box girder bridges.	16	K2	4
	(OR)			
b)	Explain in detail the behavior of composite box girder bridges under bending, torsion and torsional warping.	16	K2	4
15. a)	Justify that steel concrete composite construction for buildings are an efficient, cost effective with short capital lock-in time with a case study.	16	K4	5
	(OR)			
b)	Compare the seismic behaviour of a steel concrete composite structures when compared to steel structures.	16	K4	5

Registration Number :

Government College of Engineering, Salem
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M.E./Ph.D Degree Examinations – April/May 2025

Semester: II [Full Time]

Thermal Engineering/Mechanical Engineering

22THE45 – ENERGY SYSTEMS MODELLING AND ANALYSIS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define primary energy and state its significance in energy systems analysis.	2	K1	1
2. List the two main types of energy systems commonly used in energy analysis.	2	K1	1
3. Define the term heat exchanger.	2	K1	2
4. Name two types of solar collectors.	2	K1	2
5. List any two types of constraints commonly encountered in optimization problems.	2	K1	3
6. List the difference between necessary conditions and sufficiency conditions in optimization problems.	2	K1	3
7. What is meant by multiplier analysis in energy economics?	2	K1	4
8. List out any two methods of energy aggregation.	2	K1	4
9. Define pinch analysis.	2	K1	5
10. Tell two probabilistic techniques used in energy systems optimization.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Examine the steps involved in developing a model for a thermal energy system, and assess the importance of choosing the appropriate modeling level for different design stages.	16	K4	1
(OR)			
b) Analyze how energy analysis can be applied to the design of a solar power system and discuss the benefits of using energy analysis in the design process.	16	K4	1

Q. No		M	BTL	CO
12. a)	Explain the process of distillation in energy systems and discuss its role in energy efficiency optimization in chemical plants.	16	K2	2
	(OR)			
b)	Explain the operation of a refrigeration system and compare it with a heat pump system in terms of energy flow and efficiency.	16	K2	2
13. a)	i) Explain the concept of Lagrange multipliers and demonstrate their application in constrained optimization problems.	6	K2	3
	ii) Illustrate the advantages and limitations of using the Genetic Algorithm and Simulated Annealing for optimization problems, and compare them to traditional optimization techniques like Lagrange multipliers.	10	K2	3
	(OR)			
b) i)	Illustrate the Simplex method for solving linear programming problems and discuss its key steps, including tableau construction and pivoting.	6	K2	3
	ii) Demonstrate a linear programming problem, formulate it with constraints, and solve it using the Simplex method. Justify each step taken during the solution process, and discuss the results in terms of optimization goals.	10	K2	3
14. a)	i) Clarify the concept of input-output analysis in the context of energy and environmental systems, and analyze how it helps in evaluating the impact of energy consumption on the environment.	8	K4	4
	ii) Propose an energy demand model using econometric methods and analyze with your choice of model and variables for accurate forecasting of future energy consumption.	8	K4	4
	(OR)			
b) i)	Demonstrate the use of econometric methods in energy demand modeling and discuss the challenges of forecasting energy demand using these techniques.	8	K4	4
	ii) Explain the application of dynamic programming in solving energy optimization problems, and compare its advantages over other optimization methods like search techniques or linear programming.	8	K4	4

Q. No		M	BTL	CO
15. a)	i) Categorize the concept of optimization in energy systems and discuss how uncertainty can affect optimization decisions.	6	K4	5
	ii) Analyze the role of probabilistic techniques in handling uncertainty in energy system optimization, and compare their effectiveness to deterministic models.	10	K4	5
	(OR)			
b) i)	Analyze a case study where pinch analysis was used to balance capital and energy consumption in a thermal system, and evaluate the trade-offs involved.	6	K4	5
	ii) Analyze an optimization model for an energy system that accounts for both capital and energy trade-offs using pinch analysis. Justify the application of pinch analysis and discuss how it helps in achieving cost-effective energy solutions.	10	K4	5

Registration Number :

Government College of Engineering, Salem
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M.E./Ph.D. Degree Examinations – April/May 2025

Semester: II [Full Time]

Welding Technology/Metallurgical Engineering

22WTE31 – TESTING AND INSPECTION OF MATERIALS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Write the relationship between true stress and engineering stress.	2	K3	1
2. Write the relationship between Brinell Hardness Number and Ultimate Tensile Strength.	2	K2	1
3. What is nano indentation?	2	K1	2
4. List advantages of NDT over Destructive Testing.	2	K2	2
5. Define “Speed” and ‘Contrast’ in film radiography.	2	K2	3
6. List any Two Gamma ray radiation sources with their half life period.	2	K3	3
7. What are the applications of Phased array Ultrasonic testing?	2	K1	4
8. List the types of ultrasonic waves.	2	K2	4
9. List any TWO API codes on refinery equipments.	2	K2	5
10. What is the purpose of “Procedure Qualification Records”	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Illustrate the tensile testing procedure and tensile curve of Mild Steel with standard properties.	16	K3	1
(OR)			
b) Illustrate the Hot tensile test and Notch tensile test. Also explain the Bend test of welded stainless steel.	16	K3	1
12. a) Describe the testing procedure, advantages, disadvantages and applications of Brinell and Rockwell hardness tests.	16	K1	2
(OR)			
b) Describe the testing procedure of Vicker’s hardness test, Microhardness test and Imapct test.	16	K1	2

Q. No		M	BTL	CO
13. a)	Analyze the principle, testing procedure, applications, advantages and disadvantages of Liquid Penetrant Inspection.	16	K4	3
	(OR)			
b)	Analyze the testing procedure, applications, advantages, disadvantages and demagnetization methods of Magnetic Particle Inspection.	16	K4	3
14. a)	Describe the X-ray radiography testing procedure of automobile cast components.	16	K2	4
	(OR)			
b)	Describe the importance of Image formation and Exposure charts in radiography testing.	16	K2	4
15. a)	Explain the Pulse echo, Transmission and Resonance techniques in Ultrasonic Inspection method.	16	K2	5
	(OR)			
b)	Explain the Welding Procedure Specifications and Procedure Qualification Records with one example.	16	K2	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: III [Full Time]

Mechanical Engineering

12ME304 - MANUFACTURING TECHNOLOGY - I

(Regulations 2012)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

1. What are the different types of cutting tools?
2. Define orthogonal cutting.
3. Write the specification of a typical lathe.
4. Define an automatic machine.
5. List the major parts of a shaper.
6. Define reaming.
7. What is an abrasive?
8. Define grinding.
9. Define NC and CNC.
10. What are G-codes and M-codes? Give examples.

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

M

11. a) What is a chip breaker? Describe the different types of chips produced during metal machining with neat sketches. (16)
(OR)
b) What are the functions of cutting fluids? Explain in detail the guidelines adopted for the selection of cutting fluid based on material and tool characteristics. (16)
12. a) Explain the construction and working principle of a lathe with a neat sketch. (16)
(OR)
b) Explain the working principle of the turret lathe and the capstan lathe with neat sketches. (16)

Q. No	M
13. a) With a simple sketch, explain the process of milling and explain this various types of milling cutters used with neat sketches.	(16)
(OR)	
b) Explain the following operation with a suitable sketch	(16)
1. Drilling 2. Boring and 3. Tapping	
14. a) Explain the working principle of cylindrical and center less grinding processes with suitable sketches.	(16)
(OR)	
b) Explain the construction of a push-type and pull-type broaching machine with suitable sketches.	(16)
15. a) Explain the working of an NC machine tool with the help of a diagram. Also, state the advantages and limitations of NC.	(16)
(OR)	
b) Explain the various steps to be followed while developing a CNC part program and also explain about linear and circular interpolation.	(16)

Registration Number:

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: V [Part Time]

Civil Engineering

16PTCE503 – DESIGN OF REINFORCED CONCRETE AND MASONRY STRUCTURES

(Regulations 2016/2016A)

(IS 456 2000, DESIGN AIDS SP 16 are permitted)

Time: 3 Hours

Maximum Marks: 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. When do we prefer trapezoid footing?	2	K2	2
2. Compare mat and raft foundation.	2	K2	2
3. What is a retaining wall?	2	K1	2
4. Recall the function of counterforts in retaining wall.	2	K2	2
5. List the assumptions of Yield line theory.	2	K1	2
6. Define flat slab.	2	K1	2
7. Give the essential requirement of an impervious water bank.	2	K2	4
8. Write the advantages of limit state method of analysis in water tank design.	2	K1	1
9. How the brick masonry walls are classified?	2	K2	3
10. State lateral support in brick wall masonry.	2	K1	3

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) Enumerate the procedure for design of rectangular combined footing.	16	K3	2
(OR)			
b) Design a trapezoid combined footing for two reinforced concrete columns of 300mmx300mm size spaced 3m apart and each supporting factored axial load of 750 KN. Take ultimate bearing capacity of soil at side is 230KN/m ² . Adopt M30 concrete and Fe500 HYSD bars. Assume any relevant data needed.	16	K3	2

Q. No		M	BTL	CO
12. a)	Design a cantilever retaining wall to retain the earth embankment with a horizontal top 4m above Ground level unit weight density of earth=18KN/m ³ . Angel of internal friction $\phi = 30^\circ$, SBC of soil=200KN/m ² . Take co-efficient of friction soil and concrete as 0.55. Adopt M25 concrete and Fe 415 steel.	16	K3	2
	(OR)			
b)	Design a stem of counterfort retaining wall of the height of the wall above ground level=6m, SBC of soil is 170KN/m ² Angel of internal friction $\phi = 30^\circ$, unit weight of soil =18 KN/m ³ . Spacing of counter fort 3m c/c. Take co-efficient of friction between soil and concrete as 0.55. Adopt M30 concrete and Fe415HYSD bars.	16	K3	2
13. a)	Design a rectangular slab of size 4m x 6m which is simply support along the edges and has to carry a severe live load of 4KN/m ² . Assume co-efficient of orthotropy=0.75. Use M25 grade concrete and Fe 415 HYSD bars. The design may be restricted to bending only.	16	K3	2
	(OR)			
b)	Explain the guide lines to draw the possible yield patterns and locate the axes of rotation.	16	K3	2
14. a)	Design a ring beam and cylindrical tank wall of RC cylinder tank resting of ground with flexible base spherical dome for capacity of 5 lakh liters. The depth of storage is to be 4m below free board of 200mm. use M ₂₀ concrete and Fe 415 steel, assume if any data's required.	16	K3	1
	(OR)			
b)	A rectangular water tank with an open top is required to store 1 lakh liter of water. The inside dimension of the tank rest of wall on all four sides. Design the side wall of the tank using M20 concrete and Fe 415 steel, assume it any data's required.	16	K3	1
15. a)	Calculate the allowable compressive stress of column 300mmx600mm constructed in first class brick with 1:6 cement mortar using modular brick 200x100x100 mm. The height of pier between footing and top slab is 5.1m. The strength of the unit may be assumed as 10 MPa. If the load was applied at an eccentricity of 100mm above the major axis of the bending.	16	K4	3
	(OR)			
b)	Explain the effective height and length of brick masonry wall.	16	K4	3

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations - April/May 2025

Semester: II [Part Time]

Mechanical Engineering

16PTME203 - MANUFACTURING TECHNOLOGY - II

(Regulations 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Mention any two advantages of gear hobbing.	2	K1	1
2. List the different methods of indexing in gear cutting.	2	K1	1
3. Write the principle of CO ₂ process.	2	K1	2
4. What are the applications of continuous casting?	2	K1	2
5. Recall the basic principle of forming processes.	2	K2	3
6. Write short notes about water hammer forming.	2	K1	3
7. List the limitations of ECM process.	2	K1	4
8. How the machining is done with ultrasonic machining process?	2	K2	4
9. Define the concept of rapid prototyping.	2	K1	5
10. Tell the steps on data preparation in rapid prototyping.	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Explain the principle of operation of gear shaping process with neat diagram.	10	K2	1
ii) Differentiate between gear forming and gear generating.	6	K3	1
(OR)			
b) i) Discuss how a gear is generated by gear hobbing with neat diagram.	10	K2	1
ii) Suggest any one gear testing methods for a bevel gear used in automobile.	6	K3	1
12. a) i) Discuss in detail about squeeze casting with neat diagram.	8	K2	2
ii) Elaborate the applications, advantages and disadvantages of slush casting.	8	K3	2

(OR)

Q. No		M	BTL	CO
b)	i) Explain the principle of operation of electro slag casting with neat sketch.	8	K2	2
	ii) Compare the operating parameters of H process and CLA process in detail.	8	K3	2
13. a)	Discuss the characteristics and applications of Dynapcak in detail.	16	K3	3
	(OR)			
b)	Compare the process parameters of explosive forming and water hammer forming.	16	K3	3
14. a)	Compare between EDM and wire cut EDM based on applications, working principle and construction.	16	K3	4
	(OR)			
b)	Discuss the merits, demerits and applications of WJM processes.	16	K3	4
15. a)	Explain how the products are manufactured with fusion deposition modelling with its advantages and limitation.	16	K2	5
	(OR)			
b)	With neat sketch, explain the step by step process of Selective laser sintering, also give its important applications.	16	K2	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: V [Full Time]

Civil Engineering

22CE502 – FOUNDATION ENGINEERING

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define depth of exploration.	2	K1	1
2. Compare representative and non-representative samples.	2	K2	1
3. Differentiate between local shear failure and general shear failure.	2	K3	2
4. What are the components of settlement?	2	K2	2
5. List the different types of piles according to their functions.	2	K1	3
6. Identify the methods for estimating the load –carrying capacity of a pile.	2	K3	3
7. Differentiate between infinite slopes and finite slopes.	2	K2	4
8. Write the expression for Taylor's stability number.	2	K3	4
9. Enumerate the assumptions made in Rankine's theory.	2	K1	5
10. What are the stability conditions to be checked for the retaining wall?	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain in detail about the standard penetration test. Also examine the corrections to be applied on the observed SPT 'N' Value.	16	K1	1
(OR)			
b) Illustrate with neat sketch about the various types of boring methods available for soil exploration.	16	K1	1
12. a) Discuss about the Plate load test for determining the bearing capacity of foundation and infer on the estimation of the settlement of a footing on sand using the results of a plate load test.	16	K3	2

(OR)

Q. No

M BTL CO

- b) A strip footing 2 m wide carries a load intensity of 400 kN/m² at a depth of 1.2 m in sand. The saturated unit weight of sand is 19.5 kN/m³ and unit weight above water table is 16.8 kN/m³. The shear strength parameters are $C = 0$ and $\phi = 35^\circ$. Determine the factor of safety with respect to shear failure for the following cases of location of water table:

16 K3 2

- Water table is 4 m below Ground Level.
- Water table is 1.2 m below Ground Level.
- Water table is 2.5 m below Ground Level.
- Water table is at Ground Level itself.

Use Terzaghi's equations. Take $N_q = 41.4$ and $N_\gamma = 42.4$

13. a) A square group of 9 piles was driven into soft clay extending to a large depth. The diameter and length of the piles were 30 cm and 9 m, respectively. If the unconfined compression strength of clay is 90 kN/m² and the pile spacing is 100 cm centre to centre, what is the capacity of the group? Assume factor of safety of 2.5 and adhesion factor as 0.75.

16 K4 3

(OR)

- b) Explain in detail the procedure for pile load test to determine the load carrying capacity of pile.

16 K4 3

14. a) The following Fig.1 shows an earth slope of clayey soil having $c = 55$ kN/m² and $\phi = 0$. Determine the factor of safety against sliding along the slip surface AB.

16 K2 4

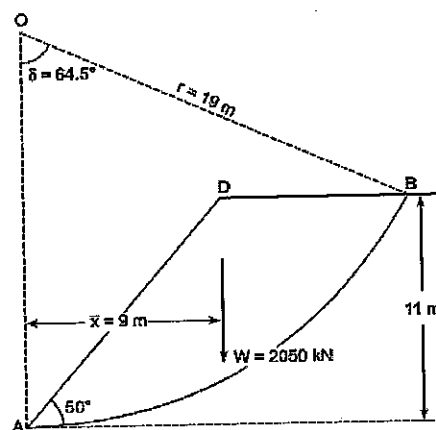


Fig.1.

(OR)

- b) Explain in detail about the Swedish Slip Circle Method for analyzing the stability of slope.

16 K2 4

Q. No

M BTL CO

15. a) A retaining wall 10 m high retains a cohesionless soil having an angle of internal friction of 30° . The surface of the soil is level with the top of the wall. The top 3 m of the fill has a unit weight of 20 kN/m^3 and that of the rest is 22 kN/m^3 . Find the magnitude per metre run and point of application of the resultant active thrust. Assume angle of internal friction is the same for both the strata.

16 K4 5

(OR)

- b) A retaining wall 4 m high has a smooth vertical back. The backfill has a horizontal surface in level with the top of the wall. There is uniformly distributed surcharge load of 36 kN/m^2 intensity over the backfill. The unit weight of the backfill is 18 kN/m^3 ; its angle of shearing resistance is 30° and cohesion is zero. Determine the magnitude and point of application of active pressure per metre length of the wall.

16 K4 5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: V [Full Time]

Computer Science and Engineering

22CS503 – COMPUTER NETWORKS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Compare and contrast guided and unguided transmission media. Give an example for each.	2	K2	1
2. For n devices in a network, what is the number of cable links required for a ring and star topology, respectively?	2	K3	1
3. List out the various types of errors.	2	K1	1
4. Mention the working of a token ring.	2	K2	2
5. An ISP has a block of 1024 addresses. It needs to divide the addresses among 1024 customers. Does it need subnetting? Explain your answer.	2	K3	3
6. Define a transparent bridge.	2	K2	2
7. List out the responsibilities of transport layer.	2	K2	2
8. Justify the statement "TCP is more reliable than UDP."	2	K2	3
9. List out the main components of electronic mail.	2	K1	2
10. Give two examples for SNMP variable.	2	K2	3

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Discuss about the functions of layers in OSI model.	16	K1	1
(OR)			
b) Explain the transmission media in detail with example.	16	K1	1
12. a) Detect and correct the error in the hamming code 11111101000 sent with odd parity. (Note: Number the bits from right to left).	16	K2	2

(OR)

Q. No	M	BTL	CO
b) Outline the concept of HDLC protocol.	16	K2	2
13. a) A router using distance vector routing has the following routing table:	16	K3	2

Net1	7	A
Net2	2	C
Net6	8	F
Net8	4	E
Net9	4	F

The router receives the following packet from router C:

Net2	4
Net3	8
Net6	4
Net8	3
Net9	5

Construct the updated routing table for the router.

(OR)

b) Mention the need for IPv6 protocol. Also explain the packet format of IPv6 with a neat diagram.	16	K3	2
14. a) Illustrate how TCP uses congestion control to avoid congestion or alleviate congestion in the network.	16	K4	3
(OR)			
b) With examples, discuss the techniques used to improve the Quality of Service.	16	K4	3
15. a) i) Explain with an example how a DNS client/server program can support an e-mail program to find the IP address of an e-mail recipient.	6	K4	3
ii) Describe the three different sections domain name space (tree) in the Internet.	10	K4	3
(OR)			
b) i) Differentiate persistent and nonpersistent connection with appropriate example.	6	K4	3
ii) Write note on the architecture of WWW.	10	K4	3

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: V [Full Time] / III [Part Time]

Electrical and Electronics Engineering

22EE503/22PTEE301/23PTEE303 – ELECTRICAL MACHINE DESIGN

(Regulations 2022/2023)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Enumerate the limitations in the design of electrical machines.	2	K1	1
2. Define stacking factor of armature windings.	2	K1	1
3. List the advantages and disadvantages of having higher number of poles in dc machines.	2	K2	2
4. How to design the number of brushes for a dc machine?	2	K2	2
5. What is window space factor in a transformer?	2	K1	3
6. What is the significance of stepping core of transformer?	2	K2	3
7. How crawling can be prevented by designing an induction motor?	2	K2	4
8. Define dispersion coefficient and write its effects on induction motors.	2	K2	4
9. Define Short Circuit Ratio (SCR).	2	K1	5
10. Write the uses of damper winding in synchronous generator and synchronous motor.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Describe the classification of insulating materials used for electrical machines.	8	K2	1
ii) Discuss about the factors that influence the choice of specific electric and magnetic loadings in the design of rotating machines.	8	K2	1
(OR)			
b) i) Discuss the major consideration to evolve a good design of electrical machine.	8	K2	1
ii) Write a short notes on standard specifications. List the Indian Standard Specifications for transformer and induction motor.	8	K2	1

Q. No	M	BTL	CO
12. a) i) Derive the output equation of a DC machine.	8	K3	2
ii) Estimate the main dimensions of core and number of poles of a 350 KW, 440V, 660 rpm direct current generator assuming a gap flux density of 0.9 wb/m ² and specific magnetic loading of 325 ac/cm, $\eta = 92\%$. Assume square pole criterion and $b/\tau = 0.67$.	8	K3	2
(OR)			
b) A multi pole DC machine has the following dimensions: cross section of pole body = 0.08 m ² ; Height of pole = 0.25 m; Cross section of yoke = 0.05 m ² ; Mean flux path in yoke = 0.9 m (pole to pole); Cross Section of armature core = 0.04 m ² ; Length of flux path in core = 0.45 m (pole to pole); Area of pole face = 0.12 m ² ; Length of air gap = 5 mm. There are 12 slots per pole and the width of each tooth is 15mm (40mm long). The length of the machine is 0.33 m and ratio of pole arc to pole pitch is 0.67. Find the mmf/pole to give a flux of 0.1 wb. The relative permeability for teeth is 15 and for rest of magnetic circuit is 1200. Assume a stacking factor of 0.9. Neglect leakage.	16	K3	2
13. a) i) Derive output equation of a core type three phase transformer.	8	K2	3
ii) A 3 Φ , 250 KVA, 6600/440V, 50 Hz core type transformer with the following data: emf per turn = 12V, Maximum flux density = 1.75 wb/m ² , current density = 2.5 A/mm ² , Window space factor = 0.32. Calculate core area and window area.	8	K3	3
(OR)			
b) i) Derive an expression for the number of cooling tubes needed for a transformer tank.	8	K2	3
ii) The tank of a 500 KVA, 1 Φ , 50 Hz 6600/400 V transformer is 110cm x 65cm x 155cm. If the full load loss is 6.2 kW, find the suitable arrangements for the cooling tubes to limit the temperature rise to 35°C. Take the diameter of the cooling tubes as 5cm and average length of the tubes as 110cm.	8	K3	3

Q. No		M	BTL	CO
14. a)	i) Determine the main dimensions of a 250 HP, 3 Φ , 50 Hz, 400 V, 1410 rpm slip induction motor. Assume $B_{av} = 0.5$ wb/m ² , $a_c = 30000$ A/M, Efficiency = 0.9 and pf = 0.9, winding factor = 0.955, current density = 3.5 A/mm ² .	8	K3	4
	ii) Discuss the rules for the selection of rotor slots for a cage induction motor.	8	K3	4
	(OR)			
b)	Find the current in the bars and end rings of a cage rotor of a 6 pole, 3 Φ induction motor having 72 stator slots with 15 conductors in each slot of the stator current per phase is 20A and rotor slots are 55. Hence find the suitable size of the cage bars and end rings.	16	K3	4
15. a)	i) Discuss and derive the expression for air gap length in a synchronous machine.	8	K3	5
	ii) A 500 KVA, 33 KV, 50 Hz, 600 rpm, 3 Φ salient pole armature has 180 turns per phase. Estimate the length of air gap of the average flux density is 0.54 wb/m ² , the ratio of pole arc to pole pitch = 0.65, Short circuit ratio = 1.2, gap contraction factor = 1.15 and the winding factor = 0.955. The mmf required for the gap is 80% of no load field mmf.	8	K3	5
	(OR)			
b)	Explain procedure to design the stator main dimensions with the algorithm, Flow chart and program.	16	K3	5

Registration Number :

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B.E. Degree Examinations – April/May 2025

Semester: V [Full Time]

Mechanical Engineering

22ME503/18ME503 – METROLOGY AND QUALITY CONTROL

(Regulations 2022/2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What is the difference between repeatability and reproducibility?	2	K1	1
2. What are the factors affecting the measuring system?	2	K1	1
3. List the functional requirements of a comparator.	2	K1	2
4. A vernier scale consists of 25 divisions on 12 mm spacing and the main scale has 24 divisions on 12 mm. What is the least count?	2	K3	2
5. What is wringing of gauge blocks?	2	K1	3
6. Point out the advantages of machine vision system.	2	K1	3
7. How surface roughness is assessed?	2	K2	4
8. Why two separate control charts are maintained while dealing with a variable quality characteristic?	2	K1	4
9. Mention the types of causes for variation in a production process.	2	K2	5
10. State characteristics of normal distribution.	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Enumerate the characteristics of precision measuring instruments.	16	K1	1
(OR)			
b) What are the various possible sources of errors in measurements? Explain in detail.	16	K1	1
12. a) With a neat diagram explain the working of angle dekkor.	16	K2	1
(OR)			
b) Discuss in detail about the various types of limit gauges with neat sketch.	16	K2	1

Q. No		M	BTL	CO
13. a)	How to measure the pitch of the screw thread by using the tool Makers Microscope? Discuss in detail.	16	K2	3
	(OR)			
b)	Explain the working principle of AC laser interferometer and how the straightness is measured.	16	K2	3
14. a)	Describe the various methods of numerical assessment of surface finish with neat diagram.	16	K2	4
	(OR)			
b)	What are the various measures used to evaluate the goodness of a sampling plan? Briefly explain each of them.	16	K2	4
15. a)	i) Following are inspection result of magnets for 5 observations. Draw proper control chart and conclude.	10	K3	5

Week No.	1	2	3	4	5
No. of magnet inspected	724	728	724	720	730
Defects found	48	83	70	80	58

ii)	Differentiate between p-charts and c-charts. Explain the applications of the two kinds of charts.	6	K3	5
	(OR)			
b) i)	What is Six-Sigma? Explain with the help of a graphical representation.	10	K3	5
ii)	"As sigma increases, cost of poor quality goes down while profitability, productivity and customer satisfaction go up". Discuss.	6	K3	5

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B.E. Degree Examinations – April/May 2025

Semester: V [Full Time]

Metallurgical Engineering

22MT503/18MT502 – STEEL MAKING

(Regulations 2022/2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Give the condition for steel making process.	2	K2	1
2. Mention the role and significance of slag in the steel-making process.	2	K1	1
3. What were the key factors leading to the decline of the open-hearth steel-making process?	2	K1	2
4. Give the principle of Electric Arc Furnace.	2	K2	2
5. What is LD Process?	2	K3	3
6. State the principle of the KALDO process to improve the refining of steel during production.	2	K2	3
7. Expand AOD and VOD.	2	K1	4
8. What are macro and micro inclusions?	2	K2	4
9. Differentiate between killed and rimmed steels.	2	K2	5
10. Give the significance of mould powder in continuous casting.	2	K3	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Discuss the thermodynamic reactions, equations and kinetic factors influencing the removal of Carbon and Silicon during steel making.	16	K2	1
(OR)			
b) Discuss the functions, properties and theories of slag and evaluate the effectiveness of various slag compositions in achieving desired steel properties and cleanliness.	16	K2	1

Q. No		M	BTL	CO
12. a)	Compare and contrast the acid and basic Bessemer processes, highlighting differences in raw materials and chemical reactions with neat sketches.	16	K2	2
	(OR)			
b)	Discuss briefly the constructional and operational characteristics of electric arc furnaces and their role in producing steels.	16	K2	2
13. a)	What is the function of the lance in the LD process, and describe the key characteristics of the top-blown LD process and its significance in steel making.	16	K3	3
	(OR)			
b)	With neat sketches, discuss and compare the constructional and operational characteristics of ROTOR & KALDO processes.	16	K3	3
14. a)	What is decarburization? Explain the process of producing stainless steel by AOD and VOD with neat figures.	16	K3	4
	(OR)			
b)	Compare the principles and benefits of RH and DH degassing processes in secondary steel making with neat labelled diagrams.	16	K3	4
15. a)	Discuss the causes of various ingot defects and propose suitable remedies to minimize them in casting process.	16	K2	5
	(OR)			
b)	Discuss the construction features operational aspects and advantages of a modern continuous casting machine with neat sketches.	16	K2	5

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B.E. Degree Examinations – April/May 2025

Semester: III [Part Time]

Civil Engineering

22PTCE304 – STRUCTURAL ANALYSIS - I

(Regulations 2022)

Time: 3 Hours

Maximum Marks: 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Calculate the SI and KI of the simply supported beam.	2	K2	3
2. List the types of moving loads.	2	K1	3
3. Define the influence line diagram (ILD).	2	K1	3
4. Draw ILD for reaction at support for simply supported beam.	2	K2	3
5. List the types of arch.	2	K1	1
6. Differentiate two hinged and three hinged arch.	2	K2	1
7. Write down the equation for calculating the total length of the cable.	2	K2	1
8. List the components of the suspension bridges.	2	K1	1
9. Define Shape factor and Load factor.	2	K1	2
10. Differentiate upper bound and lower bound theorem.	2	K2	2

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) A single point load of 100 kN rolls along a simply supported beam of span 20m. Draw the diagram of maximum bending moment and shear force. Calculate the absolute maximum positive shear force and bending moment.	16	K3	3
(OR)			
b) A UDL of 40 kN/m of 6m long, crosses the simply supported girder of span 30 m. Determine the maximum shear force and bending moment at sections 10 m, 15 m from the left support.	16	K3	3

Q. No		M	BTL	CO
12. a)	A point load of 100 kN moves on a simply supported beam of span 20 m. Construct the influence lines for shear force and bending moment for a section 5 m from left support. Determine the maximum shear force and bending moment at the section.	16	K3	3
	(OR)			
b)	Two point loads of 100 kN and 200 kN spaced 3 m apart crosses the simply supported girder of span 15 m from left to right with 100 kN load leading. Draw the influence lines for shear force and bending moment for a section 6m from left support and calculate the shear force and bending moment at the section.	16	K3	3
13. a)	A parabolic three hinged arch carries UDL of 30 kN/m on the left half span. Total span of the arch is 18 m with central rise of 3 m. Determine the resultant reaction at supports and bending moment at 2 m from left support. Also calculate the radial shear and normal thrust.	16	K4	1
	(OR)			
b)	A parabolic two hinged arch has a span of 60 m and rise of 12 m. A concentrated load of 8 kN acts at 15 m from left hinge. The second moment of area varies as secant of the inclination of the arch axis. Calculate the horizontal thrust and reactions at support.	16	K4	1
14. a)	A suspension cable having supports at same level, has a span of 35 m and maximum dip of 3 m. The cable is loaded with 5 kN/m throughout the span. Calculate the maximum tension in the cable.	16	K4	1
	(OR)			
b)	A suspension cable having horizontal span of 90 m and supports at two different levels. The right support is higher than left support by 4 m. The dip of the lowest point below the left support by 5 m. If area of cable is 3000 mm ² , Calculate the maximum UDL can be carried by the cable if maximum stress is limited to 500 N/ mm ² .	16	K4	1
15. a)	Calculate the collapse load for a propped cantilever beam of span l , subjected to a uniformly distributed load of 'w' kN/m throughout the span.	16	K4	2
	(OR)			
b)	Determine the shape factor for a T beam of flange dimension 100 X 10 mm and web dimension 90 X 10 mm thick.	16	K4	2

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B.E. Degree Examinations – April/May 2025

Semester: III [Part Time]

Mechanical Engineering

23PTME302 - KINEMATICS OF MACHINERY

(Regulations 2023)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Write down kutzbach criterion for a planar mechanism.	2	K1	1
2. Compare lower and higher pair of joints.	2	K2	1
3. Define rubbing velocity.	2	K1	2
4. Give the expression for Coriolis component of acceleration.	2	K1	2
5. Define trace point.	2	K1	3
6. Mention the classification of follower according to its shape.	2	K1	3
7. Classify the different types of gears.	2	K2	4
8. Compare gear and gear train.	2	K2	4
9. What is limiting angle of friction?	2	K1	5
10. Write the advantages and disadvantages of wire ropes over belt drives.	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain the inversions of four bar crank chain with neat sketch.	16	K2	1
(OR)			
b) Sketch and explain 'Whitworth' quick-return mechanism.	16	K2	1

Q. No	M	BTL	CO
12. a) In a four bar chain ABCD, AD is fixed and is 150 mm long. The crank AB is 40 mm long and rotates at 120r.p.m. clockwise, while the link CD is 80 mm oscillates about D. BC and AD are of equal length. Calculate the angular velocity of link CD when angle BAD is 60° .	16	K3	2
(OR)			
b) PQRS is a four bar chain with link PS fixed. The lengths of the links are PQ = 62.5 mm; QR = 175 mm; RS = 112.5 mm; and PS = 200 mm. The crank PQ rotates at 10 rad/s clockwise. Draw the velocity and acceleration diagram when angle QPS = 60° and Q and R lie on the same side of PS. Find the angular velocity and angular acceleration of links QR and RS.	16	K3	2
13. a) A cam is to give the following motion to a knife edged follower:	16	K3	3
a) Outstroke during 60° of cam rotation.			
b) Dwell for the next 30° of cam rotation.			
c) Return stroke during next 60° of cam rotation and			
d) Dwell for the remaining of cam rotation.			
The stroke of the follower is 40 mm and the minimum radius of the cam is 50 mm. The follower moves with uniform velocity during both the outstroke and return strokes. Draw the profile of the cam when the axis of the follower passes through the axis of the cam shaft.			
(OR)			
b) Draw the profile of a cam operating a roller reciprocating follower and with the following data: Minimum radius of cam = 25 mm; lift = 30 mm; Roller diameter = 15 mm. The cam lifts the follower for 120° with SHM, followed by a dwell period of 30° . Then the follower lowers down during 150° of cam rotation with uniform acceleration and retardation followed by a dwell period. If the cam rotates at a uniform speed of 150 rpm. Calculate the maximum velocity and acceleration of follower during the descent period.	16	K3	3

Q. No		M	BTL	CO
14. a)	A pair of gears having 40 and 20 teeth respectively are rotating in mesh, the speed of the smaller being 2000 rpm. Determine the velocity of sliding between the gear teeth faces at the point of engagement, at the pitch point and at the point of disengagement if the smaller gear is the driver. Assume that the gear teeth are 20° involute form, addendum length is 5 mm and the module is 5 mm. Also find the angle through which the pinion turns while any pairs of teeth are in contact.	16	K4	4
	(OR)			
b)	The arm of an epicyclic gear train rotates at 100 rpm in the anticlock wise direction. The arm carries two wheels A and B having 36 and 45 teeth respectively. The wheel A is fixed and the arm rotates about the centre of wheel A. Find the speed of wheel B. What will be the speed of B, if the wheel A instead of being fixed, makes 200 rpm (clockwise).	16	K4	4
15. a)	An open flat belt drive connects two parallel shafts 1.2 m apart. The driving and driven shaft rotates at 350 rpm and 140 rpm respectively and the driven pulley is 400 mm in diameter. The belt is 5 mm thick and 80 mm wide. The co-efficient of friction between the belt and pulley is 0.3 and the maximum permissible tension in the belting is 1.4 MN/m ² . Determine the diameter of the driving pulley, maximum power that may be transmitted by the belting and required initial belt tension.	16	K3	5
	(OR)			
b)	A single plate clutch is required to transmit 8 kW at 1000 rpm. The axis pressure is limited to 70 kN/m ² . The mean radius of the plate is 4.5 times the radial width of the friction surface. If both the sides of the plate are effective and the coefficient of friction is 0.25. Find a) the inner and the outer radius of the plate and the mean radius b) the width of the friction lining.	16	K3	5

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B.E. Degree Examinations – April/May 2025

Semester: VII [Part Time]

Civil Engineering

16PTCEE03 – GROUND WATER ENGINEERING

(Regulations 2016/2016A)

Time: 3 Hours

Maximum Marks: 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Compare apparent and actual velocity in ground water.	2	K2	1
2. What is meant by aquifuge and aquiclude?	2	K1	1
3. State Dupuit Forchheimer assumptions.	2	K1	2
4. Define specific capacity of a well.	2	K1	2
5. Write the principles of geophysical methods in determining ground water table.	2	K1	3
6. Compare collector well and infiltration gallery.	2	K2	3
7. Name any four chemical groundwater quality parameters.	2	K1	4
8. What is the relationship between Total Dissolved Solids (TDS) and Electrical conductivity?	2	K1	4
9. Define Rain Water Harvesting and state one suitable structure for recharging confined aquifer.	2	K1	5
10. Tell the advantages of artificial recharge.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) How the stage of groundwater development and potential are estimated using GEC norms?	16	K2	1
(OR)			
b) What is meant by aquifer? Explain the different types of aquifers with neat sketch.	16	K2	1
12. a) Derive the three dimensional groundwater flow equation for fully saturated condition.	16	K3	2

(OR)

Q. No	M	BTL	CO
b) In a homogeneous isotropic confined aquifer has a constant thickness of 20 m, effective porosity of 20% and permeability of 15 m/day, two observation wells 1200 m apart indicate piezometric heads of 5.4 m and 3.0 m above MSL respectively. Assuming uniform flow, average grain diameter of sand 1 mm and kinematic viscosity (ν) of water = 0.01 cm ² /s, state (a) whether Darcy's law is applicable? (b) what is the average flow velocity in pores?	16	K3	2
13. a) How is infiltration gallery designed and installed in a river bed? Under what circumstances can a radial collector well be advantageously used? (OR)	16	K2	3
b) Explain the remote sensing technique for ground water exploration.	16	K2	3
14. a) Explain the physical, chemical and biological water quality standards for various purposes. (OR)	16	K2	4
b) Explain the classification of irrigation water.	16	K2	4
15. a) Draw a suitable sketch for various RWH structure and discuss an effective way of implementing Rain Water Harvesting to induce Artificial Recharge. (OR)	16	K3	5
b) Why Ground water pollution and legislation is necessary in the present scenario? Narrate the various aspects of legislation should be covered for efficient ground water management.	16	K3	5

Registration Number :

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B.E. Degree Examinations – April/May 2025

Semester: III [Full Time]

Computer Science and Engineering

22CS301/18CS303 – COMPUTER ORGANIZATION AND ARCHITECTURE

(Regulations 2022/2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Give the basic performance equation.	2	K2	1
2. Draw the single bus structure.	2	K3	3
3. State the rules to add two integers.	2	K1	1
4. Differentiate Restoring division from non restoring division.	2	K4	4
5. Define Hazard. List different types of Hazards.	2	K1	1
6. Write the control sequence for execution of the instruction Add (R3), (R1).	2	K3	3
7. Define hit rate and miss penalty.	2	K1	1
8. Compare and contrast between Static and Dynamic RAM.	2	K4	2
9. Write about how interrupt request from multiple devices can be handled.	2	K2	1
10. List the key objective of USB.	2	K1	1

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Explain the basic functional units of a computer with a neat diagram.	8	K2	1
ii) Illustrate different addressing modes with suitable examples.	8	K3	3
(OR)			
b) i) Elaborate on Instruction sequencing.	8	K3	4
ii) Write short notes on Branching.	8	K2	1
12. a) Construct Carry-lookahead adder circuit and explain with an example.	16	K3	3

(OR)

Q. No		M	BTL	CO
b)	Apply the following, i. Booth's multiplication techniques for a suitable example. ii. Floating point operations with an example.	16	K3	3
13. a)	i) Explain Multiple bus organization with neat diagram.	8	K2	1
	ii) Explain basic organization of a micro programmed control unit.	8	K2	1
	(OR)			
b) i)	Briefly discuss about instruction hazards.	8	K2	1
	ii) Elucidate data path and control considerations with neat sketch.	8	K2	1
14. a)	i) What is the need of Cache memory? Illustrate different cache mapping techniques with example.	10	K2	1
	ii) Highlight the advantages and disadvantages of caching mechanisms.	6	K2	1
	(OR)			
b) i)	Summarize Virtual memory organization and Address translation technique.	10	K2	1
	ii) Describe about reading and writing techniques used in optical disk.	6	K2	1
15. a)	i) How will you handle interrupts from multiple devices?	8	K4	2
	ii) Discuss Bus Arbitration in DMA.	8	K4	3
	(OR)			
b) i)	Draw the block diagram of Parallel interface circuits and explain it.	8	K4	3
	ii) Compare the features of SCSI and PCI interfaces.	8	K4	2

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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Civil Engineering

22CEPE05 – SOLID WASTE MANAGEMENT

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define municipal solid waste.	2	K1	1
2. State the importance of public awareness in solid waste management.	2	K2	1
3. What are the objectives of on-site solid waste storage?	2	K1	2
4. Why is segregation at source important?	2	K2	2
5. Write short note on transfer station.	2	K1	3
6. Mention one environmental and one economic benefit of route optimization.	2	K2	3
7. Name two types of incinerators	2	K1	4
8. Mention one challenge in operating composting plants in India.	2	K2	4
9. Mention two criteria used for landfill site selection.	2	K3	5
10. State two advantages of sanitary landfilling over open dumping.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Discuss the different sources and types of solid wastes with examples for each category.	16	K2	1
(OR)			
b) Explain how improper waste disposal can affect human health and describe some ways to prevent these effects.	16	K2	1
12. a) Describe the common methods of on-site storage and segregation of waste in India and explain their purpose.	16	K2	2
(OR)			
b) Explain the various on-site storage methods used in solid waste management	16	K2	2

Q. No		M	BTL	CO
13. a)	Compare municipal solid waste collection methods and analyze factors affecting their selection.	16	K4	3
	(OR)			
b)	Analyze the types of collection vehicles used in India, and discuss their suitability for different urban and rural conditions.	16	K4	3
14. a)	Compare and contrast composting, incineration, and pyrolysis with respect to Indian conditions.	16	K4	4
	(OR)			
b)	Analyze how resource recovery from waste benefits both the environment and the economy.	16	K4	4
15. a)	Describe the components and working process involved in the design and operation of a sanitary landfill.	16	K3	5
	(OR)			
b)	Explain the methods used for collection and treatment of leachate in sanitary landfills.	16	K3	5

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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Computer Science and Engineering

22CSPE201 – SOFTWARE QUALITY AND TESTING

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Why is software quality important?	2	K2	1
2. Differentiate quality control and quality assurance.	2	K4	1
3. Define software metrics. Give example.	2	K1	2
4. What are the basic principles of effective measurements?	2	K1	2
5. State the purpose of software testing.	2	K1	3
6. What are the skills essential for software tester?	2	K2	3
7. What is software testing?	2	K1	3
8. What is a workbench in the context of software testing?	2	K1	3
9. What is meant by client/server architecture in software testing?	2	K2	4
10. What are the tools commonly used for testing web-based system?	2	K2	4

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain quality assurance at each phases of the Software Development Life Cycle (SDLC).	16	K2	1
(OR)			
b) Illustrate the various roles and responsibilities involved in inspection.	16	K2	1
12. a) i) How would you apply McCall's model to assess a desktop application?	8	K3	2
ii) Which quality model best suits agile software development? Why? Evaluate.	8	K4	2

(OR)

Q. No		M	BTL	CO
b)	i) Identify process metrics that influence product reliability.	8	K3	2
	ii) How effective are metrics in measuring software quality in agile projects?	8	K4	2
13. a)	i) Compare different testing approaches with respect to defect detection.	8	K4	3
	ii) Explain essential features and principles of software testing.	8	K2	3
	(OR)			
b) i)	How does a well-defined testing process reduce the risk of post-release defects?	8	K4	3
	ii) Illustrate the building of a supportive testing environment.	8	K2	3
14. a)	Given project scenario, A team of developers are building a new e-commerce mobile app to launch in 3 months. Identify the required input and outline the procedure for developing a test plan using the workbench model.	16	K3	3
	(OR)			
b)	Given a scenario where a team is developing a new Customer Relationship Management (CRM) system for a client. Identify the required inputs and describe the procedure you would follow to perform validation testing using the workbench model. How would you ensure the system meets the user requirements?	16	K3	3
15. a)	i) How test results are analyzed? How finding is documented and communicated?	8	K4	4
	ii) What are the main strategies and challenges in testing the security of a software system? Analyze.	8	K4	4
	(OR)			
b) i)	Analyze the key consideration and challenges in testing client/server systems.	8	K4	4
	ii) Identify the challenges in testing web-based system and elaborate them.	8	K4	4

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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Electronics and Communication Engineering

22ECPE67 – INTERNET OF THINGS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What are the security considerations in IoT?	2	K1	1
2. Outline two characteristics of IoT.	2	K1	1
3. Enumerate the main characteristics of an IoT value chain.	2	K2	2
4. List the fundamental capabilities needed in IoT architecture.	2	K1	2
5. What is the purpose of IoT deployment templates.	2	K2	3
6. Outline the significance of data analytics in IoT applications.	2	K2	3
7. Define logical design in IoT systems.	2	K1	4
8. List any two real world design constraints in IoT.	2	K1	4
9. State the importance of air quality monitoring in urban areas.	2	K1	5
10. What is the need for smart irrigation in agriculture?	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Discuss in detail how M2M communication works and its role in the foundation of IoT.	16	K3	1
(OR)			
b) Design a case study showing how a manufacturing plant benefits from moving from M2M towards IoT.	16	K3	1
12. a) Describe and analyze the components of the M2M value chain, how each component contributes to the overall functioning of an M2M communication system.	16	K3	2
(OR)			
b) Examine the architectural overview of IoT, analyzing its essential components.	16	K3	2

Q. No		M	BTL	CO
13. a)	Define the enabling technologies of IoT and explain their role in making IoT systems functional.	16	K2	3
	(OR)			
b)	Discuss the challenges of managing data in IoT systems.	16	K2	3
14. a)	Summarize the IoT physical devices and end points in detail. Write a program for controlling LED with a switch.	16	K3	4
	(OR)			
b)	Develop a simple IoT application using Raspberry Pi.	16	K3	4
15. a)	Describe the components and working of an automatic lighting system in home automation.	16	K2	5
	(OR)			
b)	Evaluate the current trends in commercial building automation.	16	K2	5

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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Electronics and Communication Engineering

22ECPE65 – MODERN SENSORS AND ITS APPLICATIONS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What are passive transducers?	2	K1	1
2. Give examples for zero, first and second order instruments.	2	K2	1
3. Name the sensors used for flow of fluids.	2	K2	2
4. Mention the uses of anemometers.	2	K1	2
5. How to measure intensity of light using LDR?	2	K3	3
6. How radiation detector works?	2	K2	3
7. Define magnetic flux density.	2	K1	4
8. Classify sound waves based on their frequency range.	2	K2	4
9. What is the use of high voltage detector?	2	K1	5
10. List two wavelength measuring sensors and their applications.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Classify different fields of sensors based on the stimuli.	8	K3	1
ii) Discuss the ramp response of first order instruments.	8	K3	1
(OR)			
b) i) Discuss the environmental factors that affect the sensor performance.	8	K3	1
ii) Derive the step response of second order instruments for different values of damping ratio.	8	K3	1
12. a) Describe the operation and constructional details of potentiometric sensor and LVDT sensor. Compare and contrast between them.	16	K2	2

(OR)

Q. No		M	BTL	CO
	b) Explain the working principle and constructional details of piezoelectric and magneto strictive accelerometers. Compare and contrast between the two.	16	K2	2
13. a)	i) Discuss the operation of thermocouples and thermistors and their uses in different situations.	10	K1	3
	ii) Give an account on color pyrometry.	6	K1	3
	(OR)			
b) i)	Draw the equivalent circuit and explain the working of phototransistor with the help of energy band diagrams.	10	K1	3
	ii) Write short notes on Geiger-Muller counters.	6	K1	3
14. a)	Brief about magneto resistors and hall sensors.	16	K1	4
	(OR)			
b)	Discuss in detail the free field and pressure response of any two types of microphones.	16	K1	4
15. a)	i) Discuss the current sensors used for high current monitoring.	8	K1	5
	ii) Explain any one type of conventional voltmeter with neat sketches.	8	K1	5
	(OR)			
b) i)	Write short notes on the following. Microwave frequency sensors	8	K1	5
	ii) Write short notes on the following. MEMS based sensors.	8	K1	5

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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Electrical and Electronics Engineering

22EEPE21- HVDC TRANSMISSION SYSTEMS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Specify the purpose of Smoothing Reactors.	2	K2	1
2. List the components of HVDC Transmission system.	2	K1	1
3. Define Pulse number.	2	K1	2
4. Specify the need for snubber circuit.	2	K2	2
5. Mention the different converter control characteristics.	2	K2	3
6. List few draw backs of Equidistant Pulse Control (EPL).	2	K1	3
7. Compare the SVC and STATCOM.	2	K2	4
8. Mention few causes of non-characteristics of harmonics.	2	K2	4
9. Mention the different methods of power flow analysis.	2	K1	5
10. Draw the equivalent basic circuit model of converter.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Summarize the difference between AC and DC Transmission System.	8	K4	1
ii) Discuss the different types of DC circuit breakers.	8	K1	1
(OR)			
b) i) Explain the following types of HVDC Transmission	8	K4	1
(i) Monopolar links			
(ii) Bipolar Links			
(iii) Homopolar Links			
(iv) Back to Back Links			
(v) Multi terminal Links.			
ii) Compare series and parallel MTDC system.	8	K1	1

Q. No		M	BTL	CO
12. a)	What are the three models of six pulse Graetz converter ? Explain the complete analysis of model operation of converter for overlap angle less than 60 degree.	16	K4	2
	(OR)			
b)	Draw the circuit diagram analysis of a 12-pulse converter and also derive the expression to calculate	16	K4	2
	(i) Average DC output voltage			
	(ii) Current harmonics with suitable and wave forms.			
13. a)	Illustrate the following type of Firing angle control scheme and explain (i) Individual Phase Control (IPC) (ii) Equidistant Pulse Control (EPC).	16	K2	3
	(OR)			
b)	Draw the block diagram of VSC Controller. Explain the control of VSC Based HVDC Link and obtain the mathematical expression.	16	K2	3
14. a)	What are the different sources of Reactive Power? Also analyze the structure and characteristics of	16	K4	4
	(i) Static Var Compensator(SVC)			
	(ii) STATCOM.			
	(OR)			
b)	What are the causes for generation of harmonics and suggest few criteria for the selection of suitable filter? Also analyze the design procedure of AC Filter.	16	K4	4
15. a)	Explain the following DC System Model	16	K2	5
	(i) Basic model of converter			
	(ii) Converter equation			
	(iii) A flexible per unit system.			
	(OR)			
b)	Discuss the Power Flow Analysis of DC system model under dynamic Conditions.	16	K2	5

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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Electrical and Electronics Engineering

22EEPE25 – UNDERGROUND CABLE ENGINEERING

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. List the main advantages of paper insulated cables.	2	K1	1
2. What is the typical voltage range for medium voltage cables?	2	K1	1
3. Define dielectric material in the context of electrical cables.	2	K1	2
4. Why is electrical insulation important in cable design?	2	K2	2
5. What are the main types of distribution cables used in power distribution systems?	2	K2	3
6. List out the merits of PVC insulated distribution cables.	2	K3	3
7. Write the applications gas pressure cables.	2	K1	4
8. Name two types of polymeric insulated cables used in AC transmission.	2	K1	4
9. What is the purpose of sheath bonding in underground cable systems?	2	K2	5
10. Why is grounding important in cable installation?	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Analyze the importance of underground cables in the distribution of electrical energy to residential areas.	16	K4	1
(OR)			
b) Compare the installation and maintenance procedures of underground cables versus overhead lines.	16	K4	1
12. a) Discuss in detail about the architecture of an underground cable system.	16	K3	2
(OR)			
b) Examine the standards applicable to cable manufacturing and testing and also give their uses in quality assurance.	16	K3	2

Q. No		M	BTL	CO
13. a)	Explain in detail about the polymeric insulated distribution cables for HT system.	16	K2	3
	(OR)			
b)	Demonstrate the testing procedures for distribution cables, with electrical and mechanical tests.	16	K2	3
14. a)	Explain the construction and working of a self-contained fluid-filled cable with its advantages over other types.	16	K2	4
	(OR)			
b)	Summarize the importance of accessories and jointing techniques in high-voltage AC transmission cables.	16	K2	4
15. a)	Briefly explain about the procedures and precautions involved in the installation and testing of underground high-voltage cables.	16	K3	5
	(OR)			
b)	Discuss the methods used for fault location in underground power cable systems and their respective advantages.	16	K3	5

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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Mechanical Engineering

22MEPE25 – INTERNAL COMBUSTION ENGINES

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
1.	Define an internal combustion engine.	2	K1	1
2.	Draw and explain theoretical and actual indicator diagram for four stroke engines.	2	K1	1
3.	What is the function of a carburetor?	2	K1	2
4.	Name two types of fuel injection systems used in CI engines.	2	K1	2
5.	Explain the effect of air motion on fuel spray evaporation and combustion efficiency in CI engines.	2	K2	3
6.	What is knocking in IC engines?	2	K1	3
7.	Explain the role of a combined ignition and fuel management system.	2	K2	4
8.	What are the advantages of using digital control in engine management?	2	K1	4
9.	Compare GDI (Gasoline Direct Injection) with CRDI (Common Rail Direct Injection).	2	K2	5
10.	Why is variable valve timing important in modern IC engines?	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
11. a)	Examine the working of a four-stroke diesel engine and a four-stroke petrol engine; compare this two based on its construction, working principle, and applications.	16	K4	1
(OR)				
b)	Examine the various ignition properties of fuels used in IC engines. Explain the significance of octane number and cetane number, and how they affect engine performance.	16	K4	1

Q. No		M	BTL	CO
12. a)	Analyse the functional differences between a carburetor-based fuel system and an electronic fuel injection system in SI engines. Evaluate their impact on fuel efficiency, throttle response, emissions, and maintenance.	16	K4	2
	(OR)			
b)	A CI engine is exhibiting poor starting behavior and high emissions. Analyse the possible faults in its fuel injection system and suggest diagnostic steps to isolate and correct the problem.	16	K4	2
13. a)	i) Explain the stages of combustion in a spark ignition (SI) engine with the help of a diagram.	6	K2	3
	ii) Analyse the role of air motion (swirl, squish, and tumble) inside the combustion chamber and its effect on combustion quality and engine emissions.	10	K4	3
	(OR)			
b) i)	Describe the phenomenon of ignition delay in compression ignition (CI) engines and its effects on engine performance.	6	K2	3
	ii) Analyse the factors affecting fuel spray penetration and evaporation in a CI engine. How do these influence combustion efficiency and emission characteristics?	10	K4	3
14. a)	A vehicle fails to meet updated emission norms despite being technically sound. Apply your knowledge of exhaust emission control techniques in SI and CI engines to recommend possible after-treatment systems that could help meet the standards.	16	K3	4
	(OR)			
b)	Discuss an engine management system using artificial intelligence (AI) concepts for optimizing fuel efficiency and emission control. Apply your understanding to explain the AI elements involved and how they interact with engine parameters.	16	K3	4
15. a)	A diesel engine is being upgraded to meet stricter emission norms. Apply your knowledge of CRDI (Common Rail Direct Injection) systems to propose an upgraded fuel injection system. Justify your selection of components and layout.	16	K3	3
	(OR)			
b)	A research team is working on reducing turbo lag in a downsized engine. Apply your knowledge of E-Turbocharger technology to design a suitable solution and explain how it improves performance over a conventional turbocharger.	16	K3	3

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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Mechanical Engineering

22MEPE26 – MACHINE DRAWING

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What is the purpose of BIS specifications in machine drawing?	2	K2	1
2. Define tolerance and its types.	2	K1	1
3. Write the fasteners used in machine assembly.	2	K1	1
4. How are riveted joints made air -tight?	2	K3	1
5. What do you mean by geometric dimensioning?	2	K1	1
6. List out three applications of threaded joints.	2	K1	2
7. What is a key joint, and draw it?	2	K1	2
8. State the purpose of cotter and pin joints.	2	K1	2
9. Mention any two types of shaft couplings.	2	K2	2
10. Explain surface finish and its significance.	2	K2	2

PART B(1 x 80 = 80 Marks)

Answer **ALL** Questions

Q. No

M BTL CO

11. a) The detailed drawing of a universal coupling is given in Fig.1.

80 K3 3

Assemble the parts of universal coupling and draw

- Sectional front view and
- Right side view. Show the important dimensions on the assembly drawing.

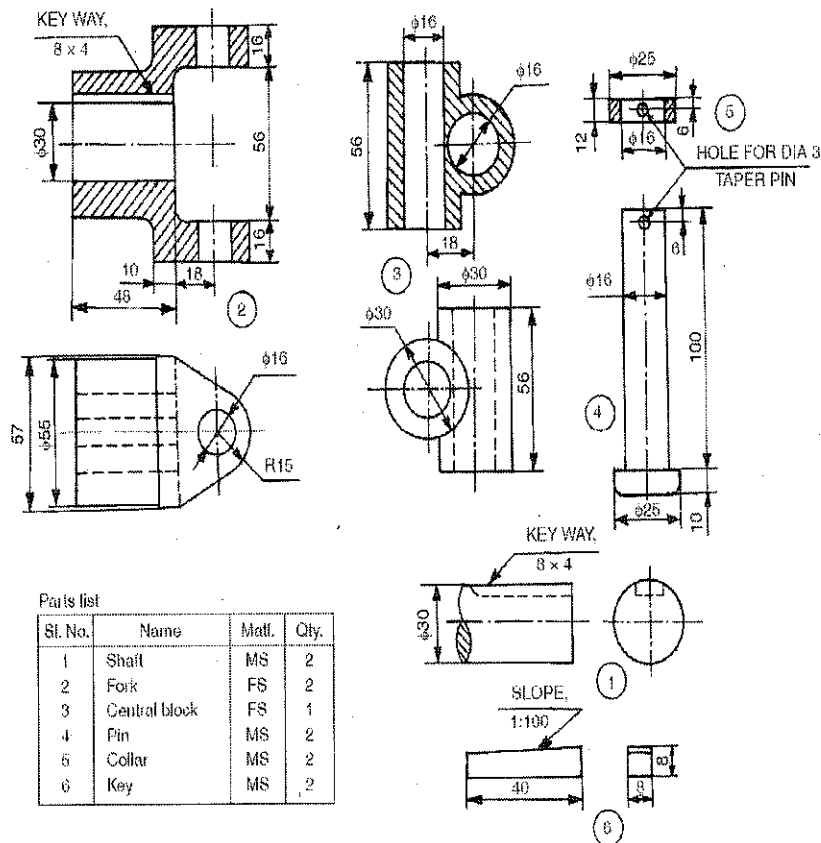


Fig. 1

(OR)

Q. No

M BTL CO

11.b) Fig. 2 shows the detailed drawing of a screw jack. Assemble the parts of screw jack and draw

80 K3 3

- Sectional front view and
- Top view. Show the important dimensions on the assembly drawing.

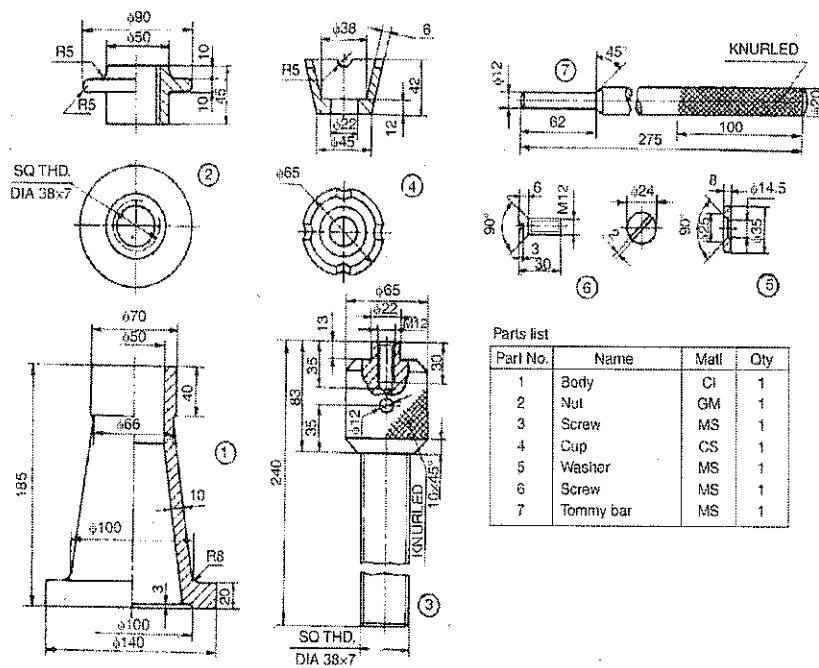


Fig. 2

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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time] / VI [Part Time]

Mechanical Engineering

22MEPE27/22PTMEE07 – POWER PLANT ENGINEERING

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What is the necessity of preparing coal?	2	K2	1
2. Compare the basic features of waste heat boiler with conventional.	2	K2	1
3. On what factors, does the selection of turbines depend upon?	2	K2	2
4. What is the function of surge tank in hydroelectric power plant?	2	K1	2
5. Why do we need cleaning and cooling of lubricating oil?	2	K2	3
6. A gas turbine working on Brayton cycle has a pressure ratio of 6. Calculate its efficiency. Take $\gamma = 1.4$	2	K3	3
7. Classify the nuclear reactors based on coolant used.	2	K2	4
8. Name the fluids that are used as conducting fluid in a MHD system.	2	K1	4
9. A generating station has a maximum demand of 30 MW and a load factor of 0.6. Find the average demand.	2	K3	5
10. Suggest the tariff method that is used for industrial customers. Give the equation used for calculating this tariff.	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Discuss the factors to be considered while selecting the site for a steam power station.	8	K4	1
ii) Classify pulverized fuel burners. Compare and contrast the merits and demerits of each burner over others.	8	K4	1
(OR)			
b) i) Classify the ash handling systems used in steam power plant. Compare and contrast the merits and demerits of each system over others.	8	K4	1
ii) Artificial mechanical draught is better in control and more economical than natural draught. Justify this statement.	8	K4	1

Q. No		M	BTL	CO
12. a)	i) Discuss the differences between Pelton, Francis and Kaplan turbines and types of power plants they are suitable for.	10	K3	2
	ii) What type of plants are used as base load and peak load plants. Discuss the factors to be considered in selecting a plant as base load or peak load plant.	6	K3	2
	(OR)			
b) i)	Classify hydro electric plant according to the quantity of water available with Brief explanation.	10	K3	2
	ii) Differentiate between a conduit and penstock. Compare the advantages and disadvantages of exposed penstock over buried penstock.	6	K3	2
13. a)	Draw a plant layout of 5 MW diesel power plant showing all the required equipment with Brief explanation.	16	K2	3
	(OR)			
b)	Elaborate the different methods that are used to improve the thermal efficiency of the open cycle gas turbine plant.	16	K2	3
14. a)	Explain with a neat sketch the working of Pressurised Water Reactor.	16	K1	4
	(OR)			
b)	Draw the layout of an Open cycle MHD generator coupled with steam plant using heat from fossil fuel. Explain its working.	16	K1	4
15. a)	A generating station has a maximum demand of 5000 kW, and the daily load on the station is as follows :	16	K4	5

Load(MW)	1000	1750	4000	1500
Time	11 PM to 6 AM	6 AM to 8 AM	8 AM to 12 PM	12 PM to 1 PM
Load(MW)	3750	4250	5000	2250
Time	1 PM to 5 PM	5 PM to 7 PM	7 PM to 9 PM	9 PM to 11 PM

- Draw the load curve.
- Draw the load duration curve.
- Select the size and number of generator units.
- Which reserve plant would be necessary?
- Load factor.
- Plant capacity factor.

(OR)

Q. No

M BTL CO

- b) A power station has the installed capacity of 180 MW. Calculate the cost of generation, other data pertaining to power station are given below:

16 K4 5

Capital cost = Rs. 300×10^6

Rate of interest and depreciation = 18 per cent

Annual cost of fuel oil, salaries and taxation = Rs. 36×10^6

Load factor = 0.4

Also calculate the saving in cost per kWh if the annual load factor is raised to 0.5.

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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Metallurgical Engineering

22MTPE25 – WELDING METALLURGY

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What is CCT diagram?	2	K1	1
2. What is meant by Epitaxial solidification?	2	K2	1
3. Give the effect of HAZ in weldments.	2	K2	2
4. How do you calculate dilution in a butt weld?	2	K2	2
5. Mention the use of Graville diagram.	2	K3	3
6. List the types of cast Iron.	2	K1	3
7. List any two each of ferrite and austenite stabilizers.	2	K1	4
8. What is the limitation of Schaeffler diagram?	2	K3	4
9. Mention two alloys of Nickel.	2	K1	5
10. Define the term 'Weldability' as per American Welding Society.	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Draw neatly the Iron-Carbon equilibrium diagram and mark the different phases.	8	K1	1
ii) Recall the major gas-metal reactions and slag-metal reactions associated with fusion welding.	8	K2	1
(OR)			
b) i) With a necessary binary phase diagram, explain the precipitation hardening treatment in any one non-ferrous alloy system.	8	K1	1
ii) Discuss the chemical composition, microstructure, properties and applications of low carbon and high carbon steels.	8	K2	1
12. a) i) Give a brief account on temperature distribution and cooling curves in fusion welding.	8	K4	2

Q. No		M	BTL	CO
ii)	Quenched & Tempered steel plates of 8 mm thick are arc welded with 20 Volts, 220 Amps and welding speed of 5 mm/s. The plates are preheated before welding at a temperature of 150°C. Calculate the Peak Temperature at a distance of 1.5 mm and 3 mm from the weld fusion boundary. Also, determine width of the HAZ. Data: - $pc = 0.0044 \text{ J/mm}^3$; Heat transfer efficiency = 0.9; $T_m = 1510^\circ\text{C}$; Tempering temperature: 400°C (OR)	8	K4	2
b) i)	Steel plates of 6 mm thick are arc welded with a current of 300 Amps and voltage of 25 Volts without any preheating. Calculate the critical cooling rate for this welding condition, if it is found that welding speed above 8 mm/s will lead to cracking problems in HAZ. Data: - $pc = 0.0044 \text{ J/mm}^3$; Heat transfer efficiency = 0.9; $T_c = 550^\circ\text{C}$; $K = 0.028 \text{ J/mm.s.}^\circ\text{C}$. Room temperature: 25°C	8	K4	2
ii)	Discuss the metallurgical difficulties encountered in welding of dissimilar alloys with suitable remedies.	8	K4	2
13. a)	Elaborate the causes, mechanism and remedies for Hot cracking and Hydrogen induced cracking. (OR)	16	K3	3
b)	Write a note on Lamellar tearing and Reheat cracking.	16	K3	3
14. a)	Discuss in detail the major metallurgical difficulties associated with the welding of austenitic stainless steels and suggest suitable methods to overcome the same. (OR)	16	K2	4
b)	Give a note on the weldability issues in (i) welding of ferritic stainless steels and (ii) welding of martensitic stainless steels with the remedial measures.	16	K2	4
15. a)	Elaborate the problems encountered in (i) welding of aluminium alloys and (ii) welding of titanium alloys. Suggest suitable remedies to overcome the problems. (OR)	16	K3	5
b)	Describe the procedure for Implant testing and Varestraint testing to assess cold cracking and hot cracking susceptibility.	16	K3	5

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B.E. Degree Examinations – April/May 2025

Semester: III [Full Time]

Mechanical Engineering

12MA301 – MATHEMATICS - III

(Regulations 2012)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

1. Obtain the partial differential equations by eliminating the arbitrary constants 'a' and 'b' from $(x + a)^2 + (y + b)^2 = z$.
2. Solve $(D^2 - 4DD' + 3D'^2)z = 0$.
3. State the condition for a function $f(x)$ to be expressed as a Fourier series.
4. Determine the value of b_{25} while expanding the function $f(x) = \begin{cases} 1 + \frac{2x}{l}, & -l \leq x \leq 0 \\ 1 - \frac{2x}{l}, & 0 \leq x \leq l \end{cases}$ as a Fourier series.
5. Classify the partial differential equation $u_{xx} - y^4 u_{yy} = 2y^3 u_y$.
6. Write down the various solution of two-dimensional heat equation.
7. If $F[f(x)] = F(s)$, then prove that $F[f(ax)] = \frac{1}{a} F\left(\frac{s}{a}\right); a > 0$.
8. Find the Fourier cosine transforms for $f(x) = e^{-2x}, x > 0$.
9. Find the Z- transform for $\frac{1}{n!}$.
10. Obtain a difference equation by eliminating arbitrary constant 'a' from $y_n = 3n + a$.

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q.No

M

11. a) i) Determine the general solution of $x(y^2 - z^2)p + y(z^2 - x^2)q = z(x^2 - y^2)$. (8)
ii) Solve the partial differential equation $[D^2 + 3DD' + 2D'^2]z = x + y$. (8)
- (OR)
- b) i) Determine the solution of $z = px + qy + \sqrt{1 + p^2 + q^2}$. (8)
ii) Solve: $p - x^2 = q + y^2$. (8)

12. a) i) Expand the Fourier series for $f(x) = x(2\pi - x)$ in $(0, 2\pi)$ and hence deduce that the sum of the series $\sum_{n=0}^{\infty} \frac{1}{n^2} = \frac{\pi^2}{6}$ (8)

- ii) Expand the function $f(x) = x, 0 < x < \pi$ in the Fourier sine series. (8)

(OR)

- b) i) Obtain the function $f(x) = \sin x, 0 < x < \pi$ in Fourier cosine series. (8)

- ii) Determine the first two harmonic of the Fourier series for the following values: (8)

$x:$	0	$\frac{\pi}{3}$	$\frac{2\pi}{3}$	π	$\frac{4\pi}{3}$	$\frac{5\pi}{3}$
$y:$	1.98	1.30	1.05	1.30	-0.88	-0.25

13. a) A string is tightly stretched and its ends are fastened at the two points $x = 0$ and $x = 2l$. The mid-point of the string is displaced transversely through a small distance b and the string is released from rest in that position. Obtain an expression for the displacement of the string at any subsequent time. (16)

(OR)

- b) A bar with 100cm long, with insulated sides, has its end kept at 0°C and 100°C respectively until steady state condition prevail. The two ends are then suddenly insulated and kept so. Then find the temperature distribution function. (16)

14. a) Find the Fourier transform for $f(x) = \begin{cases} 1 - |x| & |x| \leq 1 \\ 0 & \text{elsewhere} \end{cases}$ And hence deduce that (i) $\int_0^\infty \left(\frac{\sin x}{x}\right)^2 dx = \frac{\pi}{2}$, (ii) $\int_0^\infty \left(\frac{\sin x}{x}\right)^4 dx = \frac{\pi}{3}$. (16)

(OR)

- b) Find the Fourier transform of $f(x) = e^{-a^2 x^2}, a > 0$. Hence deduce that $e^{-\frac{x^2}{2}}$ is self-reciprocal in respect of Fourier transform (16)

15. a) i) Find the Z-transform $\frac{1}{n(n+1)}$ (8)

- ii) Find $Z^{-1} \left[\frac{z}{z^2 + 7z + 10} \right]$ using partial fraction. (8)

(OR)

- b) i) Find $Z^{-1} \left[\frac{z^2}{(z-1)(z-3)} \right]$ using convolution theorem. (8)

- ii) Solve by using Z- transform $y_{n+2} - 3y_{n+1} + 2y_n = 0$ given that $y(0) = 0$ and $y(1) = 1$. (8)

Registration Number:

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: V [Part Time]

Civil Engineering

16PTCE502 – FOUNDATION ENGINEERING

(Regulations 2016/2016A)

Time: 3 Hours

Maximum Marks: 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Explain the requirements of a good foundation.	2	K2	1
2. Define a floating foundation.	2	K1	1
3. Identify the limitations of Terzaghi's analysis.	2	K1	3
4. Describe the causes of settlement.	2	K2	3
5. Outline the methods for estimating the load carrying capacity of a single pile.	2	K1	4
6. Define negative skin friction.	2	K1	4
7. List the types of failure surfaces of slopes.	2	K1	5
8. Define stability number.	2	K1	5
9. State the assumptions made in the Rankine's theory of earth pressure.	2	K1	2
10. Explain the stability conditions that should be checked for retaining walls?	2	K2	2

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Compare disturbed and undisturbed soil samples. Describe various methods to obtain undisturbed samples.	10	K2	1
ii) Illustrate what is meant by log of a bore hole. Illustrate your answer with an example.	6	K2	1
(OR)			
b) i) What are the various methods of site exploration? Explain any one method in detail.	10	K2	1
ii) List the precautions that must be followed when transporting undisturbed soil samples from the site to the laboratory to ensure their integrity.	6	K2	1

Q. No**M BTL CO**

12. a) Design a strip footing to carry a load of 700 kN/m at a depth of 1.5 m in a cohesive soil having unit weight of 18 kN/m³ & $C = 20$ kN/m² and angle of internal friction is 25 degree. Determine the width of footing, using F.O.S as 3. Use Terzhaghi's equations. $N_c = 25.1$, $N_q = 12.7$ and $N_\gamma = 9.7$.

(OR)

- b) In a plate bearing test on pure clayey soil failure occurred at a load of 12.2 tones. The size of the plate was 45 cm x 45 cm and the test was one at a depth of 1.0 m below ground level. Find out the ultimate bearing capacity for a 1.5 m wide continuous wall footing with its base at a depth of 2 m below ground level. The unit weight of clay may be taken as 1.9 gm/cc and $N_c = 5.7$, $N_q = 1$ and $N_\gamma = 0$.
13. a) A group of 16 friction piles is to support a column load of 4000 kN. The piles will be driven in four rows with four numbers in each column. The piles are 40 cm diameter. And the c/c spacing is 1m both ways. What set value must be attained by the piles when driven by a single acting 22.5 kN steam hammer with 100 cm stroke so that the pile group can carry the column load?

(OR)

- b) Discuss in detail the construction process of under-reamed piles and explain the circumstances under which this method is preferred.
14. a) A 8 m high cutting has a slope of 45° to the horizontal. The soil was tested and the values of cohesion, void ratio and angle Φ were found to be 23kN/m², 0.85 and 16° respectively. Calculate the factor of safety with respect to cohesion against failure of the slope for the following conditions:

- a) When water level rises upto the full height.
b) When water level draws down suddenly.

Specific gravity of soil may be assumed as 2.7 and for a slope of 45° the stability number for various values of Φ are as follows:

Φ	N
7°	0.116
8°	0.106
16°	0.086

Q. No

M BTL CO

(OR)

b)	Explain in detail the Swedish Slip Circle method for stability analysis and outline the slope protection measures.	16	K2	5
15. a)	A retaining wall 4 m high, has a smooth vertical back. The backfill has a horizontal surface in level with the top of the wall. There is uniformly distributed surcharge load of 36 kN/mm ² intensity over the backfill. The unit weight of the backfill is 18 kN/m ³ , its angle of shearing resistance is 30° and cohesion is zero. Determine the magnitude and point of application of active earth pressure per metre length of the wall.	16	K3	2
(OR)				
b)	Explain in detail the Coulomb's Wedge Theory of earth pressure and discuss its advantages over Rankine's theory.	16	K2	2

Register Number :

Government College of Engineering :: Salem
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B.E. Degree Examinations – April/May 2025

Semester: VII [Full Time]

Civil Engineering

18CEPE24 – ADVANCED STEEL STRUCTURES

(Regulation 2018/2018A)

(Use of IS 800 - 2007, SP (6): Part I and all relevant IS Codes are permitted)

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Show the moment rotation relationships for different types of connections with neat sketch.
2. Differentiate between bearing type connection & friction type connection.
3. Write down the function of intermediate transverse stiffeners.
4. What is the difference between surge load and drag load of cranes?
5. List the parameters that affect the behavior of beam-columns?
6. Compare the behavior of beam-column subjected to bending in major axis and minor axis.
7. What is the use of sag rod in roof trusses?
8. How is the economical spacing of roof trusses obtained?
9. List the advantages of light gauge steel structures.
10. Illustrate the stiffened and unstiffened element of light gauge sections with neat sketch.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Design an un-stiffened welded seat connection for a beam ISMB 250 (16) @ 365.9 N/m transmitting an end reaction of 350 kN, due to the factored loads, to the flange of column ISHB 200 @ 365.9 N/m. The seat angle is welded to the column flange in workshop.

(OR)
- b) An ISLB 300 @ 369.8 N/m transmits an end reaction of 285 kN, (16) under factored loads, to the web of ISMB 450 @ 710.2 N/m. Design a bolted framed connection. Use Fe 410 steel grade and 4.6 grade bolts.

12. a) Design a welded plate girder of 20 m span using the tension field action for the following factored forces. (16)
- Maximum moment, $M_z = 4500 \text{ kNm}$
- Maximum shear force = 850 kN
- The girder is laterally restrained. Use steel of grade Fe 410 and assume yield stress of steel to be 250 MPa irrespective of thickness of plates. Connections need not be designed.

(OR)

- b) Design a gantry girder, without lateral restraint along its span, to be used in an industrial building carrying overhead travelling crane for the following data: (16)

Centre-to-centre distance between columns = 8 m

(span of the gantry girder)

Crane capacity = 55 kN

Self-weight of the crane girder excluding trolley = 40 kN

Self-weight of the trolley, electric motor, hook, etc. = 15 kN

Minimum hook approach = 1.2 m

Wheel centres = 3.2 m

Centre-to-centre distance between gantry rails = 12 m

(span of crane)

Self-weight of rail section = 120 N/m

Yield stress of steel = 250 MPa

13. a) A beam column of length 4.5 m is subjected to a compression of 850 kN and a major axis moment of 5 kNm. The weaker plane of the column is strengthened by bracing. If the effective length factor is 0.9, design the beam-column, assuming Fe 410 grade steel. (16)

(OR)

- b) A wide flange W 310 x 310 x 143 beam-column has a height of 3.74 m and is pinned at both ends. Check whether it can support a design axial load of 650 kN together with a major axis bending moment of 350 kNm applied at the top of the beam column. Assume grade Fe 410 steel. (16)

14. a) Determine the loads acting on a fink type roof truss for an industrial building for the following data. (16)

Overall width of the building = 12 m

c/c spacing of trusses = 8 m

Rise of truss = $1/4$ of span

Self-weight of purlins = 318 N/m

Height of columns = 11 m

Roofing and side coverings = Asbestos cement sheet
(dead weight = 171 N/m²)

Consider the permeability is normal. The topography site is flat. The configuration of the girder is given in Fig. 1.

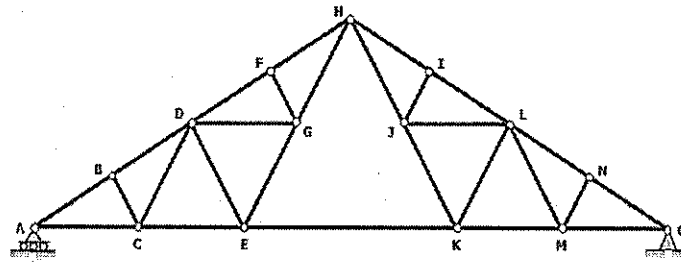


Fig. 1

(OR)

- b) Design a purlin for an industrial building located at Guwahati with a span of 25m and a length of 50 m. The roofing is galvanized iron sheeting. Basic wind speed is 55 m/s and the terrain is an open industrial area. The building is a class B building with a clear height of 10 m at the eaves. (16)

15. a) A hat of 120 mm x 100 mm x 5 mm section with a 30 mm lip is to be used as concentrically loaded column of effective length 3.5 m. Determine the allowable load. Take $f_y = 235 \text{ N/mm}^2$. (16)

(OR)

- b) Design laterally unsupported C-section (back-to-back) beams of size 350 mm x 180 mm x 50 mm x 3 using IS: 801-1975. (16)

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: V [Part Time]

Electrical and Electronics Engineering

16PTEE502 – POWER SYSTEM ANALYSIS

(Regulations 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. List major components in power systems that are to be modelled for analyzing system problems.	2	K1	1
2. A generator rated 25 MVA, 11 kV has a reactance of 15%. Calculate its p.u. reactance for a base of 50 MVA and 10 kV.	2	K3	1
3. Classify the various type of buses in per system analysis and specify the name and need of reference bus.	2	K1	2
4. Compare GSM and NRM in load flow analysis with respect to number of iterations taken for convergence and memory requirement	2	K2	2
5. List the various faults and classify them according to the severity and occurrence.	2	K1	3
6. Define synchronous reactance, transient reactance and sub transient reactance.	2	K1	3
7. Recall the boundary conditions for LLG and SLG faults.	2	K1	4
8. Examine the reason why negative and zero sequence voltage appear throughout the network.	2	K2	4
9. Infer the significance of critical clearing time	2	K2	5
10. Point out the control schemes included in stability control techniques.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
11. a) i)	Prepare a per phase schematic of the system in Fig.1 and show all the impedance in per unit on a 100 MVA, 132 kV base in the transmission line circuit. The necessary data are given as follows. G1 : 50MVA, 12.2 kV, $X=0.15$ pu. G2 : 20MVA, 13.8 kV, $X=0.15$ pu. T1 : 80MVA, 12.2/161 kV, $X=0.1$ pu. T2 : 40MVA, 13.8/161 kV, $X=0.1$ pu. LOAD: 50MVA, 0.8 lagging power factor operating at 154 kV. Evaluate the p.u impedance of the load.	8	K4	1

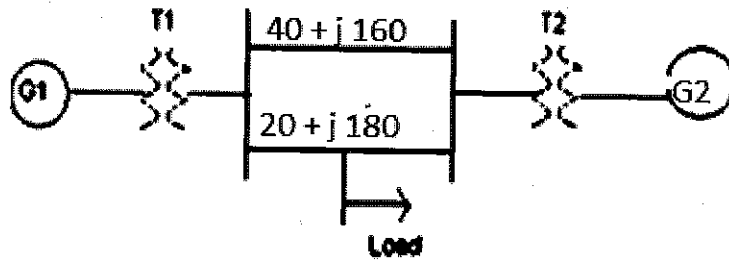


Fig.1

ii)	Explain the structure of modern power system with neat sketch.	8	K2	1
(OR)				
b) i)	Examine that the per unit equivalent impedance of a two winding transformer is the same whether the calculation is made from the high voltage side or the low voltage side.	8	K4	1
ii)	Explain the π model for a transformer with off nominal tap ratio.	8	K2	1
12. a)	For the system shown in the Fig.2, with bus 1 as slack us, obtain the power flow solution using Gauss-Seidal method(GSM)after the end of first iteration.	16	K2	2

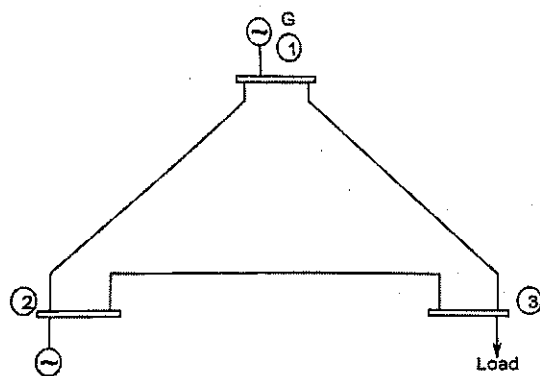


Fig.2

(OR)

Q. No		M	BTL	CO
b)	Draw the flow chart for Newton-Raphson polar coordinate when PV buses are absent and explain the implementation of this algorithm.	16	K2	2
13. a)	i) Explain the step by step procedure for systematic fault analysis for a three phase fault using bus impedance matrix.	8	K2	3
	ii) A generating station having n section bus bars each rated at Q-kVA with X % reactance is connected on the tie-bars system through bus bar reactance of b%. Determine the short-circuit kVA if a 3 phase fault takes place on one section. Determine the short-circuit kVA when n is very large.	8	K4	3
	(OR)			
b)	i) Deduce the expression for the fault current when a. L-G fault b. L-L-G fault occurs at the terminals of a unloaded alternator.	8	K2	3
	ii) For the circuit in Fig.3, calculate the post fault currents I_1^f , I_2^f and I^f .	8	K4	3

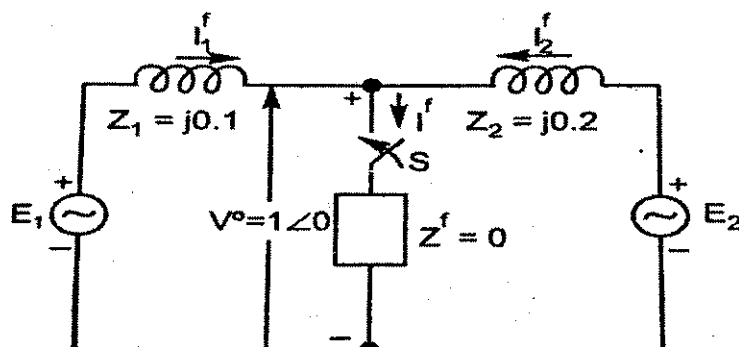


Fig.3

Q. No		M	BTL	CO
14. a)	i) Discuss briefly about the positive, negative and zero sequence impedances with reference to generator, transformers (both 1- ϕ and 3- ϕ) and transmission lines.	8	K2	4
	ii) Examine the sequence impedance of synchronous machine, transmission lines and star connected loads	8	K4	4
	(OR)			
b) i)	Show the expression for fault current in double line to ground fault on unloaded generator. Draw an equivalent network showing the inter connection of networks to simulate double line to ground fault	8	K2	4
	ii) Analyse the unsymmetrical fault using bus impedance matrix and derive the expression for the phase current and voltages.	8	K4	4
15. a)	i) Derive swing equation for a synchronous machine during transients.	8	K4	5
	ii) An alternator supplies 50 MW to an infinite bus bar with the steady state limit of the system being 100 MW. Determine with the help of power angle curve, whether the alternator will remain in synchronism if the prime mover input is abruptly increased further to 30 MW. (Assume losses are zero)	8	K4	5
	(OR)			
b) i)	Explain synchronizing coefficient and illustrate steady state stability for transferring maximum power without loss of synchronism.	8	K4	5
	ii) A 50 Hz 3-phase synchronous generator delivers 1.0 p.u. power to an infinite bus bar through a network in which resistance is negligible. A fault occurs which reduces maximum power transferable to 0.40 p.u. whereas before the fault this power was 1.8 p.u. and after the clearance of the fault 1.3 p.u. Using equal area criterion, calculate the critical angle.	8	K4	5

Register Number :

Government College of Engineering :: Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Part Time]

Civil Engineering

16PTCE603 – DESIGN AND DRAWING (CONCRETE AND STEEL)

(Regulation 2016/2016A)

(Use of IS 456-2000, IS 800-2007 and Steel Table are Permitted)

Time : 3 Hours

Maximum Marks : 100
(60 Marks)

Part A

1. a) i) Design a cantilever retaining wall to retain earth of 4.0 m above the ground. The earth is level with the top. Good soil suitable for the foundation is available at a depth of 1.1 m. The safe bearing capacity of the soil = 180 kN/m². Angle of repose of soil = 30°, Density of soil = 16 kN/m³. The coefficient of friction between soil and concrete is 0.55. Use M20 concrete and Fe 415 steel. (30)
- ii) Draw to a suitable scale: (30)
- (i) Plan view
 - (ii) Sectional elevation and cross section showing the main and secondary reinforcement details.

(OR)

- b) i) Design a circular water tank for a capacity of 2,65,000 litres. The depth of the tank is limited to 3 m from inside. Keep the joint between the wall as base slab as fixed. Base slab rests on firm ground. Use M25 concrete and Fe 415 steel. (30)
- ii) Draw the cross-sectional elevation, plan showing the reinforcements to the suitable scale. (30)

Part B

(40 Marks)

2. a) i) Design a bolted stiffened seat angle connection for a reaction of 200 kN from a beam of ISMB 300 using M22 bolts of 4.6 grades. The beam has to be connected to ISHB 200 column. Assume Fe 410 grade steel. (25)
- ii) Draw not to scale: (15)
- i) Sectional elevation
 - ii) Front elevation.

(OR)

- b) i) Design a electrically operated gantry girder for the following data: (25)

Crane capacity = 200 kN

Self weight of crane girder excluding trolley = 120 kN

Self-weight of trolley, electric motor hook etc., = 40 kN

Hook approach = 1.2 m

Wheel base = 3 m

C/C distance between gantry rails = 16 m

Span of gantry girder = 8 m

Use Fe 410 grade steel, Assume the girder is laterally supported.

- ii) Draw the cross- section, sectional elevation showing the connection details. (Not to scale) (15)

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Part Time]

Civil Engineering

16PTCE602 - WATER RESOURCES ENGINEERING

(Regulations 2016/2016A)

Time: 3 Hours

Maximum Marks: 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Write the types of Rain Gauges available to measure average rainfall.	2	K2	1
2. Define the terms Transpiration and Evaporation.	2	K1	1
3. Name the Reservoirs found in India.	2	K2	2
4. What do you mean by Flood Routing?	2	K1	2
5. Define Aquifer.	2	K2	3
6. How do you select a site for a Tube well?	2	K1	3
7. State Lacey's theory.	2	K2	4
8. Outline the GIS application in Distribution System.	2	K2	4
9. List the causes of Water logging.	2	K2	5
10. Classify the types of Drainage System.	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) The annual rainfall at 7 rain gauge stations in a basin are 60,90,65,45,20,90 and 70 cm respectively. What is the percentage accuracy of the existing network in the estimation of average depth of rainfall over the basin? How many additional gauges are required if it is desired to limit the error to only 10%. (OR)	16	K2	1
b) Explain the estimation of Runoff by empirical formula and Infiltration Indices.	16	K2	1
12. a) Enumerate the types of Reservoirs and how do you select a site for a Reservoir. (OR)	16	K4	2
b) Describe about the different Reservoir Losses in detail.	16	K4	2

Q. No		M	BTL	CO
13. a)	In an artesian aquifer of 8 m thickness, a 10 cm diameter well is pumped at a constant rate of 100 lit/min. The steady state draw down observed in two wells located at a 10 m and 50 m are 1 m and 0.5 m respectively. Compute the Transmissivity and Permeability of the aquifer.	16	K3	3
	(OR)			
b)	How do you estimate Yield from an Open Well by Constant Level Pumping Test and Recuperation Test?	16	K3	3
14. a)	Briefly explain the different classification of Canals with neat sketches.	16	K4	4
	(OR)			
b)	With a neat sketch, explain the construction and maintenance of Canals and Canal lining.	16	K4	4
15. a)	What do you mean by Water logging? Write about its importance, effects and remedial measures?	16	K2	5
	(OR)			
b)	Enumerate the classification and method of River Training Works.	16	K2	5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: VII [Part Time]

Mechanical Engineering

16PTMEE29 – SAFETY ENGINEERING

(Regulations 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What is the role of the Chief Inspector of Factories?	2	K1	1
2. Name any two welfare provisions under the Factories Act, 1948.	2	K1	1
3. What is the main objective of the Environment Protection Act, 1986?	2	K1	2
4. Who is required to obtain a No Objection Certificate (NOC) from the Pollution Control Board?	2	K1	2
5. Define 'major accident' according to hazardous chemical rule 1989.	2	K1	3
6. Explain the function of a safety data sheet (SDS).	2	K2	3
7. List out the purpose of the Indian Boiler Act, 1923.	2	K1	4
8. Mention any two welfare measures for construction workers under the Act.	2	K1	4
9. What is the primary objective of the Occupational Safety?	2	K1	5
10. Name any two penalties for non-compliance under HASAWA.	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain the powers and duties of statutory authorities and inspecting staff under the Factories Act, 1948.	16	K2	1
(OR)			
b) Discuss the provisions under the Tamil Nadu Factories Rules, 1950, concerning safety and health. Explain if briefly.	16	K2	1
12. a) Describe the provisions related to Biomedical Waste Management under the Biomedical Waste (Management and Handling) Rules, 1989, and their impact on public health and the environment.	16	K2	2

(OR)

Q. No		M	BTL	CO
b)	Differentiate the relationship between the Environment Protection Act, 1986 and other environmental laws such as the Air Act, 1981, and the Water Act, 1974, in controlling pollution.	16	K2	2
13. a)	Explain the key definitions under the Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989 and their relevance.	16	K2	3
	(OR)			
b)	Provide an overview of the list of hazardous and toxic chemicals and the criteria for their classification under the rule.	16	K2	3
14. a)	Discuss the procedure for obtaining a license for pressure vessels under SMPV rules.	16	K2	4
	(OR)			
b)	Illustrate the provisions under the Gas Cylinder Rules for the safe handling and transportation of gas cylinders.	16	K2	4
15. a)	Compare the importance of international standards like ISO 14000 and OHSAS 18000 in promoting global workplace safety and environmental sustainability.	16	K2	5
	(OR)			
b)	Explain the significance of ANSI standards in ensuring workplace safety and compliance in the USA.	16	K2	5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: II [Part Time]

Mechanical Engineering

16PTME202 – ENGINEERING MATERIALS AND METALLURGY

(Regulations 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
1. What is meant by maraging steel?	2	K1	1
2. List four important alloying elements added in alloy steels.	2	K1	1
3. Compare Normalizing and Hardening process.	2	K2	2
4. What is the purpose of annealing?	2	K1	2
5. Compare Thermoplastic and Thermosetting Plastics.	2	K2	3
6. Name any four engineering ceramics materials.	2	K1	3
7. What are the factors affecting mechanical properties?	2	K1	4
8. Define endurance limit (SN).	2	K1	4
9. Name two of the NDT techniques that can be used to detect internal defects of the materials.	2	K1	5
10. Why magnetic particle test method is not suitable for testing of plastics?	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

	M	BTL	CO
11. a) What are stainless steels? What are the main characteristics of stainless steels? Name different types of stainless steels and their main application, explain in detail.	16	K2	1
(OR)			
b) What are the properties of Aluminum? What are the different types of alloying element such as copper, iron manganese, magnesium used with aluminum? Also explain its applications?	16	K2	1

Q. No		M	BTL	CO
12. a)	i) Draw a neat sketch of the TTT diagram for eutectoid steel and label the regions. Explain the different products formed on this diagram.	8	K2	2
	ii) What is a CCT diagram? Explain various cooling curves on CCT diagrams. How such curves are drawn? Write short notes on critical cooling rate.	8	K2	2
	(OR)			
b) i)	What is meant by carburizing of steels? Briefly explain the various types of Carburizing.	8	K2	2
	ii) Draw a schematic layout explain the following: Vacuum and Plasma hardening.	8	K2	2
13. a)	What are the special properties of plastics that make them suitable for engineering applications? The concept of 'Co-polymerization'. Also explain the difference between commodity plastics and engineering plastics.	16	K2	3
	(OR)			
b)	What is polymerization? Explain addition polymerization and condensation polymerization.	16	K2	3
14. a)	Write an engineering brief about the creep test? Draw a typical creep curve and explain the various stages of creep.	16	K2	4
	(OR)			
b)	Explain the testing procedure for Vickers hardness test and mention the advantages and limitations, and compare the Vickers test with Rockwell test.	16	K2	4
15. a)	i) Compare destructive and non-destructive testing.	8	K2	5
	ii) Explain in detail about the different types of Borescopes used in visual inspection method with neat sketches.	8	K2	5
	(OR)			
b) i)	Explain with suitable sketch about the welding defects during welding process.	8	K2	5
	ii) Demonstrate with suitable sketch about the casting defects during casting Process.	8	K2	5

Registration Number :

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B.E. Degree Examinations - April/May 2025

Semester: III [Full Time]

Electronics and Communication Engineering

22EC301 - SEMICONDUCTOR DEVICES AND CIRCUITS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No

1. Write down the diode current equation?
2. Define the terms transition capacitance C_T and diffusion capacitance C_D of a diode.
3. List the advantages of C filter.
4. Identify the diode circuit to get the following output waveform from the given input shown in fig.1

M	BTL	CO
2	K1	1
2	K1	1
2	K1	2
2	K3	2

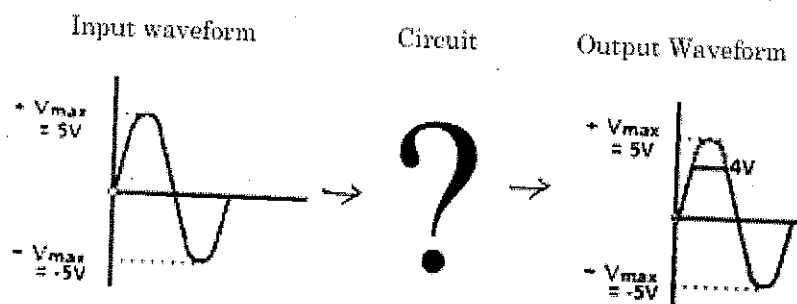


Fig.1

5. Define current amplification factor.
6. Classify amplifiers based on configuration.
7. Define hybrid parameters.
8. Define the term bandwidth and gain bandwidth product.
9. Mention the advantages of negative feedback.
10. What do you understand by the term cross over distortion?

2	K1	3
2	K2	3
2	K1	4
2	K1	4
2	K1	5
2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

11. a) i) Explain the formation of barrier potential across an open circuited PN junction diode. Describe its action under i) forward bias and (ii) reverse bias.

M	BTL	CO
10	K2	1

Q. No		M	BTL	CO
	ii) With neat diagram explain the characteristics of Photo diode. (OR)	6	K2	1
b) i)	Explain details about the switching characteristics of PN diode with neat Sketch.	10	K2	1
	ii) Explain the operation of tunnel diode and draw its equivalent circuit.	6	K2	1
12. a) i)	Describe the working principle of full wave rectifier and derive the expressions for the ripple factor, efficiency, V_{DC} , I_{RMS} , $I_{L\ max}$ and V_{RMS} .	10	K2	2
	ii) Write short notes on Clippers. (OR)	6	K1	2
b) i)	How Zener diode is used as voltage regulator? Explain the working principle of Zener voltage regulator.	10	K2	2
	ii) Write short notes on Clampers.	6	K1	2
13. a)	Explain in detail the construction and operation of depletion type MOSFET and enhancement type MOSFET. (OR)	16	K2	3
b)	Explain in detail, different biasing methods for a transistor (BJT) circuit with neat circuit diagram and obtain respective stability factors.	16	K2	3
14. a)	Draw the circuit diagram of Common Emitter amplifier with voltage divider bias, coupling capacitor and bypass capacitor. With the help of small signal equivalent circuit, obtain the expression for current gain, voltage gain, input and output impedance. (OR)	16	K3	4
b)	Explain the high frequency response of BJT and MOSFET in detail with illustrations.	16	K3	4
15. a)	Explain the transfer characteristic, signal waveforms, power dissipation and power conversion efficiency of Class A amplifier. (OR)	16	K2	5
b)	With neat diagram explain voltage shunt feedback amplifier. Derive the expression for transresistance gain, input resistance, output resistance and the voltage gain.	16	K2	5

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B.E. Degree Examinations – April/May 2025

Semester: III [Full Time]

Electrical and Electronics Engineering

22EE301 – ELECTRIC CIRCUIT ANALYSIS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. A 2 kW, 220 V, water heater is used to heat a water tank for 45 minutes. What will be the number of units of energy consumed?	2	K3	1
2. State Thevenin's theorem.	2	K1	1
3. Define time constant of a RC and RL circuit.	2	K1	2
4. What are free and forced responses?	2	K1	2
5. Describe the dot rule in coupled circuits.	2	K1	3
6. Distinguish between unbalanced source and unbalanced load.	2	K2	3
7. Use step function to write the expression for the following waveform (Fig.1).	2	K3	4

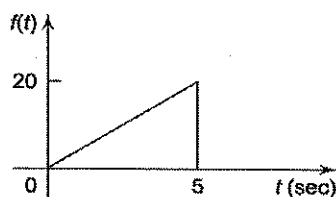


Fig.1

8. A 500 V resistor, a 16 mH inductor, and a 25 mF capacitor are connected in parallel. Express the admittance of this parallel combination of elements as a rational function of S.	2	K3	4
9. List the differences between series and parallel resonance.	2	K2	5
10. List the various parameter sets that are used to model a two-port network.	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
11. a)	Compute the current in the 23 ohm resistor of the following Fig.2, shown below by applying the superposition principle.	16	K3	1

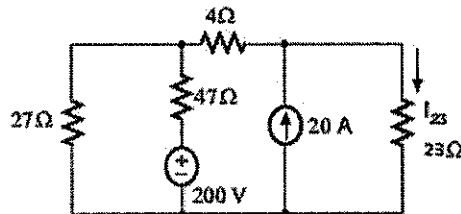


Fig.2

(OR)

b)	For the circuit shown in Fig.3, find the i) currents in different branches, ii) current supplied by the battery, iii) potential difference between terminals A and B.	16	K3	1

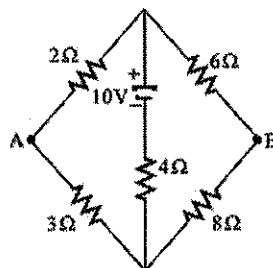


Fig.3

12. a)	Derive the equation for transient response of RC and RL circuit for DC input.	16	K2	2

(OR)

b)	In the RL circuit of Fig.4, the switch is closed at position-1 for a long time and then thrown to position-2 at time $t = 0$. Determine the response $i(t)$.	16	K3	2

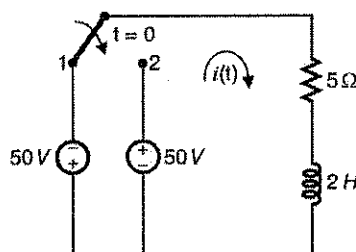


Fig.4

Q. No		M	BTL	CO
13. a)	A series combination of $10\ \Omega$ resistance, 50 mH inductance and $10\ \mu\text{F}$ capacitor is connected to a 220 V , 50 Hz supply. Estimate the current, active power, reactive power and apparent power. Also estimate the voltage across R, L and C and draw the phasor diagram.	16	K3	3
	(OR)			
b)	An unbalanced four-wire star-connected load has balanced supply voltage of 400 V . The load impedances are $Z_R = 4 + j8\ \Omega$, $Z_Y = 3 + j4\ \Omega$ and $Z_B = 15 + j10\ \Omega$. Calculate the line currents, neutral current and the total power. Also draw the phasor diagram.	16	K3	3
14. a)	i) Determine the inverse Laplace transform of the following function $F(s) = \frac{96(s^2 + 17s + 60)}{s^3 + 14s^2 + 48}$	8	K3	4
	ii) Verify the initial and final-value theorems for the function $f(t) = e^{-t}(\sin 3t + \cos 5t)$.	8	K3	4
	(OR)			
b) i)	Obtain the transform impedance of the network shown in Fig.5	8	K3	4

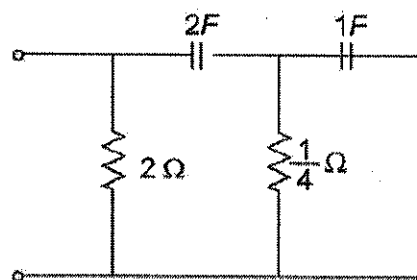


Fig.5

	ii)	What are necessary conditions for a driving point function and necessary condition for transfer functions?	8	K2	4
15. a)	i)	Derive the resonance frequency for the series RLC network and also explain the frequency response of the elements in the circuit.	8	K4	5
	ii)	In the RLC network shown in Fig.6, determine the possible values of L for the network to resonate at 4000 rad/s .	8	K3	5

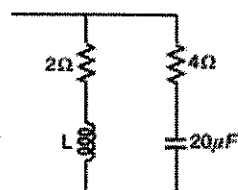


Fig.6

(OR)

Q. No

M BTL CO

- b) i) Determine the Z-parameters of the 2-port network shown in Fig.7.

8

K3

5

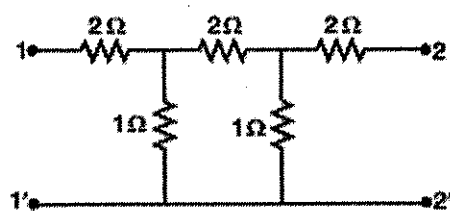


Fig.7

- ii) Determine the h-parameters of the two-port network shown in Fig.8.

8

K3

5

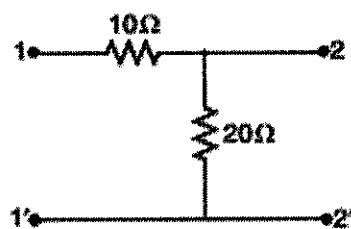


Fig.8

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B.E. Degree Examinations – April/May 2025

Semester: III [Full Time] / I [Part Time]

Mechanical Engineering

22ME301/23PTME101 – ENGINEERING THERMODYNAMICS

(Regulations 2022/2023)

(Use of Steam tables, Mollier chart and Psychrometric chart is Permitted)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
1.	Write down the equation of first law of thermodynamics for a cycle and a process.	2	K1	1
2.	State the concept of continuum in thermodynamics.	2	K1	1
3.	Define PMM2.	2	K1	2
4.	Compare heat pump and refrigerator.	2	K2	2
5.	Define dryness fraction.	2	K1	3
6.	Give two examples for flow processes and non-flow processes.	2	K1	3
7.	In what way the efficiency of a Rankine cycle can be improved?	2	K1	4
8.	Define reheat Rankine cycle.	2	K1	4
9.	Write down the equation for Vander Waal's equation of state.	2	K1	5
10.	What is the significance of reduced properties?	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
11. a)	A vessel having a capacity of 0.05 m ³ contains a mixture of saturated water and saturated steam at a temperature of 245°C. The mass of the liquid present is 10 kg. Find the following: i) The pressure ii) The mass iii) The specific volume iv) The specific enthalpy v) The specific entropy and vi) The specific internal energy.	16	K3	1

(OR)

Q. No	M	BTL	CO
b) A turbine operating under steady flow conditions receives steam at the following state: pressure 13 bar; specific volume 0.14 m ³ /kg; internal energy 2600 kJ/kg; velocity 30.5 m/s. The state of the steam leaving the turbine is: pressure 0.35 bar; specific volume 4.25 m ³ /kg; internal energy 2300 kJ/kg; velocity 91 m/s. Heat is lost to the surroundings at the rate of 0.25 kJ/s. If the rate of steam flow is 0.38 kg/s, what is the power developed by the turbine?	16	K3	2
12. a) A reversible heat engine operates between two reservoirs at temperatures 700°C and 50°C. The engine drives a reversible refrigerator which operates between reservoirs at temperatures of 50°C and - 25°C. The heat transfer to the engine is 2500 kJ and the net work output of the combined engine - refrigerator plant is 400 kJ. i) Determine the heat transfer to the refrigerant and the net heat transfer to the reservoir at 50°C; ii) Reconsider i) given that the efficiency of the heat engine and the C.O.P. of the refrigerator are each 45 per cent of their maximum possible values.	16	K3	2
(OR)			
b) 300 kJ/s of heat is supplied at a constant fixed temperature of 290° C to a heat engine. The heat rejection takes place at 8.5° C. The following results were obtained; a) 300 kJ/s heat is rejected b) 215 kJ/s heat is rejected c) 150 kJ/s heat is rejected Classify which of the above result, report a reversible cycle or irreversible cycle or impossible cycle.	16	K3	2
13. a) A pressure cooker contains 1.5 kg of saturated steam at 5 bar. Find the quantity of heat which must be rejected so as to reduce the quality to 60% dry. Determine the pressure and temperature of the steam at the new state.	16	K3	3
(OR)			
b) Steam initially at 0.3 Mpa, 250°C is cooled at constant volume. a) At what temperature will the steam become saturated vapour? b) What is the quality at 80°C? What is the heat transferred per kg of steam in cooling from 250°C to 80°C?	16	K3	3

Q. No		M	BTL	CO
14. a)	In a single-heater regenerative cycle, the steam enters the turbine at 30 bar, 400°C and the exhaust pressure is 0.10 bar. The feed water heater is a direct contact type which operates at 5 bar. Find: i) The efficiency and the steam rate of the cycle. ii) The increase in mean temperature of heat addition, iii) The efficiency and iv) Steam rate as compared to the Rankine cycle (without regeneration). Pump work may be neglected.	16	K3	4
	(OR)			
b)	In a reheat cycle, the initial steam pressure and the maximum temperature are 150 bar and 550°C respectively. If the condenser pressure is 0.1 bar and the moisture at the condenser inlet is 5%, and assuming ideal processes, determine a) the reheat pressure b) the cycle efficiency and c) the steam rate.	16	K3	4
15. a)	Derive the Clausius Clapeyron equation. What assumptions are made while deriving this equation?	16	K2	5
	(OR)			
b)	Derive the expression for Joule Thompson Coefficient with suitable diagram.	16	K2	5

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Government College of Engineering, Salem
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M.E. Degree Examinations – April/May 2025

Semester: I [Full Time]

Common to all Branches

22MLC01 – RESEARCH METHODOLOGY AND IPR

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Compare quantitative and qualitative research techniques.	2	K2	1
2. Justify the statement “Interpretation is a fundamental component of research process”.	2	K2	1
3. Point out the significance of hypothesis testing.	2	K1	2
4. Define plagiarism in research.	2	K1	2
5. Mention two key elements of a research proposal format.	2	K1	3
6. Define the importance of research objectives in a research proposal.	2	K1	3
7. What is a patent?	2	K1	4
8. Define innovation in the context of intellectual property.	2	K1	4
9. What is a Geographical Indication (GI)?	2	K1	5
10. What are the limitations of IP based protection for Traditional Knowledge?	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) What is research problem? Define the main issues which should receive the attention of the researcher in formulating the research problem. Give suitable examples to elucidate your points.	10	K2	1
ii) Compare the different types of data collection methods involved during research process.	6	K2	1
(OR)			
b) i) Explain the critical characteristics of a good research problem. Illustrate with examples.	10	K2	1

Q. No		M	BTL	CO
	ii) Explain the common errors researchers face in selecting research problems and suggest ways to overcome them.	6	K2	1
12. a)	i) What are the criteria for evaluating the suitability of a research approach? Elaborate with examples.	10	K2	2
	ii) Compare parametric and non-parametric testing with examples of their application.	6	K2	2
	(OR)			
b) i)	Explain the significance of documentation in research and provide examples of best practices.	10	K2	2
	ii) What are the challenges in maintaining reliability and validity in research findings, and how can they be addressed?	6	K2	2
13. a)	i) What are the challenges faced while presenting a research proposal, and how can they be overcome?	10	K2	3
	ii) Illustrate how feedback from a review committee can improve the quality of a research proposal.	6	K2	3
	(OR)			
b) i)	Explain the steps involved in developing a research proposal with an example.	10	K2	3
	ii) Discuss the role of a literature review in formulating a research proposal.	6	K2	3
14. a)	i) Explain the different types of intellectual property, including patents, designs, trade, and copyright.	10	K2	4
	ii) With a neat flowchart explain how patents are granted.	6	K2	4
	(OR)			
b) i)	Why are trademarks essential? Elaborate in detail on its functions, acquisition, claims, litigations involved for getting trademarks.	10	K2	4
	ii) Discuss the challenges and opportunities in international cooperation for intellectual property protection.	6	K2	4
15. a)	i) Discuss the process and significance of licensing and technology transfer in intellectual property.	10	K2	5
	ii) Illustrate the role of IPR in fostering innovation and collaboration in IITs with case studies.	6	K2	5
	(OR)			
b) i)	How does intellectual property apply to biological systems? Provide examples to illustrate your answer.	10	K2	5
	ii) Describe the functions and structure of the administration of the patent system in India.	6	K2	5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VIII [Full Time]

Computer Science and Engineering

18CSPE802 – BUSINESS INTELLIGENCE AND ITS APPLICATIONS

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Give the key functionalities of the business requirements analyst.	2	K1	1
2. Compare OLAP and OLTP.	2	K4	1
3. Mention the significance of understanding Business Intelligence (BI) definitions and concepts for implementing BI solutions in an organization.	2	K3	2
4. Evaluate the differences between structured, semi-structured, and unstructured data in terms of their use in Business Intelligence systems.	2	K5	2
5. How does Pentaho Data Integration help in integrating data from multiple sources?	2	K2	3
6. Give an application where extract, transform, load (ETL) is commonly used in data integration.	2	K3	3
7. Justify how multidimensional model helps with data analytics.	2	K4	4
8. Analyze how conceptual model different from a logical model?	2	K4	4
9. Identify the primary difference between a balanced scorecard and an enterprise dashboard.	2	K2	5
10. Mention the purpose of using pivot tables in MS Excel for reporting.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Explain in detail about Baldrige business framework with a neat sketch.	10	K2	1
ii) List and explain out the capabilities of Internet- ready applications.	6	K2	1

(OR)

Q. No		M	BTL	CO
b)	i) Discuss briefly about the key purpose of using IT in business.	10	K2	1
	ii) List and explain the categories of IT application users and their requirements.	6	K2	1
12. a)	i) Analyze the different roles and responsibilities involved in Business Intelligence (BI) and how each contributes to the overall success of BI initiatives.	8	K4	2
	ii) Examine in detail about the various applications of Business Intelligence.	8	K4	2
	(OR)			
b)	i) Examine the different components of Business Intelligence (BI) frameworks and provide relevant examples.	8	K4	2
	ii) Compare MOLAP, ROLAP and HOLAP.	8	K4	2
13. a)	Explain about the common approaches of Data Integration. How data integrity different from data quality?	16	K2	3
	(OR)			
b)	Explain why data quality is important in Business Intelligence and describe its various dimensions.	16	K2	3
14. a)	Examine how attributes, hierarchies, and schema types enhance data organization and effectiveness in Business Intelligence systems.	16	K2	4
	(OR)			
b)	Examine the role of data and dimension modeling in developing efficient Business Intelligence systems.	16	K2	4
15. a)	With the help of examples, examine the situations where a balanced scorecard is more suitable than an enterprise dashboard for monitoring organizational performance.	16	K4	4
	(OR)			
b)	Analyze how the key components of the Malcolm Baldrige Quality Performance Framework interact to assess and drive organizational performance improvement	16	K4	4

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B.E. Degree Examinations – April/May 2025

Semester: VIII [Full Time]

Electronics and Communication Engineering

18ECPE811 – BIO – MEDICAL ELECTRONICS

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Write the Nernst equation.	2	K1	1
2. Define Latency as related to EMG.	2	K1	1
3. What is meant by Mean Arterial Pressure (MAP)?	2	K2	2
4. Define Cardiac Output.	2	K1	2
5. What is Computed Tomography?	2	K2	3
6. Distinguish between CT and PET scans.	2	K3	3
7. Calculate the energy stored in 16 μ F capacitor of a DC defibrillator that is charged to a potential of 5000V DC.	2	K3	4
8. Name some of the drug delivery devices.	2	K1	4
9. Define Let-go current.	2	K1	2
10. What steps can be taken to minimize electrical hazards?	2	K2	2

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) What are bioelectric potentials? With neat diagrams explain the origin of bioelectric potentials.	16	K2	1
(OR)			
b) Draw an Electrocardiogram labeling the critical features. Include typical amplitudes and time intervals for a normal person.	16	K2	1
12. a) i) With neat diagrams explain the auscultatory method of blood pressure measurement.	8	K2	2
ii) Using the basic principles of Ultrasonics, explain the working of a blood flow meter based on transit time principle.	8	K3	2

(OR)

Q. No		M	BTL	CO
b) i)	With neat diagrams explain the following with respect to lung volume and lung capacity.	8	K2	2
	(i) Tidal Volume			
	(ii) Inspiratory Reserve Volume			
	(iii) Inspiratory Capacity			
	(iv) Total Lung Capacity.			
	ii) Develop a microprocessor based patient monitoring system and explain its salient features.	8	K3	2
13. a)	Explain the principle behind CT scanning and how it differs from standard X-ray.	16	K4	3
	(OR)			
b)	Explain the principle of MRI and how it uses magnetic fields and radio waves to create images. Also compare and contrast CT with MRI.	16	K4	3
14. a) i)	Classify pacemakers. Explain the working principle of an R-wave inhibited pacemaker.	8	K2	4
	ii) What are the key characteristics of Laser? Discuss the application of Laser in Ophthalmology.	8	K2	4
	(OR)			
b) i)	Distinguish between hemodialysis and peritoneal dialysis.	8	K2	4
	ii) What is a defibrillator? With neat diagram explain the working of synchronized DC defibrillator.	8	K2	4
15. a) i)	List out the physiological effects of electric current on humans.	8	K3	2
	ii) Write short notes on Ground -Fault circuit Interrupter.	8	K2	2
	(OR)			
b) i)	List the steps involved in testing the electrical safety of a patient monitoring system.	8	K3	2
	ii) What is Beer-Lamberts law? With neat diagrams explain the components and working principle of spectrophotometer.	8	K2	2

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VIII [Full Time]

Electrical and Electronics Engineering

18EEP24 – SMART GRID

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What are the operational advantages in smart grid against traditional grid?	2	K2	1
2. What are the utility benefits of transforming into smart grid?	2	K2	1
3. Classify communication subnetworks used in smart grid.	2	K1	5
4. What is independent basic service set (IBSS)?	2	K1	5
5. What are the functions of smart metering?	2	K1	3
6. How do IEDs contribute to control and automation in distribution systems?	2	K3	3
7. Classify phasor measurement unit.	2	K1	4
8. What are the functions of demand management system?	2	K1	5
9. How do energy storage devices enhance power quality?	2	K3	2
10. What are the potential applications of supercapacitors in smart grid technology?	2	K3	2

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Elaborate the key aspects of smart grid development and deployment.	12	K2	1
ii) Distinguish between traditional grid and smart grid.	4	K2	1
(OR)			
b) i) Explain the functions of various smart grid components.	12	K2	1
ii) What are the nine areas to be focused to adopt smart grid technology as per the architecture proposed by Department of Energy?	4	K2	1

Q. No		M	BTL	CO
12. a)	i) Elaborate on the properties of IEEE 802 protocols. How can a suitable protocol be identified in WAN, NAN, and HAN subnetworks?	12	K3	5
	ii) How can power line communication be used in smart grids?	4	K3	5
	(OR)			
b) i)	With the aid of suitable example, describe the application of Zigbee technology in metering systems.	12	K3	5
	ii) How can MODBUS be used for smart metering?	4	K3	5
13. a)	i) Elaborate the communication architecture for smart metering.	8	K3	2
	ii) Explain the levels and various connections schemes adopted for substation automation equipment.	8	K3	2
	(OR)			
b) i)	Explain the services provided by demand side integration.	8	K3	2
	ii) What are the important factors for consideration when assessing communication protocols for smart metering?	8	K3	2
14. a)	Elaborate the configuration of wide area monitoring, protection, and control (WAMPAC). Explain how an online transient stability controller can be used in smart grid.	16	K3	3
	(OR)			
b)	Detail the structure and components of distribution management system (DMS). Detail how DMS contribute to enhance network operation.	16	K3	3
15. a)	Explain the operation of fuel cell and hydrogen electrolyser and detail how they can contribute for improving network operation.	16	K3	4
	(OR)			
b)	Detail the operation of superconducting magnetic energy storage system (SMES) and elaborate its role in smart grid operations.	16	K3	4

Registration Number:

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: III [Full Time]

Civil Engineering

22CE301 - MECHANICS OF FLUIDS

(Regulations 2022)

Time: 3 Hours

Maximum Marks: 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. State Pascal's law.	2	K1	1
2. What is capillarity?	2	K1	1
3. List out the types of flow.	2	K1	2
4. Define meta centre.	2	K1	2
5. Write the assumptions made in the derivation of Bernoulli's equation.	2	K1	3
6. Compare Laminar flow and turbulent flow.	2	K1	3
7. Differentiate major and minor head loss.	2	K2	4
8. What is the boundary layer in fluids?	2	K1	4
9. Define dimensionless numbers and list any two dimensionless numbers.	2	K1	5
10. What is meant by similitude? Mention its types.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) A liquid has a specific gravity of 0.72. Find its density, specific weight and the weight per litre of the liquid. If the above liquid is used for lubrication between a shaft and a sleeve, find the power lost in liquid for a sleeve length of 100 mm. The diameter of the shaft is 0.5 m and the thickness of the liquid film is 1 mm. Take the viscosity of fluid as 0.5 Ns/m ² and the speed of the shaft as 200 rpm.	16	K3	1

(OR)

Q. No		M	BTL	CO
b)	Calculate the capillary effect in millimeters a glass tube of 4 mm diameter, when immersed in (a) water (b) mercury. The temperature of the liquid is 20°C and the values of the surface tension of water and mercury at 20°C in contact with air are 0.073575 N/m and 0.51 N/m respectively. The angle of contact for water is 0°C and that for mercury 130°C. Take specific weight of water as 9790 N/m ³ .	16	K3	1
12. a)	If for a two-dimensional potential flow, the velocity potential function is given by $\phi = x(2y-1)$, determine the velocity at the point P (4,5). Determine also the value of stream function (Ψ) at the point P.	16	K3	2
	(OR)			
b)	Water flows through a pipe AB 1.2 m diameter at 3 m/s and then passes through a pipe BC 1.5 m diameter. At C, the pipe branches. Branch CD is 0.8 m in diameter and carries one third of flow in AB. The flow velocity in branch CE is 2.5 m/s. Find the volume rate of flow in AB, the velocity in BC, the velocity in CD and the diameter of CE.	16	K3	2
13. a)	A venturimeter of inlet diameter 300 mm and throat diameter 150 mm is inserted in vertical pipe carrying water flowing in the upward direction. A differential mercury manometer connected to the inlet and throat gives a reading of 200 mm. Find the discharge if the coefficient of discharge of meter is 0.98.	16	K3	3
	(OR)			
b)	An orifice meter with orifice diameter 15 cm is inserted in a pipe of 30 cm diameter. The pressure difference measured by a mercury oil differential manometer on the two sides of the orifice meter gives a reading of 50 cm of mercury. Find the rate of flow of oil of sp.gr 0.9, when the coefficient of discharge of the orifice meter = 0.64.	16	K3	3

Q. No**M BTL CO**

14. a) A horizontal pipe line 40 m long is connected to a water tank at one end discharges freely into the atmosphere at the other end. For the first 25 m of its length from the tank, the pipe is 150 mm diameter and its diameter is suddenly enlarged to 300 mm. The height of water level in the tank is 8 m above the centre of the pipe. Considering all losses of head which occur. Calculate the rate of flow. Take Darcy's co-efficient of friction as 0.01 for both sections of the pipe.

16 K3 4

(OR)

- b) Two pipes of diameter 400 mm and 200 mm are each 300 m long. When the pipes are connected in series the discharge through the pipeline is $0.10 \text{ m}^3/\text{sec}$, Estimate the loss of head incurred. What would be the loss of head in the system to pass the same total discharge when the pipes are connected in parallel. Take friction factor = 0.0075 for each pipe.

16 K3 4

15. a) An oil of specific gravity 0.91 and viscosity of 0.03 poise is to be transported at the rate of $3 \text{ m}^3/\text{s}$ through a 1.3 m diameter pipe. Model tests were conducted on 130 mm diameter pipe using water having a viscosity of 0.01 poise. Estimate the velocity of flow and discharge in the model.

16 K3 5

(OR)

- b) The efficiency η of geometrically similar fans depends upon the mass density of air ρ , its viscosity μ , speed of the fan N (revolutions per second), diameter of blades D and discharge Q . Perform dimensional analysis using Buckingham's theorem.

16 K3 5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Electrical and Electronics Engineering

18EEP05 – HIGH VOLTAGE ENGINEERING

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Write the causes of over voltages in Power System.	2	K1	1
2. What is meant by insulation coordination?	2	K2	1
3. Outline the concept of corona discharge.	2	K2	2
4. State the Paschen's law.	2	K1	2
5. List the merits and demerits of Van-de-Graff generator.	2	K3	3
6. What is tesla coil?	2	K1	3
7. What are the problems associated with measurement of very high impulse voltages?	2	K1	4
8. State the advantages and disadvantages of CVT.	2	K1	4
9. Mention the various tests done on circuit breakers.	2	K1	5
10. Distinguish between flashover and puncture.	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Give the origin and characteristics of switching surges and explain the causes of over voltage due to switching surges in EHV and UHV system.	16	K2	1
(OR)			
b) With necessary sketches, explain the step by step procedure of Bewley Lattice Diagram for a two substation system.	16	K2	1
12. a) i) From the fundamental principles derive Townsend's criteria for the breakdown of gaseous dielectric medium.	8	K4	2
ii) Discuss about various mechanisms in Vacuum breakdown	8	K2	2
(OR)			

Q. No		M	BTL	CO
b)	i) Explain any two theories which explains breakdown in commercial liquid dielectrics.	8	K4	2
	ii) Describe the intrinsic breakdown mechanism in solid dielectrics.	8	K2	2
13. a)	Elucidate the operation of Vande Graff generator from the electrostatic principle.	16	K3	3
	(OR)			
b)	Explain the different methods of producing switching impulse currents in test laboratories.	16	K3	3
14. a)	Tabulate the various methods of high AC and DC voltage and current measurements.	16	K4	4
	(OR)			
b)	Explain any two methods to measure high frequency and impulse current.	16	K4	4
15. a)	Discuss the different high voltage tests conducted on bushings.	16	K3	5
	(OR)			
b)	Discuss the various tests carried out in a surge arrester at high voltage laboratories.	16	K3	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Electrical and Electronics Engineering

18EEP06 – HVDC TRANSMISSION SYSTEMS

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Compare AC and DC transmission.	2	K2	1
2. List the applications of MTDC systems.	2	K1	1
3. Identify is the role of overlap in Graetz circuit analysis.	2	K2	2
4. Indicate the choice of converter configuration is important in power transmission systems.	2	K2	2
5. State the principles of DC link control.	2	K1	3
6. Draw the hierarchical control structure for a DC link.	2	K1	3
7. Define reactive power requirements in steady state.	2	K1	4
8. Identify sources of reactive power in power systems.	2	K2	4
9. Define the per unit system for DC quantities.	2	K1	6
10. Draw the Norton's equivalent circuit of converter.	2	K1	6

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Describe the basic components and functions of a DC transmission system.	8	K2	1
ii) Discuss the planning considerations involved in HVDC transmission projects.	8	K2	1
(OR)			
b) i) Explain the operation of DC breakers and describe their significance in maintaining the reliability of DC transmission systems.	8	K2	1
ii) Discuss the operating problems commonly encountered in HVDC systems and propose strategies for mitigating these issues.	8	K2	1

Q. No		M	BTL	CO
12. a)	i) Summarize the factors influencing the choice of converter configuration in power transmission systems.	8	K2	2
	ii) Discuss the characteristics of different converter bridge configurations and their suitability for specific applications.	8	K2	2
	(OR)			
b) i)	Summarize the effectiveness of various firing schemes in Voltage Source Converter (VSC) topologies, considering factors such as control accuracy and system stability.	8	K2	2
	ii) Explain the performance of 12-pulse converters in power transmission systems, considering factors such as efficiency and harmonics.	8	K2	2
13. a) i)	Analyze the characteristics of converter control and their influence on system performance.	8	K2	3
	ii) Discuss the analysis of firing angle control methods and their impact on converter operation.	8	K4	3
	(OR)			
b) i)	Describe in detail the various techniques for starting and stopping the DC link, considering their impact on system stability and grid integration.	8	K2	3
	ii) Explain the principles of DC link control and their implementation in VSC-based systems.	8	K2	3
14. a)	Explain how Static Var Compensators (SVC) and Static Synchronous Compensators (STATCOM) operate and detail their control strategies.	16	K2	4
	(OR)			
b)	Discuss the design principles and considerations involved in the implementation of AC and DC filters for mitigating harmonic distortion, including types of filters and tuning methods.	16	K2	5
15. a)	Analyze the significance of including constraints in DC system modeling and their impact on power flow analysis.	16	K4	6
	(OR)			
b)	Provide a case study illustrating the application of power flow analysis in a real-world DC system, highlighting the role of constraints and the implications for system operation.	16	K4	6

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VIII [Full Time]

Mechanical Engineering

18MTOE04 – NANO SCIENCE AND TECHNOLOGY

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define the terms Nanoscience and Nanotechnology.	2	K1	1
2. What are quantum dots?	2	K1	1
3. Name the techniques by which Severe Plastic Deformation can be done.	2	K2	2
4. How are graphene synthesized?	2	K3	2
5. What are magnetic polymer nanocomposites?	2	K2	3
6. List a few techniques for consolidation of nanoparticles.	2	K2	3
7. Mention the use of Dynamic Light Scattering technique.	2	K3	4
8. What is nano indentation?	2	K1	4
9. List the applications of fuel cells.	2	K2	5
10. Give any two examples for Smart nanomaterials with their applications.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Discuss the different classes of nanomaterials with examples and applications. Give the advantages and disadvantages of nanomaterials.	16	K2	1
(OR)			
b) Elaborate the properties of carbon nanotubes, graphene, clays and nanowires.	16	K2	1
12. a) With neat sketches, explain the steps in different lithography methods of fabrication of nanomaterials.	16	K1	2
(OR)			
b) With suitable sketches, discuss the procedure for fabrication of nanomaterials by different types of Atomic Layer Deposition technique.	16	K1	2

Q. No		M	BTL	CO
13. a)	Explain in detail the various approaches for the fabrication of CNT-Polymer nanocomposites.	16	K3	3
	(OR)			
b)	Describe the methods of fabrication of Carbon nanotube reinforced metal matrix nanocomposites.	16	K3	3
14. a)	Discuss about the important information that can be obtained from (i) XRD technique and (ii) TEM analysis of nanomaterials sample.	16	K2	4
	(OR)			
b)	Describe the construction and operation of Atomic Force Microscope and discuss the characterization of nanomaterials using AFM.	16	K2	4
15. a)	Give a detailed account on Structural and Biomedical applications of nanomaterials.	16	K1	5
	(OR)			
b)	Enumerate the applications of nanomaterials in the fields of Optics and Electronics.	16	K1	5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: III [Full Time]

Metallurgical Engineering

22MT301 – ELEMENTS OF PHYSICAL METALLURGY

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Draw the unit cells of BCC and BCT crystal systems.	2	K2	1
2. What is meant by i) isotropy and ii) anisotropy?	2	K2	1
3. Give four examples for point defects.	2	K1	2
4. What are tilt boundaries and twist boundaries?	2	K2	2
5. Give some industrial processes/applications where the phenomena of diffusion can be applied.	2	K3	3
6. What is directional solidification process?	2	K3	3
7. Steel is an example for interstitial solid solution, How?	2	K3	4
8. What are intermetallics and give an example?	2	K3	4
9. List the applications of Iron-Carbon phase diagram in the field of metallurgy and materials engineering.	2	K2	5
10. Give the typical carbon percentage of an AISI 1080 grade steel.	2	K3	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Show the atomic arrangements in (111) plane of a face centre cubic structure and show the following directions $[1\bar{1}0]$, $[01\bar{1}]$ and $[1\bar{2}1]$.	16	K2	1
(OR)			
b) Calculate the atomic radius, coordination number and packing factor of SC, BCC and FCC systems.	16	K2	1
12. a) Write a short note on various crystallographic imperfections and their role in material behavior.	16	K1	2
(OR)			
b) What is grain size in metallography and explain the different ways of measuring the grain size of a material?	16	K1	2

Q. No		M	BTL	CO
13. a)	If iron is kept at 1200 K in a carburizing atmosphere for 8 hrs to obtain a carbon concentration of 0.75 at a depth of 0.5 mm. Find the time it would take to reach same carbon concentration at a depth of 0.75 mm at 1250K. (Given $D_0 = 0.2 \times 10^{-4} \text{ m}^2/\text{s}$ and $Q = 143 \text{ kJ/mole/K}$).	16	K4	3
	(OR)			
b)	Give a detailed account on the nucleation and growth processes take place during solidification of liquid metals in sand mould.	16	K4	3
14. a)	Explain the various types of solid solutions with Hume Rothery rules.	16	K4	4
	(OR)			
b)	A binary alloy having 28 wt % Cu and balance Ag solidifies at 779°C . The solid consists of two phases α and β . Phase α has 9 % Cu whereas β phase has 92 % Cu at 779°C . At room temperature these are pure Ag and Cu respectively. Sketch the phase diagram. Label all fields and lines. Melting points of Cu & Ag are 1083°C and 960°C respectively. Estimate the amount of α and β in the above alloy at 779°C and at room temperature.	16	K4	4
15. a)	Draw neat and labeled iron cementite phase diagram and explain the various invariant reactions taking place in iron cementite phase diagram.	16	K3	5
	(OR)			
b)	Explain the transformation of following steels from liquid condition to room temperature with neat sketches.	16	K3	5
	a) 0.4 % Carbon			
	b) 0.8 % Carbon			
	c) 1.2 % Carbon.			

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VIII [Full Time] / V [Part time]

Electrical and Electronics Engineering

18EEP21/22PTEE503 – TOTAL QUALITY MANAGEMENT

(Regulations 2018/2018A/2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Brief on quality statements.	2	K1	1
2. List the barriers to implement TQM.	2	K2	1
3. What is customer retention?	2	K1	2
4. Brief on 5S.	2	K2	2
5. List the seven tools of quality.	2	K1	3
6. Mention the statistical fundamentals required for statistical process control.	2	K3	3
7. Draw the house of quality.	2	K3	4
8. List the reasons for benchmarking.	2	K1	4
9. Give the difference between ISO 9000 and 14000.	2	K2	6
10. How do you perform quality audit?	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Elaborate on Leadership quality and role of senior management. (OR)	16	K1	1
b) Give a detailed view on Deming's philosophy.	16	K1	1
12. a) Give a detailed report on Juran Trilogy and Kaizen. (OR)	16	K2	2
b) Give a detailed report on Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention.	16	K2	2
13. a) Discuss on the concept of six sigma. (OR)	16	K4	3
b) Discuss on the control charts for variables and attributes.	16	K4	3

Q. No		M	BTL	CO
14. a)	Discuss on the TPM Concept.	16	K4	4
	(OR)			
b)	Discuss on the stages of FMEA.	16	K4	4
15. a)	Discuss on the need for all quality systems.	16	K4	5
	(OR)			
b)	Discuss on the elements, implementation of QS, documentation and quality auditing.	16	K4	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: III [Full Time]

Computer Science and Engineering

22CS301/18CS303 – COMPUTER ORGANIZATION AND ARCHITECTURE

(Regulations 2022/2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Give the basic performance equation.	2	K2	1
2. Draw the single bus structure.	2	K3	3
3. State the rules to add two integers.	2	K1	1
4. Differentiate Restoring division from non restoring division.	2	K4	4
5. Define Hazard. List different types of Hazards.	2	K1	1
6. Write the control sequence for execution of the instruction Add (R3), (R1).	2	K3	3
7. Define hit rate and miss penalty.	2	K1	1
8. Compare and contrast between Static and Dynamic RAM.	2	K4	2
9. Write about how interrupt request from multiple devices can be handled.	2	K2	1
10. List the key objective of USB.	2	K1	1

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Explain the basic functional units of a computer with a neat diagram.	8	K2	1
ii) Illustrate different addressing modes with suitable examples.	8	K3	3
(OR)			
b) i) Elaborate on Instruction sequencing.	8	K3	4
ii) Write short notes on Branching.	8	K2	1
12. a) Construct Carry-lookahead adder circuit and explain with an example.	16	K3	3

(OR)

Q. No	M	BTL	CO
b) Apply the following, i. Booth's multiplication techniques for a suitable example. ii. Floating point operations with an example.	16	K3	3
13. a) i) Explain Multiple bus organization with neat diagram.	8	K2	1
ii) Explain basic organization of a micro programmed control unit.	8	K2	1
(OR)			
b) i) Briefly discuss about instruction hazards.	8	K2	1
ii) Elucidate data path and control considerations with neat sketch.	8	K2	1
14. a) i) What is the need of Cache memory? Illustrate different cache mapping techniques with example.	10	K2	1
ii) Highlight the advantages and disadvantages of caching mechanisms.	6	K2	1
(OR)			
b) i) Summarize Virtual memory organization and Address translation technique.	10	K2	1
ii) Describe about reading and writing techniques used in optical disk.	6	K2	1
15. a) i) How will you handle interrupts from multiple devices?	8	K4	2
ii) Discuss Bus Arbitration in DMA.	8	K4	3
(OR)			
b) i) Draw the block diagram of Parallel interface circuits and explain it.	8	K4	3
ii) Compare the features of SCSI and PCI interfaces.	8	K4	2

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV [Part Time]

Civil Engineering

22PTCE403/23PTCE402 – STRUCTURAL ANALYSIS - II

(Regulations 2022/2023)

Time: 3 Hours

Maximum Marks: 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Specify the applications of Betti's theorem.	2	K2	1
2. Give examples for trusses with lack of fit.	2	K2	1
3. Write the assumptions made in slope deflection method.	2	K1	2
4. List the causes of sway in frames.	2	K2	2
5. Define carry over factor.	2	K1	2
6. Write the effects of sinking of supports in continuous beams.	2	K2	2
7. Infer the properties of flexibility matrix.	2	K2	2
8. write the conditions to select force method of analysis.	2	K3	2
9. Compare the relationship between flexibility and stiffness matrix.	2	K2	2
10. Write down the element stiffness matrix for the beam member.	2	K2	2

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) In the truss shown in Fig.1, the member BE is the last member to be fixed and it was found that BE was too long by 1.2 mm. Find the force in BE. Take $A = 1000 \text{ mm}^2$ and $E = 2 \times 10^5 \text{ N/mm}^2$ for all the members.	16	K3	1

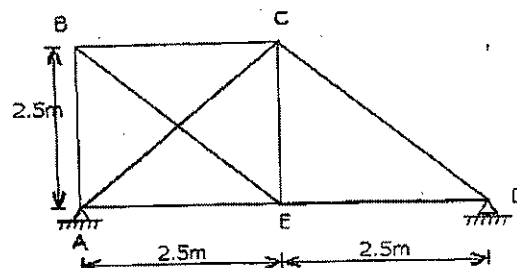


Fig.1

Q. No

M BTL CO

(OR)

- b) Draw the influence line for Moment at B of the continuous beam ABC simply supported at A,B,C using Muller Breslau's principle. AB = 3 m, BC = 4 m. EI is constant.

16 K3 1

12. a) Analyse the continuous beam shown in Fig.2 by slope deflection method and draw the bending moment diagram.

16 K4 2

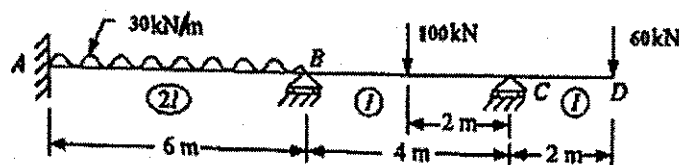


Fig.2

(OR)

- b) Analyse and draw the bending moment diagram for the frame shown in the Fig.3 by slope deflection method take EI is constant for all members.

16 K4 2

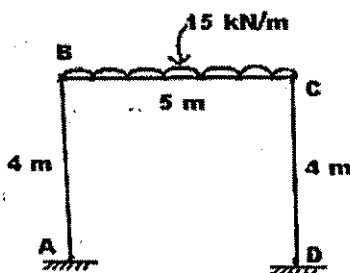


Fig.3

13. a) Analyse the continuous beam shown in Fig.4 by moment distribution method and draw the bending moment and shear force diagram. take EI is constant for all members.

16 K4 2

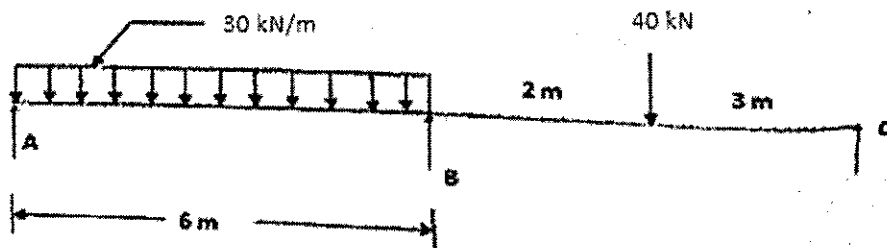


Fig.4

(OR)

Q. No

M BTL CO

- b) Analyse the rigid frame shown in Fig.5 by moment distribution method and draw bending moment diagram.

16 K4 2

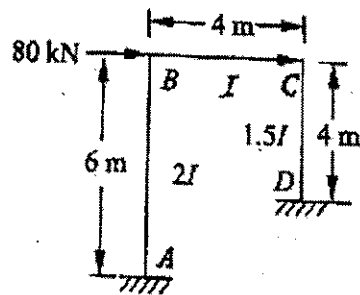


Fig.5

14. a) Analyse the truss loaded as shown in Fig.6 using matrix flexibility method and find the member force. Consider AE is same for all members.

16 K4 2

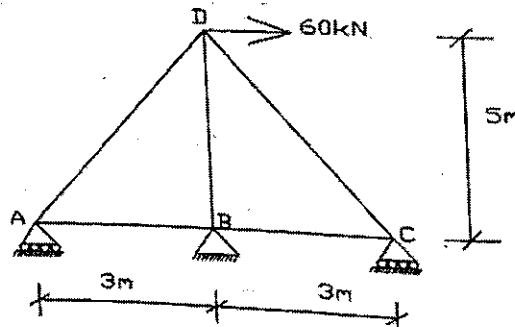


Fig.6

(OR)

- b) Analyse the continuous beam shown in Fig.7 by flexibility method. take EI is constant for all members.

16 K4 2

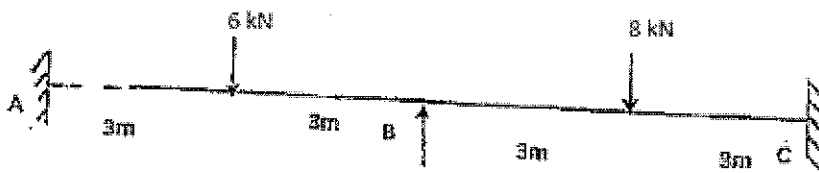


Fig.7

Q. No

M BTL CO

15. a) Analyse the truss shown in Fig.8 by stiffness matrix method
take EI is constant for all members.

16 K4

2

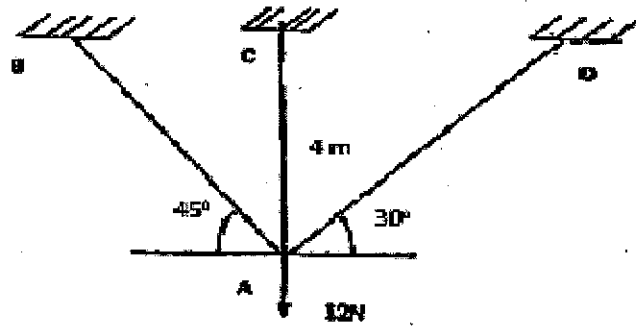


Fig.8

(OR)

- b) Analyse the given frame shown in Fig.9 by stiffness method.

16 K4

5

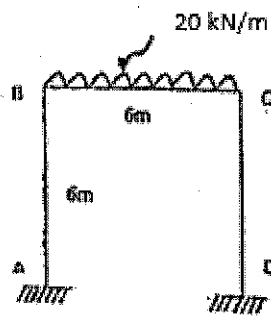


Fig.9

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: V [Full Time]

Civil Engineering

22CE501- BASIC STRUCTURAL ANALYSIS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. When will you get absolute maximum B.M. when the span is loaded with UDL shorter than span?	2	K1	1
2. Draw the influence line for shear force and bending moment at a section 4m from the left end of a simply supported beam of span 6m.	2	K3	1
3. What is degree of redundancy for frames?	2	K1	2
4. State Muller Breslau's Principle.	2	K1	2
5. List the types of Arches.	2	K1	3
6. Find the horizontal thrust of a three hinged parabolic arch of 40 m carrying a point load of 100 kN at point 10m from the left support?	2	K3	3
7. Why stiffening girders are necessary in the suspension bridges?	2	K1	4
8. Find the maximum bending moment at a section 20 m from the left end of the three hinged stiffening girder of span 80 m when a UDL of 6 kN/m, 4 m length crosses the girder.	2	K3	4
9. Define Plastic section modulus.	2	K1	5
10. What is shape function?	2	K1	5

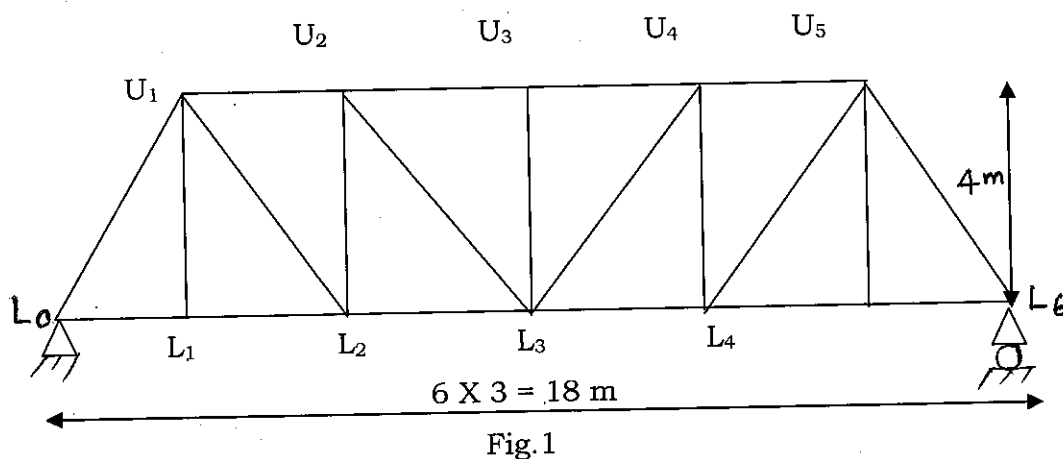
PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) A UDL of load intensity 0.8 kN/m of length 10 m crosses a beam of 48 m. Find the maximum positive and negative shear force and maximum bending moment at 15 m from the left end. Also find the absolute maximum bending moment	16	K3	1

(OR)

Q. No	M	BTL	CO
b) A simply supported beam has a span of 18 m and is subjected to a UDL of 40 kN/m, 5 m long travelling from left to right. Draw the ILD for shear force and bending moment at a section 6 m from left end. Use these diagrams for calculating maximum shear force and bending moment at this section.	16	K3	1
12. a) A two span continuous beam ABC has spans AB = 6 m and BC = 8 m. Construct the influence line diagram for reaction at left support and influence line diagram for bending moment at support B. Compute influence line diagram ordinates at 1m intervals.	16	K3	2
(OR)			
b) Draw the ILD for members $L_0 L_1$, $L_1 U_1$, $U_1 L_2$ and $U_3 L_3$, in a pin jointed frame as shown in Fig.1.	16	K3	2



13. a) A three hinged parabolic arch having span 20 m, Rise 4 m carries a UDL of 30 kN/m over the left half of the span. Draw the BMD. Also find the normal thrust and radial shear at a section 4m from the left support.	16	K3	3
(OR)			
b) A three hinged parabolic arch has a horizontal span of 30 m with a central rise of 5 m. A point load of 10 kN moves across the span from left to right. Calculate the maximum positive and negative moments at a section 8 m from the left hinge.	16	K3	3

Q. No**M BTL CO**

14. a) A suspension cable with 100 m span and 10 m dip is stiffened by a three hinged girder. Two point loads of 400 kN and 600 kN are placed at the distances of 25 m and 50 m from the left end. Find shear force and bending moment in the girder at a section 30 m from the left end.

16 K3 4

(OR)

- b) A cable is used to five equal and equidistant loads over a span of 30 m. Find the length of the cable required and its sectional area if the safe tensile stress is 140 N/mm^2 . The central dip of the cable is 2.5 m and loads are 5 kN each.

16 K3 4

15. a) A uniform beam of span 4m and fully plastic moment M_p is simply supported at one end and rigidly clamped at other end. A concentrated load of 15 kN may be applied anywhere within the span. Find the smallest value of M_p such that collapse would first occur when the load is in its most unfavourable position

16 K3 5

(OR)

- b) A two span continuous beam ABC has span lengths $AB = 8 \text{ m}$ and $BC = 8 \text{ m}$ and carries a UDL of 25 kN/m completely covering the spans AB and BC. A and C are simple supports. If the load factor is 1.70 and the shape factor is 1.2 for the 'T' section, find the section modules needed. Assume yield stress for the material as 250 N/mm^2

16 K3 5

Registration Number :

Government College of Engineering, Salem
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M.E. Degree Examinations – April/May 2025

Semester: II [Full Time]

Structural Engineering

22STC22 – STRUCTURAL DYNAMICS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define logarithmic decrement method.	2	K1	1
2. List the types of Damping.	2	K1	1
3. Compare orthogonality and normality principles.	2	K2	2
4. State fundamental frequency and fundamental mode shape.	2	K1	2
5. Write the general expression of the fourth-order Runge-Kutta method.	2	K2	3
6. List any two advantages of the Wilson- θ method.	2	K2	3
7. State difference between lumped and continuous parameter systems.	2	K2	4
8. Write down the governing differential equation for flexural vibration of continuous system.	2	K2	4
9. State the typical frequencies associated with machinery vibrations.	2	K1	5
10. Name two types of vibrations caused by traffic.	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Derive the equation of motion for SDOF system free vibration and find the solution for a) Under damped system b) Over damped system c) Critically damped system.	16	K3	1
(OR)			
b) A machine of mass one tonne is acted upon by an external force of 2450 N at a frequency of 1500 rpm. To reduce the effects of vibration, isolator of rubber having a static deflection of 2 mm under the machine load and an estimated damping factor = 0.2 are used. Determine a) The force transmitted to the foundation b) The amplitude of vibration of the machine	16	K3	1

Q. No

M BTL CO

12. a) Determine the natural frequency and draw the mode shape for the shear building as shown in Fig.1.

16 K4 2

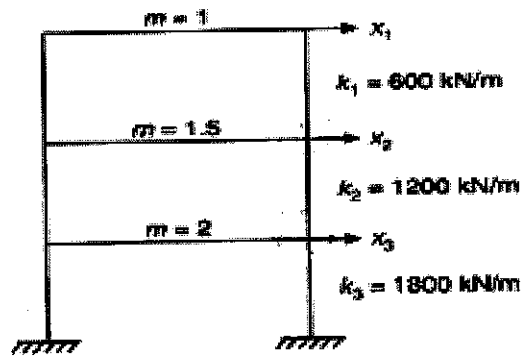


Fig.1

(OR)

- b) Determine the approximate natural frequency of the system as shown in Fig .2 by using Holzer method.

16 K4 2

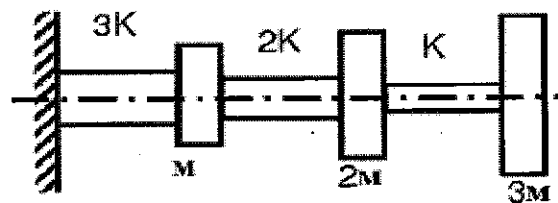


Fig.2

13. a) Compute the response of a SDOF system, which is initially at rest by Newmark's β method. The data in consistent units are, mass $m = 16$, stiffness $k = 144$, $F(t) = 96$, damping $\zeta = 10\%$ of critical.

16 K4 3

(OR)

- b) Using numerical method determine the response of a single degree of freedom system having mass = 150 kg and stiffness 60N/m when subjected to a triangular pulse loading as shown in the Fig.3, the responses are required at an interval of 0.1 s upto 0.2 s.

16 K4 3

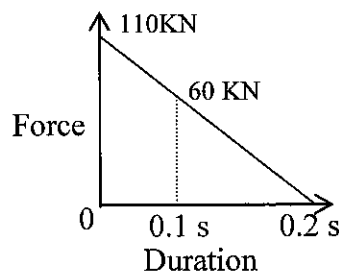


Fig.3

Q. No		M	BTL	CO
14. a)	Derive and formulate the equation of motion of beam element of continuous mass and stiffness subjected to a transverse vibration due to an applied dynamic load and a constant axial force.	16	K4	4
	(OR)			
b)	Derive the natural frequency and mode shape for uniform beam having one end fixed other end simply supported.	16	K4	4
15. a)	i) Explain the dynamic effects of wind loading on tall structures.	8	K2	5
	ii) Explain the impact of blasting and pile driving on existing structures and evaluation method.	8	K4	5
	(OR)			
b)	i) Describe the influence of moving loads on bridges.	8	K4	5
	ii) Explain the principle and types of base isolation systems used in buildings.	8	K2	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time]

Civil Engineering

22CE402 – STEEL STRUCTURAL ELEMENTS

(Regulations 2022)

(use of IS 800-2007 & Steel tables to be Permitted)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define partial safety factor.	2	K1	1
2. What are the different types of loads considered in steel design?	2	K1	1
3. State any two advantages of welded connections over bolted connections.	2	K2	2
4. What is meant by net effective area in tension members?	2	K2	2
5. List the different failure modes of a tension member.	2	K1	3
6. What is a gusset plate? Why is it used?	2	K2	3
7. What is the function of lacing in built-up columns?	2	K2	4
8. Calculate the slenderness ratio of a 3 m long column pinned at both ends and having radius of gyration 40 mm.	2	K3	4
9. Classify the section type for ISMB 250 as per IS 800:2007.	2	K3	5
10. Determine the plastic modulus of a rectangular section 200 mm × 10 mm.	2	K3	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) A truss is subjected to dead load = 30 kN and live load = 60 kN. Calculate the factored loads and explain the concept of limit state design.	16	K3	1
(OR)			
b) Analyze the advantages of limit state design over working stress method with reference to IS 800:2007. Explain the role of partial safety factors and load combinations in structural design.	16	K3	1

Q. No		M	BTL	CO
12. a)	Design a bolted connection using 20 mm black bolts to connect two plates 10 mm thick carrying a factored axial tensile force of 200 kN. Use Fe 410 grade steel.	16	K4	2
	(OR)			
b)	Design a welded connection to join a 150 mm × 10 mm plate to a 200 mm × 10 mm gusset plate to carry 180 kN axial tension. Use shop welding.	16	K4	2
13. a)	Design a single angle tension member 100 mm × 100 mm × 10 mm to carry a factored axial load of 350 kN. The member is connected to a gusset plate using two bolts.	16	K4	3
	(OR)			
b)	A double angle section is used as a tension member to carry a load of 400 kN. Design the tension member considering shear lag effect. Use Fe 410 steel and show all steps.	16	K4	3
14. a)	Design a built-up laced column to carry a factored axial load of 1000 kN. The column is 3 m long and pinned at both ends. Use two ISHB 200 sections placed back-to-back.	16	K4	4
	(OR)			
b)	Design a gusseted base for a column carrying an axial load of 1200 kN. Use M20 concrete and Fe 410 steel.	16	K4	4
15. a)	Design a simply supported beam of 5 m span carrying a UDL of 50 kN/m including self - weight. Assume full lateral support. Use steel grade Fe 410.	16	K4	5
	(OR)			
b)	A simply supported steel beam (ISMB 350) of span 6 m is laterally unsupported. Check for lateral - torsional buckling and determine the safe uniformly distributed load it can carry.	16	K4	5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time]

Computer Science and Engineering

22CS401 – DESIGN AND ANALYSIS OF ALGORITHMS

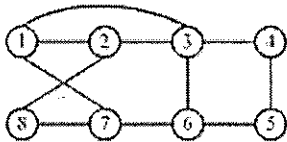
(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What kind of problems are solved by algorithms.	2	K2	1
2. Analyze the statement, "The running time of algorithm A is at most $\Omega(n^2)$," and infer why it is meaningless.	2	K4	1
3. Consider there are 4 jobs with profits {100, 10, 15, 27} and deadline {2, 1, 2, 1} respectively. Find the feasible solution set.	2	K3	2
4. Recall the recurrence relation for MaxMin in terms of $T(n)$.	2	K1	1
5. Interpret the significance of finding optimal binary search tree from a list of possible BST trees for n.	2	K4	2
6. Compare dynamic programming with divide and Conquer approach.	2	K4	3
7. Find Hamiltonian cycle for the following graph	2	K3	3
			
8. Define sum of subsets problem.	2	K1	3
9. State Cook's theorem.	2	K2	2
10. What is LC search in branch and bound problems.	2	K4	2

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Use a recursion tree to determine a good asymptotic upper bound on the recurrence. $T(n) = 3T(\frac{n}{4}) + n^2$. Use the substitution method to verify your answer.	16	K3	1
(OR)			
b) Discuss O , Ω and θ notations with formula graphically. Derive the best, worst and average time complexity for linear search.	16	K3	1

Q. No

M BTL CO

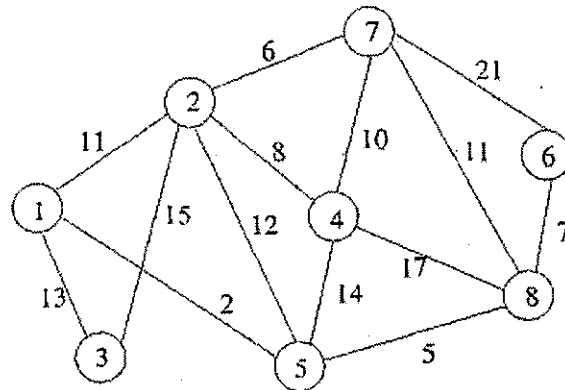
12. a) Sort the list of elements 7, 8, 4, 5, 6, 2, 3, 9, 1 using merge sort. Design an algorithm to perform merge sort and analyze the same.

16 K3 2

(OR)

b) Compute a minimum cost spanning tree for the given using
a) Prim's algorithm and b) Kruskal's algorithm.

16 K3 2



13. a) Consider the initial matrix and find all pairs shortest path using Floyd Warshall algorithm.

16 K2 2

	A	B	C	D	E
A	0	4	∞	5	∞
B	∞	0	1	∞	6
C	2	∞	0	3	∞
D	∞	∞	1	0	2
E	1	∞	∞	4	0

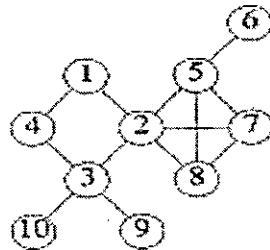
(OR)

b) Consider you have 4 objects, for each object, there's weight and value associated with it as shown in table below. There's a knapsack of capacity 8. Solve this 0/1 Knapsack problem using dynamic programming. Analyze the time complexity of the algorithm.

16 K2 2

OBJECT	WEIGHT	VALUE
1	2	10
2	3	20
3	4	50
4	5	60

Q. No		M	BTL	CO
14. a)	Discuss the steps involved in backtracking algorithms. Solve 8-queens problem using backtracking.	16	K1	3
	(OR)			
b)	Explain graph coloring problem with suitable example. Also derive its complexity	16	K1	3
15. a)	Explain biconnected components of the given graph and show its depth first spanning tree.	16	K4	1



(OR)

b)	Explain NP-hard and NP-complete problems with suitable examples.	16	K4	1

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B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time]

Electronics and Communication Engineering

22EC401 – ANALOG CIRCUITS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Find the frequency of oscillation of a RC oscillator if $R=10k$ and $C=0.1\mu f$.	2	K3	1
2. List the different types of RC and LC oscillators.	2	K1	1
3. Define tuned amplifier.	2	K1	2
4. Differentiate monostable and bistable multivibrator.	2	K3	2
5. The differential gain of differential amplifier is 5000 and the CMRR is 100. Find the common mode gain.	2	K3	3
6. Define thermal drift.	2	K1	3
7. Recall the applications of a Schmitt trigger.	2	K1	4
8. Define the quality factor of a band-pass filter.	2	K1	4
9. Compare R-2R and binary weighted DAC.	2	K2	5
10. Find the values of LSB and MSB for an 8bit DAC for 0V to 10V range.	2	K3	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Draw and explain the block diagram of a general oscillator based on Barkhausen criterion.	16	K2	1
(OR)			
b) Explain how amplitude stabilization is achieved in a Wien Bridge oscillator.	16	K2	1
12. a) i) Explain the working of a single tuned amplifier with a neat circuit diagram and waveform. Differentiate single tuned and synchronously tuned amplifier.	8	K3	2
ii) Illustrate the operation of a collector-coupled astable multivibrator with timing diagrams.	8	K2	2

(OR)

Q. No	M	BTL	CO
b) i) Construct a monostable multivibrator using transistors to produce a pulse width of 1ms using R and C.	8	K3	2
ii) Analyze the efficiency of a Class C tuned amplifier with respect to input drive and load matching.	8	K2	2
13. a) i) Explain the significance of a Widlar current source and derive an expression for the output current.	8	K2	3
ii) State the need for frequency compensation in operational amplifier and explain the dominant pole compensation method.	8	K3	3
(OR)			
b) i) Explain the following modes of operation of a differential amplifier with necessary equations. i) Differential mode ii) Common mode	8	K2	3
ii) Explain the effect of slew rate on the performance of an op-amp circuit. Compute the slew rate of the op-amp in the circuit shown in fig.1 Assume that the input is of large amplitude, high frequency sine wave.	8	K3	3

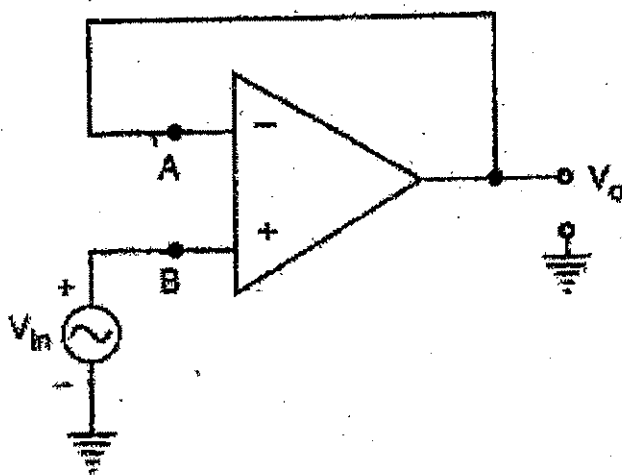


Fig.1

14. a) i) Explain the operation of inverting and non-inverting amplifiers with neat circuit diagrams and derive their gain expressions.	8	K2	4
ii) Interpret a summing amplifier using op-amp that adds three signals. Include circuit diagram and output expression.	8	K2	4

(OR)

Q. No		M	BTL	CO
b)	i) Explain the circuit and operation of a Schmitt Trigger using op-amp. Derive expressions for upper and lower threshold voltages.	8	K2	4
	ii) Outline the working of a band-pass filter using op-amp. Derive the expression for center frequency and bandwidth.	8	K2	4
15. a)	i) Explain the significance of inverted R-2R ladder type DAC network.	8	K2	5
	ii) Explain the working of an ADC suitable for high-speed applications with a neat circuit diagram and truth table.	8	K2	5
	(OR)			
b)	i) Explain the operation of a flash type ADC with a neat block diagram.	8	K2	5
	ii) Show the functional block diagram of a 555 timer and describe its working principle.	8	K2	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time]

Mechanical Engineering

22ME402 – THERMAL ENGINEERING

(Regulations 2022)

(Use of standard thermodynamic tables, Mollier diagram, Psychrometric chart
and Refrigerant property tables are permitted)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What are the assumptions made in Air Standard Cycles?	2	K1	1
2. Draw the Diesel cycle on P-v and T-s planes and mention the four thermodynamic processes involved.	2	K2	1
3. List the types of steam nozzles.	2	K1	2
4. Write energy conversion process in the steam Turbines.	2	K2	2
5. Write two main difference between reciprocating and rotary compressors.	2	K2	3
6. Define free air delivery.	2	K1	3
7. Differentiate humidification process from dehumidification process.	2	K2	4
8. Mention any four psychrometric properties.	2	K1	4
9. List out the main components in vapour compression refrigeration system.	2	K1	5
10. What are effects of superheating in vapor compression Refrigeration system.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) In an air standard Otto cycle the pressure and temperature at the beginning of the cycle is 42° C and 0.1 MPa. The compression ratio and maximum temperature of the cycle are 8 and 1250 °C respectively. Find (a) the temperature and pressure at the cardinal points of the cycle (b) heat supplied per kg of air (c) work done per kg of air (d) cycle efficiency and (e) the m.e.p of the cycle. Also draw P V and Ts diagram of this cycle.	16	K3	1

(OR)		M	BTL	CO
Q. No				
b)	Explain the Dual cycle with P-v and T-s diagram and derive the expression for air standard efficiency of the Diesel cycle.	16	K3	1
12. a)	Dry saturated steam of pressure 10 bar is expanded in a nozzle to a pressure of 0.7 bar. With the help of Mollier diagram find the velocity and dryness fraction of steam issuing from the nozzle, and friction is neglected. Also find the velocity and dryness fraction of the steam, if 15% of the heat is lost in friction.	16	K3	2
(OR)				
b)	Briefly explain the working principle of impulse turbine with neat sketch and discuss about its limitations, advantages.	16	K3	2
13. a)	A single acting reciprocating air compressor has cylinder diameter and stroke of 200 mm and 300 mm respectively. The compressor sucks air at 1 bar and 27° C and delivers at 8 bar while running at 100 r.p.m. Find: 1. Indicated power of the compressor 2. Mass of air delivered by the compressor per minute and 3. Temperature of the air delivered by the compressor. The compression follows the law $pv^{1.25} = C$. Take R as 287 J/kg K.	16	K3	3
(OR)				
b)	Derive the expression for finding out the optimum intermediate pressure in a two stage reciprocating air compressor.	16	K3	3
14. a)	Following data refers to an air conditioning system to be designed for an industrial process for hot and wet climate: Outside conditions = 30°C DBT and 75% RH Required inside conditions = 20° C DBT and 60% RH The required condition is to be achieved first by cooling and dehumidifying and then by heating. If 20 m³ of air is absorbed by the plant every minute. Find: 1. capacity of the cooling coil in tonne of refrigeration; 2. capacity of the heating coil in kW and 3. amount of water removed per hour	16	K4	4

(OR)

Q. No	M	BTL	CO
b) A theatre of 1200 seating capacity is to be air conditioned for summer conditions with the following data Outdoor conditions 30°C DBT and 55% RH Required conditions 20°C DBT and 60% RH Amount of air supplied 0.25 m ³ / min / person Find the sensible heat, latent heat removed from the air per minute and sensible heat factor for the system.	16	K4	4
15. a) Describe the working of vapour compression refrigerator system, Where the condition of refrigerant is superheated.	16	K2	5
(OR)			
b) Explain the working principle of vapour absorption system with suitable sketch and discuss about the advantages over vapour compression system.	16	K2	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time]

Metallurgical Engineering

22CY401 – NON-METALLIC MATERIALS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Identify the various types of polymers based on structure.	2	K3	1
2. State degree of polymerization.	2	K1	1
3. Interpret the strength of the polymer.	2	K2	2
4. Define ceramics.	2	K1	2
5. Identify the uses of Obscured glass.	2	K3	3
6. Write the preparation of silicon carbide.	2	K2	3
7. Spell the load withstand for iso-strain condition.	2	K1	4
8. What is the advantage of prepreg fabrication.	2	K1	4
9. Recall Dispersoids.	2	K2	5
10. Summarise some examples for particle reinforced composites.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Analyze the free radical, cationic and anionic mechanism of addition Polymerization reaction.	16	K4	1
(OR)			
b) Inspect the addition and condensation polymerization and compare their characteristics.	16	K4	1
12. a) Outline the important behaviors of the polymers.	16	K2	2
(OR)			
b) Summarize the application of polymers in Medicine, Space, Agriculture and Automobiles.	16	K2	2

Q. No		M	BTL	CO
13. a)	Recall the preparation, properties and uses of Float glass and Laminated glass.	16	K1	3
	(OR)			
b)	Show the manufacturing of glass through Blowing and Rolling methods.	16	K1	3
14. a)	Categorize the polymers based on reinforcement and matrix	16	K4	4
	(OR)			
b)	Organize the application of FRP.	16	K4	4
15. a)	Illustrate the powder metallurgy technique of production of particle reinforced composites.	16	K3	5
	(OR)			
b)	Explain the vacuum bag molding and autoclave methods of manufacturing of laminar composites.	16	K3	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV [Part Time]

Electronics and Communication Engineering

23PTEC402 – DIGITAL SIGNAL PROCESSING

(Regulations 2023)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Draw the basic butterfly diagram of Radix-2 DIF algorithm.	2	K1	1
2. Calculate the number of multiplications required in the calculation of direct DFT and Radix 2 FFT for an 8 point sequence.	2	K3	1
3. What is the main characteristic of the magnitude response of a Butterworth filter, and how does it differ from a Chebyshev filter?	2	K2	2
4. Draw a basic block diagram of a second-order IIR filter using direct form-I structure.	2	K1	2
5. Why Hamming window is preferred over the rectangular window in FIR filter design? State one advantage.	2	K2	3
6. Draw a basic structure of a 3-tap FIR filter using direct form.	2	K1	3
7. What are limit cycle oscillations in IIR filters, and how are they caused by product round-off?	2	K2	4
8. Give the advantage of finite word length in DSP.	2	K1	4
9. Write about pipelining operation of TMS320C54X processor.	2	K2	5
10. What do you understand by the term interpolation and decimation in digital signal processing?	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Define the Discrete Fourier Transform (DFT). List and explain four important properties of DFT Find the 4 point DFT of the sequence $x(n) = \{1, 2, 3, 4\}$ using DFT formula.	16	K3	1

(OR)

Q. No	M	BTL	CO
b) Perform circular convolution between the two sequences $x(n)=\{1,1,2,2\}$ and $h(n)=\{1,2,1,2\}$ using DFT and perform IDFT algorithm on the circular convoluted output and verify .	16	K3	1
12. a) Convert an analog low pass filter with transfer function, $H(s) = \frac{1}{s^2 + 3s + 2}$ to its digital equivalent using the bilinear transformation method with sampling period $T=1$ second. Sketch the frequency response and discuss.	16	K4	2
(OR)			
b) Given, $H(z) = \frac{1+0.5z^{-1}}{1-0.3z^{-1}+0.2z^{-2}}$ Realize the above system in Direct Form I and Direct Form II structures and Compare memory requirements and delay elements in both forms.	16	K4	2
13. a) Develop a linear phase FIR high pass filter using Hanning window with cut off frequency $\omega_c = 0.6\pi$ rad/sample and $N=9$.	16	K3	3
(OR)			
b) Develop a filter with, $H_d(e^{jw}) = \begin{cases} e^{-j4w} & \pi/2 \leq w \leq \pi \\ 0 & \text{otherwise} \end{cases}$ Use a Hamming window with $N=7$.	16	K3	3
14. a) Define quantization error. Derive the expression for quantization noise variance assuming a uniform distribution also discuss about the impact of quantization error on signal-to-noise ratio (SNR) and suggest a method to minimize the quantization error in DSP systems.	16	K2	4
(OR)			
b) Explain in detail about: i) Truncation and rounding in quantization with example ii) Limit cycle oscillation.	16	K2	4
15. a) Draw the architecture of TMS320C54X processor and explain in detail about the on-chip Peripherals, also discuss the salient features of TMS320C54X.	16	K2	5
(OR)			
b) List the various addressing modes in TMS320C54X processor and brief about each addressing mode with suitable example.	16	K2	5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time] / II & III [Part Time]

Electrical and Electronics Engineering

22EE402/22PTEE203/23PTEE304 – MEASUREMENTS AND INSTRUMENTATION

(Regulations 2022/2023)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. List the basic functional elements of an instrument.	2	K1	1
2. Compare Moving coil with Moving iron Instruments.	2	K2	1
3. Define creeping in energy meter and tell how it is minimized?	2	K1	2
4. "A current transformer secondary should not be open circuited"- Justify the statement.	2	K2	2
5. With the diagram, write the balanced equation of Wheatstone bridge.	2	K1	3
6. Name the bridges for measuring unknown resistance, self-inductance, capacitance and frequency.	2	K1	3
7. What are the main parts of analog cathode ray tube?	2	K1	6
8. A 3-1/2 digit voltmeter is used for measurement. Examine its resolution and tell how it would display a reading of 12.57V in 100V scale.	2	K2	4
9. Classify the types of transducers with example.	2	K2	5
10. What are the components in a smart sensor?	2	K1	6

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Analyze in detail the types of errors and how to minimize errors in instrument during measurement.	8	K4	1
ii) An electric current of 3 Ampere is flowing through a resistance of 10Ω. It was found that the resistance was 0.2% greater than what was specified as rated and the ammeter measurement was 0.5% more than the true value. Determine the relative error in power measurement.	8	K4	1

Q. No		M	BTL	CO
	(OR)			
	b) Explain the working principle of PMMC Instrument. And also illustrate the procedure to convert PMMC into a DC ammeter and voltmeter.	16	K4	1
12. a)	i) Discuss the construction and the working principle of electro dynamometer type wattmeter.	8	K2	2
	ii) Explain the functional blocks and working of a digital frequency meter.	8	K2	2
	(OR)			
b) i)	Discuss with circuit diagram, describe the working of single phase electro dynamometer type power factor meter.	8	K2	2
	ii) Describe the construction details and working of a single phase induction type energy meter with a sketch.	8	K2	2
13. a) i)	Draw a neat diagram of Kelvin double bridge and explain how to measure low resistance.	8	K4	3
	ii) With necessary circuit and equation explain how Hay's bridge is used to determine the unknown inductance.	8	K2	3
	(OR)			
b) i)	Explain how the inductance is measured in terms of known Capacitance using Maxwell's bridge. Compose the conditions for balance.	8	K4	3
	ii) Describe how a schering bridge is used to measure dielectric loss and power factor of a capacitor.	8	K2	3
14. a) i)	With the circuit diagram, describe the principle of operation of crompton range DC potentiometer.	8	K2	4
	ii) Explain the principle of operation of Drysdale polar potentiometer with the circuit diagram,	8	K2	4
	(OR)			
b) i)	Explain the functional blocks of DSO and write the advantage over analog CRO.	8	K2	4
	ii) Describe the working of digital multi meter with a block diagram.	8	K2	4
15. a) i)	Explain how a Hall Effect transducer is used to measure electric current with a schematic representation.	8	K2	5
	ii) Describe Bourdon tube gauge transducer with a diagram to measure the pressure.	8	K2	5
	(OR)			

Q. No		M	BTL	CO
b) i)	Describe the construction and working of potentiometer type resistance transducer for measuring linear displacement.	8	K2	5
ii)	Write a detailed technical note on smart sensors. Also explain the various built-in features of them compared to conventional sensors.	8	K2	5

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B.E. Degree Examinations – April/May 2025

Semester: III /IV [Part Time]

Mechanical Engineering

22PTME301 /23PTME401- ENGINEERING METROLOGY AND INSTRUMENTATION

(Regulations 2022/2023)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Contrast repeatability and reproducibility.	2	K2	1
2. While taking measurements, the operator is often advised to use of an instruments in the middle third of its range. Why?	2	K2	1
3. What is difference between gauging and measurements?	2	K2	2
4. A 100 mm sine bar was used to measure the taper angle of the specimen and the gauge block was 5.055 mm. Calculate the taper angle.	2	K3	2
5. Name the various methods for measuring pitch diameter.	2	K1	3
6. Calculate the “best size wire” for checking a effective diameter of a M10 X 2.5 thread.	2	K3	3
7. Name the different types of interferometers.	2	K1	4
8. Why monochromatic light used in an interferometer instead of white light?	2	K1	4
9. Contrast between force and torque.	2	K2	5
10. Examine how flow in a draft is measured?	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Describe briefly about, i) Sensitivity ii) Readability iii) Calibration.	8	K2	1
ii) What is the need of calibration? Explain the classifications of various standards.	8	K2	1

(OR)

Q. No		M	BTL	CO
b)	i) Explain the various errors in measurements.	8	K2	1
	ii) Explain the characteristics of line standard and end standard with suitable example. And also how to transfer from line standard to end standard with example.	8	K2	1
12. a)	i) With suitable sketches, Identify and explain measurements of straightness using suitable method.	8	K2	2
	ii) Calculate the tolerances, fundamental deviations and limits of sizes for the shaft designated as 40H8/f7. Standard tolerance for IT 7 is 16i and IT 8 is 25i. Where 'i' is the standard tolerance unit. Upper deviation for 'f' shaft is -5.5D ^{0.41} , 40 mm lies in the diameter range 30-50 mm.	8	K4	2
	(OR)			
b)	i) Explain the construction and working principle of vernier bevel protractor with neat sketch.	8	K2	2
	ii) Design a workshop type progressive type Go-Not-GO plug gauge suitable for 25H7, with following information:	8	K4	2
	i) 25 mm lies in the diameter step of 18-30 mm			
	ii) $i = 0.45 \sqrt[3]{D+0.001D}$			
	iii) IT7 = 16i.			
13. a)	i) Explain gear tooth vernier method of measuring the gear tooth thickness.	8	K2	3
	ii) Derive the expression for the tooth thickness of the gear by using gear tooth vernier caliper.	8	K2	3
	(OR)			
b)	i) Explain various orders of geometrical irregularities with example.	8	K2	3
	ii) How will you test the straightness using Spirit level and autocollimator?	8	K2	3
14. a)	i) Explain the working principle of laser scanning gauge.	8	K2	4
	ii) Sketch and interpret the different pattern of interference bands observed through optical flats for the following: i) A perfectly flat surface ii) A concave surface iii) A convex surface iv) A block with beveled edge v) A gauge block with edges rounded off.	8	K2	4
	(OR)			
b)	i) What is the significance of CMM? How Gears are measured using CMM?	8	K2	4

Q. No		M	BTL	CO
	ii) Sketch and describe the optical system used in Michelson interferometer and also explain the method of checking the height of the component with the help of optical flat.	8	K2	4
15. a)	i) Explain the working principle of an electrical resistance thermometer.	8	K2	5
	ii) How metallic strips are used for temperature measurements? (OR)	8	K2	5
b) i)	Explain the following with neat sketch.	8	K2	5
	i) Pitot Tube			
	ii) Optical Pyrometer			
	iii) Thermistors			
	ii) Air is randomly moving inside a control volume. How do you measure the air movement?	8	K2	5

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M.E. Degree Examinations – April/May 2025

Semester: II [Full Time]

Computer Aided Design

22CDC22 – MECHANICAL VIBRATIONS AND ACOUSTICS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
1.	Write the response equation for forced vibration with two degree freedom.	2	K2	1
2.	Give an example of damped vibration system	2	K2	1
3.	Differentiate between stiffness coefficient and influence coefficient.	2	K3	2
4.	Mention the advantages of Holzers method.	2	K3	2
5.	Give any two examples for vibrations in string.	2	K1	3
6.	Highlight your views on auto and cross correlation function	2	K3	3
7.	Mention the need of condition monitoring.	2	K2	4
8.	Write about untuned viscous dampers.	2	K3	4
9.	Can you identify three types of acoustic field?	2	K3	5
10.	Define sound transmission coefficient of a wall.	2	K3	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
11. a)	Discuss in detail different types of damping encountered by the vibrating systems. Elaborate the free response behavior of single degree freedom vibration under the following conditions. 1) over damped 2) critically damped 3) under damped	16	K3	1

(OR)

Q. No

M BTL CO

- b) An underdamped shock absorber is to be designed for a motorcycle of mass 200 kg Fig. 1(a). When the shock absorber is subjected to an initial vertical velocity due to a road bump, the resulting displacement-time curve is to be as indicated in Fig. 1(b). Find the necessary stiffness and damping constants of the shock absorber if the damped period of vibration is to be 2 s and the amplitude x_1 is to be reduced to one-fourth in one half cycle (i.e., $x_{1.5} = x_1/4$). Also find the minimum initial velocity that leads to a maximum displacement of 240 mm.

16 K3 1

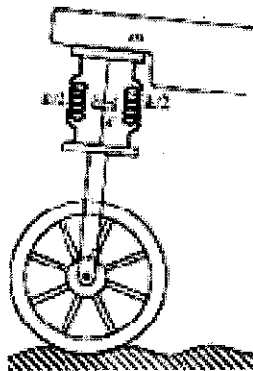


Fig.1(a)

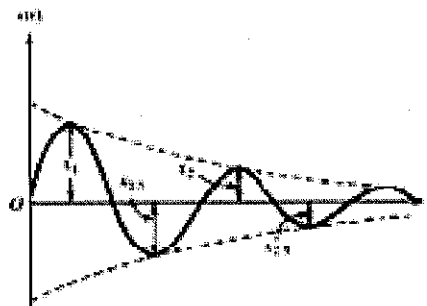


Fig.1(b)

12. a) Determine the natural frequencies and principal modes of vibration for the spring-mass system as shown in fig. 2 by matrix iteration method.

16 K3 2

$m_1 = 100$ kg, $m_2 = 200$ kg and $m_3 = 300$ kg, $k_1 = 2$ kN/m, $k_2 = 1.5$ kN/m and $k_3 = 2$ kN/m.

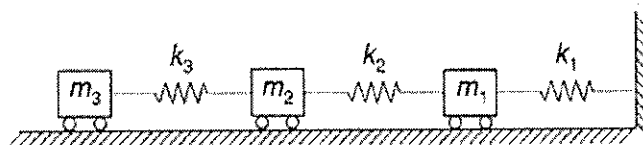


Fig. 2

(OR)

- b) Prove the orthogonal character of Eigen vectors. Obtain the flexibility influence coefficient matrix for simply supported beam of flexural strength EI and span L subjected to two point loads, one at mid span and other at $1/4$ th span from left support.

16 K3 2

Q. No		M	BTL	CO
13. a)	Explain the response of a single degree of freedom system to a step input using Duhamel's integral, Illustrate with a neat sketch and example.	16	K2	3
	(OR)			
b)	Discuss in detail free, forced and transient vibrations with example.	16	K2	3
14. a)	A displacement type vibration measuring instrument is mounted on a machine running at 1000 rpm. The natural frequency of the instrument is 20 rad/s. The instrument records a relative amplitude of 0.5 mm, Calculate the displacement, velocity and acceleration of the machine. Damping in the instrument is neglected	16	K3	4
	(OR)			
b)	Detail about the role of all components in the vibration exciters. Compare it with similar one.	16	K3	4
15. a)	Explain with a block diagram the principle of working of a sound meter. Mention advantages of using it.	16	K2	5
	(OR)			
b)	Explain the functions of noise absorbers and noise control.	16	K2	5

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Government College of Engineering, Salem
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M.E. Degree Examinations – April/May 2025

Semester: II [Full Time]

Communication Systems

22COC22 – ADVANCED DIGITAL SIGNAL PROCESSING

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. How does the PSD of a white noise process influence filtering behavior?	2	K2	1
2. How can the stability of an ARMA process be determined using its poles?	2	K1	1
3. How does the length of a finite signal affect spectral resolution?	2	K2	2
4. What is the significance of the signal and noise subspaces in the MUSIC algorithm?	2	K2	2
5. What is the principle behind the least squares method?	2	K1	3
6. Why are lattice filters preferred in adaptive filtering?	2	K2	3
7. Why is Newton's method considered a second-order optimization technique?	2	K2	4
8. Define echo canceller.	2	K1	4
9. What happens to the sampling rate when a signal is decimated by a factor D?	2	K1	5
10. Define Quadrature Mirror Filter and its applications.	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Explain in detail about: i) Random process ii) Ergodic process	8	K2	1
ii) Explain Autocorrelation and bring out the properties of Auto Correlation.	8	K2	1

(OR)

Q. No		M	BTL	CO
b) i)	Show the derivation for Yule walker equation for ARMA, AR and MA models.	10	K2	1
ii)	Explain Wiener Khintchine relation.	6	K2	1
12. a) i)	Explain with necessary equations Bartlett method of estimating the spectrum with neat sketch.	10	K2	2
ii)	What is the basic principle of parametric methods in power spectral estimation? Discuss briefly various techniques in parametric method.	6	K2	2
(OR)				
b) i)	Describe the MA and ARMA models for power spectrum estimation.	10	K2	2
ii)	Compare and Contrast the Bartlett, Welch and Blackman Tukey methods of power spectrum estimation.	6	K2	2
13. a) i)	Derive the Wiener-Hopf equations for a non-causal IIR Wiener filter.	10	K2	3
ii)	Explain the concept of Pade Approximation and derive the expression for Pade approximants.	6	K2	3
(OR)				
b) i)	Explain Forward and backward linear prediction with an example.	10	K2	3
ii)	Explain the need for the Extended Kalman Filter in non-linear systems.	6	K2	3
14. a) i)	Describe using appropriate equations how weight update is implemented in steepest descent algorithm, LMS and normalized LMS algorithms.	10	K3	4
ii)	Explain sliding window RLS.	6	K2	4
(OR)				
b) i)	Derive the Recursive Least Squares (RLS) adaptive algorithm from the least squares cost function.	10	K3	4
ii)	How noise cancellation is achieved using adaptive filter.	6	K2	4
15. a) i)	Explain decimation and interpolation with appropriate equations and plots for the output signals both in time and frequency domain.	10	K2	5
ii)	Summarize multirate signal processing, with applications.	6	K2	5
(OR)				
b) i)	Explain in detail about subband coding of speech signals.	10	K2	5
ii)	Explain with neat block diagram the implementation of Quadrature mirror filter bank.	6	K2	5

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M.E. Degree Examinations – April/May 2025

Semester: II [Full Time]

Power Electronics and Drives

22PEC22 – MODERN ELECTRICAL DRIVES

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Identify any four applications of high speed drives.	2	K1	1
2. Write the different types of motor duty.	2	K1	1
3. What principle implies in converter fed DC drive?	2	K2	2
4. What type of braking is preferred for DC Drive? Why?	2	K2	2
5. What is called rotating magnetic field? Write its mathematical expression?	2	K2	3
6. Specify the constant torque and constant power operating regions in induction motor drive.	2	K2	3
7. Identify how the three phase induction motor drive is analogous to DC drive.	2	K2	4
8. Write the salient features of direct torque control (DTC) for induction motor drive.	2	K1	4
9. Draw the equivalent circuit of cylindrical rotor type synchronous motor.	2	K2	5
10. Distinguish between brush and brushless excitation in synchronous motor.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Derive the speed-torque equation of separately excited DC motor and examine the different speed control methods with its speed-torque characteristics. Specify the speed control region in constant torque and power operations.	16	K2	1

(OR)

Q. No	M	BTL	CO
b) Derive the fundamental torque equation of motor-load system and explain the four quadrant speed control operation in an electrical drive driving a hoist load.	16	K2	1
12. a) Develop the power circuit for separately excited DC motor drive in two quadrant mode operation and explain its operation with suitable waveforms. Also derive its speed-torque expression in continuous conduction mode.	16	K3	2
(OR)			
b) Develop the power circuit for single phase dual converter fed separately excited DC motor drive and explain its operation with speed-torque characteristics.	16	K3	2
13. a) From the fundamental principles, derive the per-phase equivalent circuit and torque expression for three phase induction motor?	16	K3	3
(OR)			
b) Examine the operating regions of torque-speed curves for a variable speed induction motor drive with a variable-frequency, variable-voltage AC supply with v/f control.	16	K3	3
14. a) Draw the block diagram for direct vector control for three phase induction motor drive with rotor flux orientation and explain its principle of control with phasor diagram.	16	K2	4
(OR)			
b) Develop the control strategy of direct torque and flux control for three phase induction motor drive and explain its control principle with stator flux vector diagram.	16	K2	4
15. a) Explain the principle of self-control for synchronous motor drive in detail with necessary illustrations. Compare self control with v/f control.	16	K2	5
(OR)			
b) Draw the schematic diagram for load commutated wound-field synchronous motor drive employing current fed inverter and explains its operation with phasor diagrams in motor and regeneration modes.	16	K2	5

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M.E. Degree Examinations – April/May 2025

Semester: II [Full Time]

Thermal Engineering

22THC22 – COMPUTATIONAL FLUID DYNAMICS FOR THERMAL SYSTEMS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. List the fundamental governing equation of fluid dynamics.	2	K1	1
2. List the different stages of CFD simulation process.	2	K1	1
3. What are the stability criteria for explicit and semi implicit schemes?	2	K1	2
4. Interpret the difference between finite volume and finite element method?	2	K2	2
5. List any two differences between implicit and explicit method.	2	K1	3
6. What are the advantages of upwind differencing.	2	K1	3
7. What is the main objective of using pressure-based algorithms like SIMPLE in solving incompressible flow equations?	2	K1	4
8. Distinguish between the SIMPLE and SIMPLER algorithms in the context of pressure-velocity coupling.	2	K3	4
9. List the three major classifications of turbulence modelling technique.	2	K1	5
10. What are the advantages and disadvantages of κ - ϵ model?	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Construct partial differential equations (PDEs) relevant to fluid flow problems into elliptic, parabolic, and hyperbolic types. Explain the distinguishing characteristics of each type with reference to their physical significance in fluid mechanics. Additionally, describe the types of boundary conditions typically associated with these flow problems.	16	K3	1

(OR)

Q. No	M	BTL	CO
b) A large plane wall of thickness $L=2$ cm has a constant thermal conductivity $k=0.5$ W/m. K. The wall is subjected to a uniform internal heat generation of 1000 kW/m ³ . The temperature at the left and right boundaries of the wall are maintained at 100°C and 200°C , respectively. Assume one-dimensional, steady-state heat conduction and use the finite difference method (FDM) with 4 equal divisions to determine the temperature distribution within the wall.	16	K3	1
12. a) Solve for the steady-state temperature distribution in a rectangular fin of length 2 cm, thickness 2 mm, and width 20 cm using the finite volume method with 5 equal control volumes. The fin is attached to a plane wall maintained at a temperature of $T_w=200^{\circ}\text{C}$, and it dissipates heat to an ambient environment at $T_{\infty}=25^{\circ}\text{C}$. The thermal conductivity of the fin material is $k=45$ W/m.K, and the convective heat transfer coefficient is $h=15$ W/m ² .K. Assume the tip of the fin is insulated.	16	K3	2
(OR)			
b) Develop the finite difference scheme to approximate the two-dimensional steady-state heat conduction equation given below, using the line-by-line approach combined with the under-relaxation technique: $k([\partial^2 T / \partial x^2] + [\partial^2 T / \partial y^2]) + Q = 0$	16	K3	2
13. a) Build a the steady-state one-dimensional convection-diffusion equation for a scalar property ϕ , given by: $d/dx (\rho u \phi) = d/dx (\Gamma d\phi/dx)$ Using the control volume approach, Dissect the above equation and obtain the expressions for the neighboring coefficients using the following schemes: 1. Central Difference Scheme (CDS) 2. Upwind Difference Scheme (UDS)	16	K3	3
(OR)			

Q. No		M	BTL	CO
b)	Apply the finite volume discretization for the steady one-dimensional convection-diffusion equation of a scalar property ϕ , given by: $d/dx (\rho u \phi) = d/dx (\Gamma d\phi/dx)$. Using the QUICK scheme, perform the integration of the above equation over a control volume and develop the corresponding finite volume formulations for the following two cases: 1. $u_e, u_w < 0$ 2. $u_e, u_w > 0$	16	K3	3
14. a)	Model and explain the steps involved in the SIMPLE algorithm to solve the incompressible Navier-Stokes equation in two – dimensions indexing using a finite volume grid. (OR)	16	K3	4
b)	Develop the discretized equations for velocity corrections (u_c) and pressure correction, and explain the sequence of solution steps involved in the SIMPLE (Semi-Implicit Method for Pressure Linked Equations) algorithm.	16	K3	4
15. a)	Outline the derivation of the k- ϵ two-equation turbulence model and interpret the physical significance of each term in the resulting equations. (OR)	16	K2	5
b)	Explain the features of 1) k- ϵ turbulence model and 2) k- ω turbulence model.	16	K2	5

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M.E. Degree Examinations – April/May 2025

Semester: II [Full Time]

Welding Technology

22WTC22 – WELDING METALLURGY

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Write the steps to calculate the HAZ from peak temperature equations.	2	K2	1
2. List the effects of hydrogen during welding.	2	K1	1
3. Write the causes of cold cracking.	2	K3	2
4. Show all weld metal test. What is its significant?	2	K3	2
5. What is lamellar tearing?	2	K2	3
6. Recall how the excessive weaving reduce strength of the Q & T steel weld.	2	K2	3
7. What is weld decay?	2	K1	4
8. How Schaeffer diagram useful in the welding of austenitic stainless steel.	2	K3	4
9. Give typical preheat and post heat for cast iron.	2	K2	5
10. Name few common grades of Nickel based alloys.	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Discuss effect of welding parameters on heat distribution with neat sketch.	16	K2	1
(OR)			
b) Explain gas/metal and slag/metal reactions with neat sketch.	16	K2	1
12. a) List the welding defects. Elaborately discuss the Causes and remedies of any four defects with neat sketch.	16	K2	2
(OR)			
b) What are the causes of hot cracking? Explain any three hot cracking tests with neat sketch.	16	K2	2

Q. No		M	BTL	CO
13. a)	i) Name the different types of carbon steels and their weldability.	8	K4	3
	ii) Why is preheating and post heating required? What is its function?	8	K4	3
	(OR)			
b) i)	Define weldability and how carbon affects weldability of steels.	8	K4	3
	ii) Give the weldability of 100 x 50 x 10 mm ³ 9Cr –1Mo steel.	8	K4	3
14. a) i)	Name and explain the welding problems encountered in ferritic stainless steel.	8	K1	4
	ii) How is the measurement of delta-ferrite done?	8	K1	4
	(OR)			
b) i)	What precautions are required in welding austenitic stainless steel?	8	K1	4
	ii) What are the procedures and parameters used?	8	K1	4
15. a) i)	Explain the MIG welding of aluminium.	8	K3	5
	ii) Enumerate the weld defects in aluminium, and the recommended remedial steps for each.	8	K3	5
	(OR)			
b) i)	What is the metallurgical problems encounter during dissimilar welding?	8	K3	5
	ii) Discuss the methods of dilution with its calculations.	8	K3	5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: I [Full Time]

Mechanical Engineering

12CS101 – COMPUTER CONCEPTS AND C PROGRAMMING

(Regulations 2012)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

1. List out few input and output devices.
2. Convert decimal to octal: $(243)_{10}$.
3. Differentiate flowchart and algorithm.
4. What is an identifier? Give example.
5. Mention the different types of operators in C.
6. Difference between while and do-while loop.
7. How to declare and initialize an array in C?
8. What are the operations of string?
9. What is the relation between the operators & and * in C pointers?
10. Mention the key difference between structures and unions.

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M
11. a) Explain in detail about the generations of a computer.	(16)
(OR)	
b) Explain in detail about the types of networks and LAN topologies.	(16)
12. a) i) Write a pseudocode to find the sum and average of given three numbers.	(8)
ii) Draw the flowchart and write a C program to compute simple interest.	(8)
(OR)	
b) i) Write an algorithm to find the area and perimeter of a circle.	(8)
ii) Write a C program that compute the size of int, float, double and char variables.	(8)

Q. No		M
13. a)	i) Implement a C program to find the reverse of an integer number and check whether it is a palindrome or not.	(8)
	ii) Show how break and continue statements are used in C program with example.	(8)
	(OR)	
b) i)	Write a C program to find the factorial of a number using do-while, where the number 'n' is entered by user.	(8)
	ii) Explain about the conditional operator and bitwise operator with example.	(8)
14. a) i)	Explain about the initialization of two dimensional array with an example.	(8)
	ii) Write a program to read and display n numbers using an array in C.	(8)
	(OR)	
b) i)	Explain the classification of user defined function based on parameter passing and return type with examples.	(8)
	ii) Write a C program to swap two numbers using function.	(8)
15. a) i)	Write a C program to store and print name, register number subject and marks of student using structure.	(10)
	ii) Write short notes on the difference between array and structure.	(6)
	(OR)	
b) i)	Write a C program to find the sum and mean of all elements in an array using pointers.	(10)
	ii) Discuss with example how pointers and arrays are related.	(6)

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: V [Full Time]

Computer Science and Engineering

22CS502 – JAVA PROGRAMMING

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define Java Virtual Machine.	2	K1	1
2. Compare String class with String Buffer class.	2	K4	1
3. How will you convert the string object into primitive data type integer and double?	2	K4	1
4. Mention the similarities and dissimilarities between abstract class and interface.	2	K1	1
5. How will you pass and get the parameters in applet? Give example.	2	K4	2
6. List the source components of the ActionEvent and ItemEvent.	2	K1	2
7. How swing controls are different from the AWT controls?	2	K4	2
8. Write down the difference between modal window and modelless window.	2	K1	3
9. What is the role of drivers in JDBC? List its types.	2	K2	3
10. What are the differences between TCP and UDP protocols?	2	K4	3

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Write a java program to perform basic string operations.	10	K3	1
ii) Write a java program to fetch the name and department of 10 students and display them.	6	K3	1

(OR)

Q. No**M BTL CO**

- b) i) 10 students test scores for 5 subjects are stored in 2D array.
The following grading scale is assigned to a student based on average of his/her 5 subjects.

Test Score	Grade
91-100	O
81 - 90	A
71 - 80	B
61 - 70	C
51 - 60	D
>50	RA

Write a program to print each student's average test score and grade.

- ii) Write a java program to calculate the income tax to be paid by an employee to government as per slabs mentioned below.

6 K3 1

Tax Slab	Tax Rate
Upto ₹ 3 lakh	Nil
₹ 3 lakh - ₹ 7 lakh	5%
₹ 7 lakh - ₹ 10 lakh	10%
₹ 10 lakh - ₹ 12 lakh	15%
₹ 12 lakh - ₹ 15 lakh	20%
More than ₹ 15 lakh	30%

12. a) i) Describe the concept of multiple inheritance with suitable example.

8 K2 1

- ii) Demonstrate the steps in package creation with example.

8 K2 1**(OR)**

- b) i) Explain the concept of user defined and built-in exceptions.

8 K2 1

- ii) Discuss the features of multithreading.

8 K2 1

Q. No		M	BTL	CO
13. a)	i) Discuss the usage of frame window in java applets.	8	K1	2
	ii) Assess the applet skeleton with example.	8	K1	2
	(OR)			
b) i)	Demonstrate the usage of Mouse listener and window listener interface in the Java.	8	K1	2
	ii) Explain the usage of event listener interfaces with examples.	8	K1	2
14. a) i)	Design a GUI application for symposium registration system. Calculate the registration fees based on the events registered and also set the maximum event registration for the system.	8	K3	2
	ii) Explain the various layout managers in Java with suitable example.	8	K3	2
	(OR)			
b) i)	Design a tabbed pane with scroll pane, tree and table as tabs. Illustrate with suitable example.	8	K3	2
	ii) Create a program with the menu bar that allows user to select different options for a Hotel management with suitable example.	8	K3	2
15. a)	Build a simple client/server application using socket programming. The client will send the amount and year of the fixed deposit to a server .The server receives the data and produces the maturity amount as response. The result is sent to client and displayed in console.	16	K4	3
	(OR)			
b)	Write the steps to connect the Java application with database. Develop an application to connect the database, insert, select and delete the records for the student table .The student table attributes must exclude register number, name, date of birth and GCPA.	16	K4	3

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: V [Full Time]

Electronics and Communication Engineering

22EC502 – DIGITAL SIGNAL PROCESSING

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. If the DFT $\{x(n)\} = X(K) = \{2, -j3, 0, j3\}$, using properties of DFT, Find DFT of $x(n-2)$.	2	K3	1
2. Draw the basic butterfly diagram of radix- 2 DIF FFT algorithm.	2	K3	1
3. Compare Butterworth and Chebyshev filters.	2	K2	2
4. State the significance of prewarping in bilinear transformation.	2	K1	2
5. Draw the direct form I structure of a general second order system.	2	K3	3
6. What are the conditions to be satisfied to have constant phase delay in linear phase FIR filter?	2	K2	3
7. The filter coefficient $H = -0.673$ is represented by sign magnitude fixed point arithmetic. If the word length is 6 bits; compute the quantization error due to truncation.	2	K3	4
8. Differentiate between floating point arithmetic and fixed point arithmetic.	2	K2	4
9. Mention the four phases available in pipelining technique.	2	K1	5
10. List the four important features of TMS320C54X processors.	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Perform circular convolution of finite duration sequences $h(n) = \{1, 2, 1, 3, 1\}$ and $x(n) = \{2, 4, 1, 3\}$.	8	K3	1
ii) An audio speech signal is sampled using 5 KHz sampling frequency, the first eight samples of the signal can be obtained from the equation, $x(n) = n+1$. Find the various frequency components present in the signal using radix -2 DIF FFT algorithm.	8	K3	1

(OR)

Q. No	M	BTL	CO
b) Using DIT-FFT algorithm compute DFT of the sequence $x_1(n) = \{1, 2, -1, 2, 4, 2, -1, 2\}$. If $x_2(n) = x_1(-n)$ without performing FFT find $X_2(k)$ using $X_1(k)$.	16	K3	1
12. a) Design a Butterworth digital low pass filter using bilinear transformation technique with $T=0.1$ sec satisfying the following specification. $0.6 \leq H(e^{j\omega}) \leq 1 \quad 0 \leq \omega \leq 0.35\pi$ $ H(e^{j\omega}) \leq 0.1 \quad 0.7\pi \leq \omega \leq \pi$ (OR)	16	K4	2
b) Design a Chebyshev filter for the following specification using impulse invariance method $0.8 \leq H(e^{j\omega}) \leq 1 \quad 0 \leq \omega \leq 0.2\pi$ $ H(e^{j\omega}) \leq 0.2 \quad 0.6\pi \leq \omega \leq \pi$	16	K4	2
13. a) Design an FIR filter with $H_d(e^{j\omega}) = e^{-j5\omega} \quad -\pi/2 \leq \omega \leq \pi/2$ $= 0 \quad \pi/2 < \omega \leq \pi$ Using Blackman window with $N=11$ (OR)	16	K4	3
b) Use the frequency sampling method to design an FIR low pass filter with $\omega_c = \pi/4$ for $N=15$. Plot the magnitude and phase response.	16	K4	3
14. a) i) For the given transfer function $H(z) = H_1(Z) H_2(Z)$, where $H_1(Z) = 1/1 - 0.5Z^{-1}$ and $H_2(Z) = 1/1 - 0.4Z^{-1}$. Find the output round off noise power. ii) Determine the scale factor for the given system $H(Z) = \frac{1+0.75z^{-1}}{1-0.4z^{-1}}$ so as to avoid overflow in the input adder. (OR)	8	K4	4
b) Determine the limit cycle oscillations of the following system. Truncated bit $b=3$. $y(n) + 0.9y(n-1) = x(n)$ Input to the system is $x(n) = \begin{cases} 0.875 & n = 0 \\ 0 & \text{otherwise} \end{cases}$	16	K4	4
15. a) i) Draw the architecture of TMS320C54X processors and elaborate the function of each block. ii) Write any two special instructions of TMS320C54X processors that are suitable for signal processing applications and explain.	8	K2	5
	8	K3	5

(OR)

Q. No		M	BTL	CO
b) i)	Draw and explain the various types of internal and external memory in TMS320C54X processors with neat sketch.	8	K2	5
ii)	Classify and brief on the two addressing modes of TMS320C54X processors with example/pseudocode.	8	K3	5



Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: V [Full Time] / IV & V [Part Time]

Electrical and Electronics Engineering

**22EE502/22PTEE501/23PTEE402 – MICROPROCESSORS AND MICROCONTROLLERS/
MICROPROCESSOR AND MICROCONTROLLER**

(Regulations 2022/2023)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What are the functions of an accumulator?	2	K1	1
2. Define a subroutine.	2	K1	1
3. What are the addressing modes of 8051 microcontroller?	2	K2	2
4. List interrupts of 8051 microcontroller?	2	K1	2
5. What is meant by A/D converter?	2	K2	3
6. Draw the circuit of LED interface with 8051 microcontroller in sourcing mode and sinking mode.	2	K3	3
7. Differentiate synchronous and asynchronous communication mode.	2	K2	4
8. What is meant by baud rate?	2	K2	4
9. Write an assembly language program to add two 4-bit numbers.	2	K3	5
10. List any four application of Microcontroller.	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) With the help of neat diagram explain the architecture of 8085 microprocessor in detail.	16	K2	1
(OR)			
b) Explain the addressing modes of 8085 microprocessor with one example for each.	16	K2	1
12. a) With functional block diagram briefly discuss the architecture of the 8051 microcontroller.	16	K2	2
(OR)			
b) Describe the various operating modes of the timers, counters and associated control registers of 8051 microcontroller.	16	K2	2
13. a) Explain in detail about the interfacing of LCD display with 8051 microcontroller.	16	K3	3

(OR)

Q. No		M	BTL	CO
b)	With neat diagram explain the interfacing of current, voltage and RTD sensors with 8051 microcontroller.	16	K3	3
14. a)	Describe the operation of SPI and I2C communication protocol with microcontroller in detail.	16	K4	4
	(OR)			
b)	Explain the concept of interfacing of Bluetooth and Zig-bee protocols with microcontroller in detail.	16	K4	4
15. a)	Sketch the block diagram of the 8279 Keyboard Display Interface and explain the functions in detail.	16	K2	5
	(OR)			
b)	Describe the basic operation of stepper motor and also discuss about microcontroller based stepper motor control.	16	K2	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VII [Full Time]

Electrical and Electronics Engineering

18EE702 – INDUSTRIAL MANAGEMENT AND ECONOMICS

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What do you mean by scientific management?	2	K1	1
2. Compare line and line & staff relationship.	2	K2	1
3. What are the possible Industrial disputes?	2	K1	2
4. What do you mean by quality circles?	2	K1	2
5. Brief on Channels of Distribution.	2	K2	3
6. What do you understand by Pricing and promotion?	2	K1	3
7. Mention the theories of demand and supply.	2	K2	4
8. Compare direct and indirect taxes.	2	K2	4
9. What is the role of public sector?	2	K1	5
10. Brief on the impact of MNC s on Indian economy.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Discuss on the functions and the modern concepts of management.	16	K2	1
(OR)			
b) Discuss on the MBO.	16	K2	1
12. a) Give a detailed view on the functions, objectives of Personnel management, its recruitment, selection and training process.	16	K2	2
(OR)			
b) Compare Public sector, Joint sector and Co-operative sector.	16	K2	2
13. a) Compare batch and Mass production.	16	K2	3
(OR)			
b) Report on Market research and advertising.	16	K2	3

Q. No		M	BTL	CO
14. a)	i) Discuss on Black money.	8	K2	4
	ii) Report on the causes and consequences of Inflation.	8	K4	4
	(OR)			
b) i)	Report on national income.	8	K2	4
	ii) Report on the difficulties in estimation.	8	K4	4
15. a)	Compare IDBI, ICICI, SIDBI, NABARD.	16	K3	5
	(OR)			
b)	Compare Indian capital market and stock market.	16	K3	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: V [Full Time]

Mechanical Engineering

22ME502 – HEAT AND MASS TRANSFER

(Regulations 2022)

(Use of standard HMT data book is permitted)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
1.	Write the three-dimensional Poisson and Laplace equations for heat transfer in Cartesian coordinates.	2	K1	1
2.	Define thermal Diffusivity.	2	K1	1
3.	Define Boundary layer thickness.	2	K1	2
4.	State the physical significance of Reynolds number.	2	K1	2
5.	Compare the Filmwise and Dropwise condensation.	2	K4	3
6.	Define the Fouling factor.	2	K1	3
7.	Find the temperature of the sun assuming as a block body, if the intensity of radiation is maximum at the wavelength of 0.5μ .	2	K3	4
8.	What is a radiation shield? Why is it used?	2	K1	4
9.	State Fick's law of diffusion.	2	K1	5
10.	Define Sherwood Number.	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
11. a)	Derive the heat transfer rate for steady-state heat conduction through a multi-layered hollow cylinder with inner radius r_1 and outer radius r_3 , and L is the length of the cylinder, consisting of two layers, where each layer has its own thermal conductivity k_1 and k_2 . Assume steady-state, radial conduction, and no heat generation within the layers. The temperatures at the innermost and outermost surfaces are T_1 and T_3 , respectively.	16	K3	1

(OR)

Q. No	M	BTL	CO
b) A turbine blade 6 cm long and having a cross-sectional area of 4.65 cm ² and a perimeter of 12 cm is made of stainless steel ($k = 23.3 \text{ W/mK}$). The temperature at the root is 500°C. The blade is exposed to a hot gas at 870°C. The heat transfer coefficient between the blade surface and gas is 442 W/m ² K. Determine the temperature at the tip and rate of heat flow at the root of the blade. Assume the tip of the blade to be insulated.	16	K3	1
12. a) The crankcase of an IC engine measuring 80 cm x 20 cm may be idealized as a flat plate. The engine runs at 90 km/h and the crankcase is cooled by the air flowing past it at the same speed. Due to road-induced vibration, the boundary layer becomes turbulent from the leading edge itself. Calculate the heat loss from the crankcase maintained at 85°C to the ambient air at 15°C.	16	K2	2
(OR)			
b) A thin 80 cm long and 8 cm wide horizontal plate is maintained at a temperature of 130°C in a large tank full of water at 70°C. Estimate the rate of heat input into the plate necessary to maintain the temperature of 130°C.	16	K2	2
13. a) Water is to be boiled at atmospheric pressure in a polished copper pan using an electric heater. The diameter of the pan is 350 mm and is kept at 115°C. Calculate the following,	16	K3	3
i. Power required boiling the water,			
ii. Rate of evaporation,			
iii. Critical heat flux.			
(OR)			
b) The flow rate of hot and cold water streams running through a parallel flow heat exchanger are 0.2 kg/s and 0.5 kg/s respectively. The inlet temperatures on the hot and cold sides are 75°C and 25°C respectively. The exit temperature of hot water is 45°C. If the individual heat transfer coefficient on both sides is 650 W/m ² K, calculate the area of the heat exchanger.	16	K3	3

Q. No		M	BTL	CO
14. a)	A furnace wall emits radiation at 2000 K. Treating it as black body radiation, Calculate, i. Monochromatic radiant flux intensity at 1 μm wavelength. ii. Wavelength at which emission is maximum and iii. The corresponding emissive power. iv. Total emissive power.	16	K3	4
	(OR)			
b)	Two parallel plates are maintained at a temperature of 600 K and 900 K and emissivity of 0.4 and 0.7 respectively. Determine heat transfer by radiation and also calculate the percentage of reduction in heat transfer and shield temperature when another plate of emissivity 0.05 is introduced in between them.	16	K3	4
15. a)	Dry air at 20°C ($\rho = 1.2 \text{ kg/m}^3$, $\nu = 15 \times 10^{-6} \text{ m}^2/\text{s}$, $D = 4.2 \times 10^{-5} \text{ m}^2/\text{s}$) flows over a flat plate of length 50 cm which is covered with a thin layer of water at a velocity of 1 m/s. Estimate the local mass transfer coefficient at a distance of 10 cm from the leading edge and the average mass transfer coefficient.	16	K3	5
	(OR)			
b)	CO ₂ and air experience equimolar counter diffusion in a circular tube whose length and diameter are 1.2 m and 60 mm respectively. The system is at a total pressure of 1 atm and a temperature of 273 K. The tube ends are connected to large chambers where the species concentrations are maintained at fixed values. The partial pressure of CO ₂ at one end is 200 mm of Hg while at the other end is 90 mm of Hg. Calculate the mass transfer rate of CO ₂ and air through the tube.	16	K3	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VII [Full Time]

Mechanical Engineering

18ME601 – COMPUTER INTEGRATED MANUFACTURING

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. State the types of scheduling.	2	K1	1
2. List out the factors affecting process planning.	2	K3	1
3. What are the stages of generative CAPP system?	2	K2	2
4. List out the three methods of Group Technology.	2	K2	2
5. What are the tasks carried out by vision system?	2	K3	3
6. Enumerate the technologies available for automatic identification system.	2	K3	3
7. What do you mean by CIM architecture?	2	K2	4
8. List out the activities of computer integrated production system.	2	K3	4
9. What are the three levels of architecture of database system?	2	K2	5
10. Distinguish between MAP and TOP.	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Discuss the various functions of production planning and control.	8	K2	1
ii) Briefly explain external communication system.	8	K2	1
(OR)			
b) i) Explain in detail about Manufacturing Automation Protocol.	8	K2	1
ii) Discuss the objectives of CIM.	8	K2	1
12. a) Explain the importance of process planning in CAD/CAM Integration.	16	K3	2

(OR)

Q. No		M	BTL	CO
	b) Explain the applications of production flow analysis. Describe how production cost can be reduced.	16	K3	2
13. a)	Discuss in detail about the various components of FMS.	16	K3	3
	(OR)			
	b) Explain in detail about the various types of scheduling process.	16	K3	3
14. a)	Explain briefly the concepts of CIM-OSA.	16	K2	4
	(OR)			
	b) Explain the various computer network architecture with neat sketch.	16	K2	4
15. a) i)	What are the advantages and disadvantages of DBMS?	8	K2	5
	ii) What is data modelling and its uses?	8	K2	5
	(OR)			
b) i)	Explain briefly the relational databases.	8	K2	5
	ii) What are the various types of layers in database architecture? Explain in detail.	8	K2	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: V & VII [Full Time]

Metallurgical Engineering

22MT502/18MT602 – FORMING PROCESSES

(Regulations 2022/2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What is meant by octahedral shear stress?	2	K1	1
2. List the variables in metal forming that affect the properties of formed material.	2	K2	1
3. Mention the functions of flash in closed die forging.	2	K1	2
4. Differentiate bloom, billet, slab and sheet.	2	K2	2
5. What is meant by “Equal Channel Angular Extrusion? How is it advantageous over conventional extrusion?	2	K2	3
6. What are the property requirements of extrusion die material?	2	K1	3
7. List the remedial measures to prevent earing during deep drawing.	2	K2	4
8. State with an example the effect of strain hardening coefficient on formability.	2	K3	4
9. What is cold isostatic pressing? For what applications cold isostatic pressing is practiced?	2	K1	5
10. Differentiate solid state and liquid phase sintering.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) State Von Mises yield criterion and Tresca yield criterion. Prove that for any condition Von Mises and Tresca yield criteria do not differ more than 15 %.	8	K2	1
ii) Discuss in detail the effect of temperature and strain rate on flow stress during forming.	8	K2	1

(OR)

Q. No		M	BTL	CO
	b) i) If the yield strength of a steel is 920 MPa, determine whether yielding will occur on the basis of Von Mises' criterion and Tresca criterion for the given state of stress: $\sigma_{yy} = -400$ MPa; $\sigma_{zz} = -780$ MPa; $\sigma_{zx} = 300$ MPa.	8	K2	1
	ii) Explain with suitable examples the importance of study of metallurgical structure during hot and cold forming.	8	K2	1
12. a)	i) Dissect an expression to determine the forming load for forging a slab under plane strain condition using slab method.	8	K4	2
	ii) Demonstrate the nature, causes and remedial measures for any TWO defects caused during forging.	8	K3	2
	(OR)			
b) i)	Diagnose the equations to calculate the forces and geometrical relationships in rolling.	8	K4	2
	ii) Describe, with sketch, any TWO rolling defects with their nature, causes and remedial measures.	8	K3	2
13. a)	Differentiate direct and indirect extrusion methods. Explain the equipment and die requirements for both the methods.	16	K2	3
	(OR)			
b)	Discuss on the method of producing seamless pipes and tubes by extrusion.	16	K2	3
14. a)	Explain, with sketch, any TWO sheet metal forming processes indicating the factors that affect the formability in each process.	16	K3	4
	(OR)			
b)	Explain how forming limit diagrams are drawn. State with suitable examples the applications of forming limit diagrams.	16	K3	4
15. a)	Explain any three physical methods of metal powder production.	16	K2	5
	(OR)			
b)	Discuss with a sketch the principle and working of microwave sintering unit. List the advantages of microwave sintering over other sintering methods.	16	K2	5

Registration Number:

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: I [Part Time]

Civil Engineering

23PTCE101 – MECHANICS OF SOLIDS

(Regulations 2023)

Time: 3 Hours

Maximum Marks: 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define poisson's ratio?	2	K1	1
2. Distinguish between compression and tension?	2	K2	1
3. Define point of contraflexure?	2	K1	2
4. What is the relationship between SF and BM?	2	K2	2
5. List out any two assumptions made in simple bending theory?	2	K1	1
6. Schematically sketch the shear stress distribution across the rectangular beam cross section?	2	K2	1
7. Give the expression for stiffness of a closed helical spring?	2	K3	3
8. Define the term polar modulus?	2	K1	3
9. What are principal planes?	2	K1	1
10. What do you mean by a perfect plane truss?	2	K2	1

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) A bar of 30 mm diameter is subjected to a pull of 75 kN. The measured extension on gauge length of 200 mm is 0.1 mm and change in diameter is 0.004 mm, Calculate a) Young's modulus b) Poisson's ratio c) Bulk modulus.	16	K4	1

(OR)

Q. No		M	BTL	CO
b)	A 3 m long thin cylinder is of 1000 mm internal diameter and 10 mm thickness. It is subjected to an internal pressure of 20 MPa. Assume Young's modulus $E = 200 \text{ GPa}$ and Poisson's ratio $= 0.30$, Determine i) Hoop stress ii) Longitudinal stress iii) Change in length iv) Change in diameter v) Change in Volume.	16	K4	1
12. a)	A cantilever of span 6m carries a concentrated loads of 3 kN, 5 kN and 8 kN at 2 m, 3 m and 5 m from fixed end respectively. It also subjected to a uniformly distributed load of 3 kN/m over the entire span. Draw the Shear force and bending moment diagram.	16	K3	1
	(OR)			
b)	An overhanging beam ABC of length 8 m is simply supported at B and C over a span of 6m and the portion AB overhangs by 2 m. Draw the shearing force and bending moment diagrams and determine the point of contra-flexure, if it is subjected to uniformly distributed loads of 5 kN/m over the portion AB and 7 kN/m over the portion BC.	16	K3	1
13. a)	Find the dimensions of a beam of 5 m to carry a brick wall of 230 mm thick and 3 m high, if the weight of the brick work is 20 kN/m^3 and the maximum stress is limited to 7.5 N/mm^2 . The depth is to be twice the width.	16	K4	2
	(OR)			
b)	A channel section made with 120 mm x 12 mm horizontal flanges and 150 mm x 12 mm vertical web is subjected to a vertical shearing force of 150 kN. Draw the shear stress distribution diagram across the section.	16	K4	2
14. a)	Determine the diameter of solid shaft which will transmit 250 kW at 275 r.p.m. The maximum shear stress should not exceed 25 N/mm^2 and twist should not be more than 1° . In a shaft length of 1.8 m. Take the modulus of rigidity as $8.1 \times 10^4 \text{ N/mm}^2$.	16	K4	3
	(OR)			
b)	A closed coil helical spring of 100 mm mean diameter is made up of 10 mm diameter rod and has 22 turns. The spring carries an axial load of 220 N. Determine the shearing stress. Take the modulus of rigidity as $8.1 \times 10^4 \text{ N/mm}^2$, determine the deflection when carrying this load. Also calculate the stiffness of the spring and the frequency of free vibration for a mass hanging from it.	16	K4	3

Q. No

M BTL CO

15. a) The normal stress in the two mutually perpendicular directions are 500 N/mm^2 and 250 N/mm^2 both tensile. The complementary shear stresses in these directions are of intensity 300 N/mm^2 . Find the normal and tangential stresses on the two planes which are equally inclined to the plane carrying the normal stresses mentioned above.

16 K4 1

(OR)

- b) A truss of span 7.5 m carries a point load of 1 kN at a joint as shown in Fig.1. Find the reactions and forces in the members of the truss.

16 K4 1

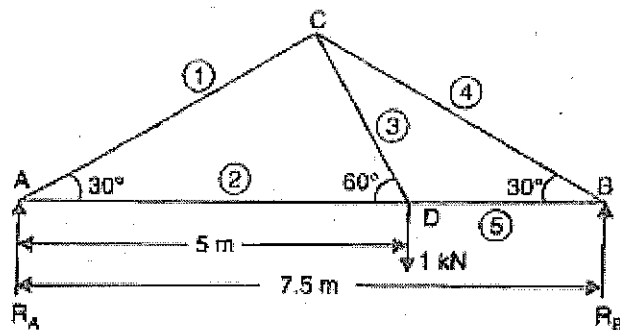


Fig.1

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: II [Part Time]

Civil Engineering

22PTCE201 – BASIC STRUCTURAL STEEL DESIGN

(Regulations 2022)

(Use of IS 800-2007 and Steel tables may be Permitted)

Time : 3 Hours

Maximum Marks: 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Compare buoyant load and snow load.	2	K2	1
2. Summarize the limitations of the working stress method.	2	K2	1
3. List the various types of groove welds with a neat diagram.	2	K1	2
4. Summarize the washer's main purpose in High Strength Friction Grip (HSFG) bolts.	2	K2	2
5. List the different failure modes that can occur in tension members.	2	K1	3
6. Why are lug angles used in tension members?	2	K1	3
7. List the factors affecting the strength of compression members.	2	K1	4
8. What is the main purpose of providing lacings and battens in columns?	2	K1	4
9. Compare web buckling and web crippling.	2	K2	5
10. How the restraints are provided in laterally supported beams?	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Explain the various loads and load combinations considered in limit state design of structures.	8	K2	1
ii) Explain the aspects of durability and fire protection in the design of steel structures.	8	K2	1
(OR)			
b) i) Illustrate various types of structural systems used in construction.	8	K2	1
ii) Summarize the importance of the probabilistic approach and load and resistance factor design.	8	K2	1

Q. No		M	BTL	CO
12. a)	A double cover butt joint is to be provided for connecting 10 mm and 20 mm thick plates of suitable width in grade Fe410 steel carrying tensile load of 1000 kN. Design the joint using 20 mm nominal diameter black bolts of grade 4.6 for connection and determine the efficiency of the joint.	16	K4	2
	(OR)			
b)	An ISLC 300@ 324.7 N/m (Fe 410 grade steel) is to carry a factored tensile force of 800 kN. The channel section is to be welded at the site to a gusset plate 12 mm thick. Design a fillet weld, if the overlap is limited to 300 mm.	16	K4	2
13. a)	Design a 4.5 m long single unequal angle member and its connection to support total factored tensile load of 425 kN. The member is to be connected to a 20 mm thick gusset plate with at least four bolts of grade 4.6 in a line. The length of connection is restricted to 400 mm. The slenderness ratio should not exceed 300. The structural steel is of grade Fe410.	16	K4	3
	(OR)			
b)	Design a splice for tension member sections 200 mm x 12 mm and 260 mm x 16 mm. The member is subjected to a factored tensile load of 400 kN. Assume Fe410 grade of steel. Provide 20 mm diameter bolts of grade 4.6 for making the connections.	16	K4	3
14. a)	Design a built-up column 10m long to carry a factored axial compressive load of 800 kN. The column is restrained in position and direction at both ends. Design the column with connecting system as lacings with bolted connections. Use two channel sections back to back. Use steel of grade Fe410.	16	K4	4
	(OR)			
b)	Design a slab base for a column ISHB 300 @ 588 N/m carrying an axial factored load of 1000 kN. M20 grade concrete is used for the foundation. Provide welded connection between column and base plate.	16	K4	4
15. a)	Design a simply supported beam of span 5 m carrying a reinforced concrete floor capable of providing lateral restraint to the top compression flange. The uniformly distributed load is made up of 20 kN/m imposed load and 20 kN/m dead load (section is stiff against bearing). Assume Fe410 grade steel.	16	K4	5

(OR)

Q. No	M	BTL	CO
b) A laterally supported beam with a span 8 m carries two point loads of 90 kN each from 2 m from left and right support respectively. Select a suitable rolled steel section and carry out necessary checks. Assume Fe410 grade steel.	16	K4	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: II [Part Time]

Mechanical Engineering

22PTME201 – KINEMATICS OF MACHINERY

(Regulations 2022)

(Use of approved design data book may be permitted)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define degrees of freedom for plane mechanisms.	2	K1	1
2. Recall the mechanical advantage of inversions.	2	K1	1
3. Name the types of instantaneous centers.	2	K1	2
4. What is coincident points in the analysis of simple mechanism using computer?	2	K2	2
5. Define structural error in synthesis.	2	K1	3
6. What is path generation?	2	K2	3
7. Outline the importance of cams and followers in modern machinery.	2	K2	4
8. Infer base circle, prime circle and pitch circle used in radial cams.	2	K1	4
9. Relate the term working depth to the clearance circle.	2	K2	5
10. Define precessional angular motion.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain Whitworth quick return motion mechanism with neat sketch.	16	K2	1
(OR)			
b) Explain basic structures of robot manipulators in detail.	16	K2	1
12. a) In a pin jointed four bar mechanism having joints ABCD, AB=300 mm, BC=CD=360 mm and AD=600 mm. The angle BAD=60°. Link AD is fixed. The crank AB rotates uniformly at 100 rpm. Locate all the instantaneous centers and find the angular velocity of the link BC.	16	K3	2

Q. No

M BTL CO

(OR)

- b) A mechanism of a crank and slotted lever quick return motion is shown in Fig. 1. If the crank rotates counter clockwise at 120 rpm, determine for the configuration shown, the velocity and acceleration of the ram D. Also determine the angular acceleration of the slotted lever.

16 K3 2

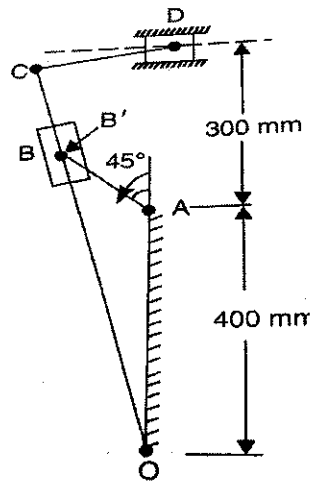


Fig. 1

13. a) Design a four bar mechanism to coordinate the input and output angles as follows:

16 K3 3

Input angles= 15° , 30° and 45° : Output angles= 30° , 40° , and 55°

(OR)

- b) Synthesize a four bar mechanism to guide a rod AB through three consecutive positions, A_1B_1 , A_2B_2 , A_3B_3 as shown in Fig. 2.

16 K3 3

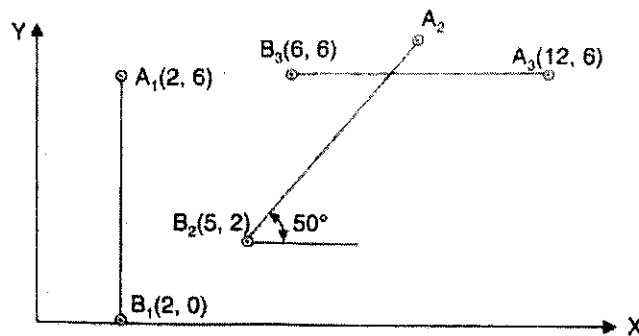


Fig. 2

Q. No		M	BTL	CO
14. a)	Acam is to be designed for a knife edge follower with the following data: 1. Cam lift is equal to 40 mm during 90 degree of cam rotation with simple harmonic motion. 2.Dwell for the next 30 degree. 3. During the next 60 degree of cam rotation, the follower returns to its original position with simple harmonic motion. 4.Dwell during the remaining 180 degree.Draw the profile of the cam when the line of the stroke is offset 20 mm from the axis of the camshaft. Theradius of the base circle of the cam is 40 mm.Determine the maximum velocity and acceleration of the follower during its ascent and descent, if the cam rotates at 240 rpm	16	K3	4
	(OR)			
b)	A cam drives a flat reciprocating follower in the following manner: During first 120°rotation of the cam, follower moves outwards through a distance of 20 mm with simple harmonic motion. The follower dwells during next 30° of cam rotation. During next 120° of cam rotation, the follower moves inwards with simple harmonic motion. The follower dwells for the next 90° of cam rotation. The minimum radius of the cam is 25 mm will stop draw the profile of the cam.	16	K3	4
15. a)	The number of teeth on each of the two equal spur gears in mesh are 40. Theteeth have 20degree involute profile and the module is 6 mm. If the arc of contact is 1.75 times the circular pitch, find the addendum.	16	K3	5

(OR)

Q. No

M BTL CO

- b) A uniform disc of 150 mm diameter has a mass of 5 kg. It is mounted centrally in bearings which maintain its axle in a horizontal plane. The disc spins about its axle with a constant speed of 1000 rpm while the axle precesses uniformly about the vertical at 60 rpm. The directions of rotations are as shown in Fig. 3. If the distance between the bearings is 100mm, find the resultant reaction at each bearing due to the mass and the gyroscopic effects.

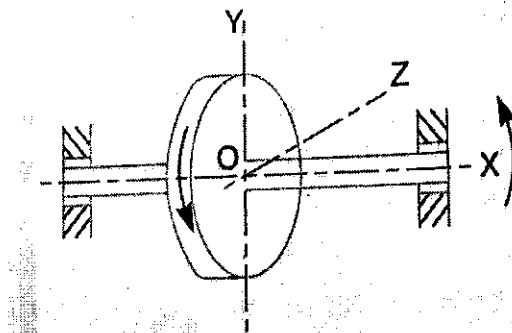


Fig. 3

Registration Number:

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: V [Part Time]

Civil Engineering

16PTCE501 – APPLIED HYDRAULIC ENGINEERING

(Regulations 2016/2016A)

Time: 3 Hours

Maximum Marks: 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define Open-Channel flow.	2	K1	1
2. State the Chezy's formula for determining velocity of flow in an open channel.	2	K1	1
3. Differentiate between normal depth and critical depth.	2	K2	2
4. List out the assumptions made in the derivation of dynamic equation of gradually varied flow.	2	K1	2
5. State linear momentum principle.	2	K1	3
6. List out the applications of jet.	2	K1	3
7. Define hydraulic efficiency of a turbine.	2	K1	4
8. Classify hydraulic turbines.	2	K2	4
9. Outline the advantages of priming of pumps.	2	K2	5
10. Define cavitation of pumps.	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) A V-shaped open channel of included angle 90° conveys a discharge of $0.05 \text{ m}^3/\text{s}$ when the depth of flow at the center is 0.225 m . Assuming that $C = 50 \text{ m}^{1/2}/\text{s}$ in the Chezy's equation, calculate the slope of the channel and also calculate the dimensions of the rectangular cross-section of an open channel which requires minimum area to convey $10 \text{ m}^3/\text{s}$. The slope being 1 in 1500. Take the Manning's 'n' as 0.013.	16	K4	1

(OR)

Q. No		M	BTL	CO
b)	A rectangular channel carries a water flow of $20 \text{ m}^3/\text{s}$ and has $n=0.014$ and bed width as 6.5 m . Find the following: (i) Critical depth (ii) Minimum specific energy (iii) Depth of flow for specific energy of 3.5m (iv) What is the type of flow if the depths of flow are 2 m and 1.5 m ?	16	K4	1
12. a)	In a given channel, Y_0 and Y_c are two fixed depths if Q , n and S_0 are fixed. Also, there are three possible relations between Y_0 and Y_c . Further, there are two cases where Y_0 does not exist. Based on these, how the channels are classified? And also discuss in detail about the devices used for measuring the velocity of fluid flow. (OR)	16	K2	2
b)	Derive the dynamic equations of the Gradually varied flow.	16	K2	2
13. a)	A Sluice gate discharges $2.5 \text{ m}^3/\text{s}$ into a wide horizontal rectangular channel. The depth at the vena - contracta is 0.2m . The tail water depth is 2.0m . Assuming the channel to have a Manning's $n = 0.015$, determine the location of the hydraulic jump. Consider the bed slope as 0.0005 . (OR)	16	K3	3
b)	Derive the expression for the head loss in a hydraulic jump formed in a rectangular channel.	16	K3	3
14. a)	A Kaplan turbine runner is to be designed to develop 9100 kW . The net available head is 5.6 m . If the speed ratio = 2.09 , flow ratio = 0.68 , overall efficiency 86% and the diameter of the boss is $1/3$ the diameter of the runner. Find the diameter of the runner, its speed and the specific speed of the turbine. (OR)	16	K3	4
b)	Discuss in detail the various classification of turbines and explain the components and velocity triangles for Pelton wheel turbine.	16	K3	4
15. a)	A centrifugal pump is to discharge $0.118 \text{ m}^3/\text{s}$ at a speed of 1450 r.p.m. against a head of 25 m . The impeller diameter is 250 mm , its width at outlet is 50 mm and manometric efficiency is 75% . Determine the vane angle at the outer periphery of the impeller. (OR)	16	K2	5
b)	Explain in detail about types of efficiency of a centrifugal pump.	16	K2	5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: VII [Part Time]

Electronics and Communication Engineering

16PTEC701 – MOBILE COMMUNICATION

(Regulations 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. List few examples of wireless communication.	2	K1	1
2. Define Grade of Service.	2	K1	1
3. Justify the situation of free space propagation model.	2	K2	2
4. Outline the principle in large scale fading.	2	K2	2
5. Compare MSK and GMSK methods.	2	K2	3
6. Mention any two criteria to select a modulation technique for a specific wireless application.	2	K2	3
7. Give the disadvantages of SDMA.	2	K1	3
8. Label the types of speech coder for mobile communication.	2	K1	3
9. Show the applications of WLL.	2	K1	4
10. Compile the distinctiveness of IS-95 over GSM.	2	K2	4

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Describe the Channel Assignment Strategies.	8	K2	1
ii) A spectrum of 30MHz is allocated to a wireless FDD cellular system which uses two 25kHz simplex channels to provide full duplex voice and control channels, compute the number of channels available per cell if a system uses a)four-cell reuse b)seven-cell reuse,and c)12-cell reuse. If 1MHz of the allocated spectrum is dedicated to control channels, determine an equitable distribution of control channels and voice channels in each cell for each of the three systems.	8	K3	1

(OR)

Q. No	M	BTL	CO
b) i) Outline the capacity calculations formula in cellular system.	8	K2	1
ii) A hexagonal cell within a 4-cell system has a radius of 1.387 km. A total of 60 channels are used within the entire system. If the load per user is 0.029 Erlangs, and $\lambda = 1$ call per hour, compute the following for an Erlang C system that has a 5% probability of a delayed call: 1. How many users per square kilometre will this system support? 2. What is the probability that a delayed call will have to wait for more than 10sec?	8	K3	1
12. a) i) Illustrate the process to achieve a link budget in the given cell size.	8	K2	2
ii) A mobile is located 5 km away from a base station and uses a vertical $\lambda/4$ monopole antenna with a gain of 2.55 dB to receive cellular radio signals. The E-field at 1 km from the transmitter is measured to be 10^{-3} V/m. The carrier frequency used for this system is 900 MHz. Find the length and the gain of the receiving antenna.	8	K3	2
(OR)			
b) i) Summarize the parameters of mobile multipath channels.	8	K2	2
ii) Assume a receiver is located 10 km from a 50 W transmitter. The carrier frequency is 900 MHz, free space propagation is assumed, $G_t = 1$, and $G_r = 2$. Find the power at the receiver.	8	K3	2
13. a) i) Analyze the MFSK principles with neat diagram.	8	K4	3
ii) Compare the performances of Linear and Non-linear equalization.	8	K2	3
(OR)			
b) i) Describe any one algorithm in Adaptive equalization.	8	K4	3
ii) Illustrate the operation of RAKE receiver in detail.	8	K2	3
14. a) i) Review the features of Linear Predictive Coders briefly.	8	K2	3
ii) Mention the performances of GSM Codec and USDC Codec.	8	K2	3
(OR)			
b) i) Compare the performances of multiple access techniques FDMA, TDMA and CDMA.	8	K2	3
ii) Retrieve the idea behind CDMA technique.	8	K2	3

Q. No		M	BTL	CO
15. a)	i) Write short notes on the generation of Wireless Networks.	8	K1	4
	ii) Demonstrate the various feature of Bluetooth and its operation in detail.	8	K2	4
	(OR)			
b) i)	Using neat figure, assess the concept of General Packet Radio Service.	8	K1	4
	ii) Demonstrate the EVDO technique in wireless systems.	8	K2	4



Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: II [Part Time]

Mechanical Engineering

16PTME201 – THERMAL ENGINEERING

(Regulations 2016/2016A)

(Use of Steam table and refrigerant property table is permitted)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Plot the diesel engine cycle on P-V and T-S diagram. Name the various processes of the diesel cycle.	2	K1	1
2. Compare open and closed cycle gas turbine.	2	K2	1
3. What is meant by valve overlapping?	2	K1	2
4. Compare SI and CI Engines.	2	K2	2
5. Write the types of nozzles with line diagram.	2	K1	3
6. List the effect of friction on nozzle.	2	K1	3
7. How are rotary compressors classified?	2	K1	4
8. How work saving is possible in multi stage compressor?	2	K1	4
9. List any four applications of refrigeration.	2	K1	5
10. If a refrigerator with COP of 1.8 and removes heat at a rate of 90kJ/min, what would be the work input?	2	K3	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) In an SI engine working on the ideal Otto cycle, the compression ratio is 5.5, the pressure and temperature of compression are 1 bar and 27°C. respectively. The peak pressure is 30 bar. Determine the pressure and temperature at the salient points, the air-standard efficiency and the mean effective pressure. Assume ratio of specific heats to be 1.4 for air.	16	K3	1

(OR)

Q. No	M	BTL	CO
b) In a gas turbine power plant working on Brayton cycle, the inlet air temperature is 30°C and pressure is 1.0 bar, the pressure ratio is 6.25 and the maximum temperature is 827° C. Find a) the compression work b) the turbine work c) the cycle efficiency and d) the work ratio compared with the efficiency of Carnot cycle operating between the same temperature limits.	16	K3	1
12. a) The following details were noted in a test on a four-cylinder, four stroke engine, diameter = 100 mm, stroke = 120 mm; speed of the engine = 1600 rpm; fuel consumption = 0.2 kg/min; fuel calorific value = 44000 kJ/kg; difference in tension on either side of the brake pulley = 400N; brake circumference 300 cm. If the mechanical efficiency is 80%, Calculate i) brake thermal efficiency ii) indicated thermal efficiency iii) indicated mean effective pressure and iv) brake specific fuel consumption. (OR)	16	K3	2
b) Identify any four methods of classification of internal combustion engines. Also draw the valve timing diagram for four- stroke SI engine.	16	K3	2
13. a) Dry saturated steam at a pressure at 8 bar enters a convergent – divergent nozzle and leaves it at a pressure at 1.5 bar. If the flow is isentropic, and the corresponding expansion index is 1.135, find the ratio of cross – sectional area at exit and throat for maximum discharge. Also explain the critical pressure ratio of a nozzle. (OR)	16	K3	3
b) The velocity of steam, leaving the nozzle of an impulse turbine, is 1200 m/s and the nozzle angle is 20°. The blade velocity is 375 m/s and the blade velocity coefficient is 0.75. Assuming no loss due to shock at inlet, calculate for a mass flow of 0.5 kg/s and symmetrical blading: a) blade inlet angle b) driving force on the wheel c) axial thrust on the wheel and d) power developed by the turbine.	16	K3	3

Q. No		M	BTL	CO
14. a)	A single-stage single-acting air compressor delivers 0.6 kg of air per minute at 6 bar. The temperature and pressure at the end of suction stroke are 30°C and 1 bar. The bore and stroke of the compressor are 100 mm and 150 mm respectively. The clearance is 3% of the swept volume. Assuming the index of compression and expansion to be 1.3 find: (i) Volumetric efficiency of the compressor, (ii) Power required if the mechanical efficiency is 85%.	16	K3	4
	(OR)			
b)	Develop a sketch and explain the working of reciprocating air compressor using relevant sketch.	16	K3	4
15. a)	Build a neat sketch, discuss the water ammonia absorption refrigeration system and write its merits and demerits.	16	K3	5
	(OR)			
b)	A refrigeration system of 10.5 tonne capacity at an evaporator temperature of -12°C and a condenser temperature of 27°C is needed in a food storage locker. The refrigerant ammonia is sub cooled by 6°C before entering the expansion valve. The vapour is 0.95 dry as it leaves the evaporator coil. The compression in the compressor is of adiabatic type. Find (i) Condition of vapour at the outlet of the compressor (ii) Condition of vapour at the entrance of the evaporator (iii) COP and (iv) The power required. Neglect valve throttling and clearance effect.	16	K3	5

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Registration Number:

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: VI [Part Time]

Civil Engineering

16PTCE601 – ENVIRONMENTAL ENGINEERING - II

(Regulations 2016/2016A)

Time: 3 Hours

Maximum Marks: 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. List out the factors to be considered before selecting a material for sewer pipe.	2	K1	1
2. Classify various types of joint.	2	K2	1
3. State the objectives of grit removal.	2	K1	2
4. Enumerate the functions of primary sedimentation tank.	2	K2	2
5. Define sludge volume index.	2	K2	3
6. Mention the purpose of aeration in waste water treatment.	2	K1	3
7. What do you mean by oxygen sag curve?	2	K2	4
8. Name the source points of sludge in the treatment plant.	2	K1	4
9. Identify the conditions favoring disposal by dilution.	2	K2	5
10. Under what circumstances land treatment of sewage is suitable?	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain the various classifications of sewerage system in detail. (OR)	16	K1	1
b) Sketch and explain the different shapes of sewers and drains.	16	K1	1
12. a) Demonstrate the physical and biological characteristics of sewage. (OR)	16	K4	2
b) Outline the various decomposition cycles.	16	K4	2
13. a) Design a trickling filter with the following data. i) Sewage quantity = 4.5 MLD ii) Raw BOD = 400 ppm iii) Effluent BOD = 50 ppm iv) Recirculation ratio(R/I) = 1.5 v) BOD removal in primary clarifier = 30% vi) Depth of tank = 1.8 m.	16	K4	3

Q. No		M	BTL	CO
	(OR)			
b) i)	Elaborate the activated sludge process with the help of a neat sketch.	10	K4	3
	ii) Examine the effect of recirculation on trickling filter with necessary sketch.	6	K4	3
14. a)	Identify the purpose of sludge digestion and also explain the process of digestion.	16	K3	4
	(OR)			
b)	Illustrate the general layout of house drainage.	16	K3	4
15. a)	Discuss the land disposal of sewage and its merits and demerits.	16	K3	5
	(OR)			
b)	What is self-purification of streams? Discover the various factors that affecting the self-purification of streams.	16	K3	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Part Time]

Electronics and Communication Engineering

16PTECE20 – MEDICAL ELECTRONICS

(Regulations 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What are bio electric signals?	2	K1	1
2. Define latency in EMG.	2	K1	1
3. Mention the role of EMR signal in MRI.	2	K1	2
4. What is radio pill? Mention the application of radio pill.	2	K1	2
5. What are the types of radio graphy?	2	K2	3
6. List the application of MRI.	2	K1	3
7. Mention the few differences between internal and external defibrillators.	2	K1	4
8. List the types of pumping sources used in LASER.	2	K1	4
9. Define let-go current.	2	K1	5
10. Draw the block diagram of telemedicine system.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Explain the different lead system used in the measurement of ECG waveforms with neat diagrams.	10	K2	1
ii) With neat diagrams explain the working of EMG systems and also give its typical waveforms that represent signal characteristics.	6	K2	1
(OR)			
b) i) Draw the action potential waveform and discuss the depolarization, repolarization, absolute and relative refractory periods.	10	K2	1
ii) What is bio potential electrode and draw its equivalent circuit.	6	K2	1

Q. No		M	BTL	CO
12. a)	With the principle of operation explain the working of diagnostic X-ray equipment and its applications in medical field.	16	K3	2
	(OR)			
b)	What are the various radio isotopes used in diagnosis? List the advantages and disadvantages. Explain the radio isotopes used in therapeutic purpose.	16	K3	2
13. a)	i) Explain the Construction and working principal of computer tomography.	8	K2	3
	ii) With neat diagram explain the method of blood cell counting based on change in electrical conductivity.	8	K2	3
	(OR)			
b)	i) Describe positron Emission tomography.	8	K2	3
	ii) Write short note on Nuclear medicine.	8	K2	3
14. a)	How pacemakers are classified based on the operation? Draw the block diagram of standby and demand pacemakers and explain its working principle.	16	K3	4
	(OR)			
b)	Explain the different types of Lasers used in therapeutic applications.	16	K3	4
15. a)	i) Explain the working of ground fault interrupter.	6	K3	5
	ii) Describe how you would determine the concentration of an unknown sample using spectrophotometer.	10	K3	5
	(OR)			
b)	i) Interpret about the hazardous effects of radiation.	6	K3	5
	ii) Explain the regulatory subsystem and optical subsystem of telemedicine with a neat block diagram.	10	K3	5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: II [Part Time]

Mechanical Engineering

16PTEEG201 – ELECTRICAL TECHNOLOGY

(Regulations 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What are the classifications of electric drives system?	2	K1	1
2. Mention the different types of enclosures used for the electric drive systems.	2	K1	1
3. What is active load torque?	2	K2	2
4. How loads are classified based on speed torque characteristics?	2	K1	2
5. What is meant by soft starting of electric motors?	2	K2	3
6. Define the slip speed.	2	K2	3
7. An induced emf in a DC machine is 220 V at a speed of 1200 rpm. Calculate the electromagnetic torque developed at an armature current of 15A.	2	K3	4
8. Describe the advantages of chopper fed DC drive.	2	K2	4
9. What is the condition to be satisfied for maximum torque in induction motor under running condition?	2	K2	5
10. What are the drawbacks of stator voltage controlled Induction Motor drive?	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Discuss in detail about the different classes of Duty and selection of motors for an application.	16	K2	1

(OR)

Q. No		M	BTL	CO
b)	A constant speed drive has the following duty cycle: i) Load rising from 0 to 400 KW- 5min ii) Uniform load of 500 KW- 5 min iii) Regenerative power of 400 KW returned to the supply – 4 min iv) Remains idle for - 2 min Estimate power rating of motor. Assume losses to be proportional to (power) ²	16	K3	1
12. a)	Explain about the four quadrant operation of speed torque characteristics in a motor driving hoist load. (OR)	16	K2	2
b)	Discuss the characteristics of DC series and shunt motor drives.	16	K2	2
13. a)	Explain the construction and operation of three point starter. (OR)	16	K2	3
b)	Explain the construction and operation of any two types of starters of three phase squirrel cage induction motor in detail with neat sketch and equations.	16	K2	3
14. a)	Discuss about the conventional speed control methods of DC shunt motors in detail. (OR)	16	K2	4
b)	Explain the steady state analysis of the single phase fully Controlled converter fed separately excited DC motor Drive for continuous current mode. Also explain its Operation in motoring and regenerative braking mode.	16	K4	4
15. a)	Discuss in detail with suitable diagrams and waveforms of v/f control technique of speed control method in Induction motor. (OR)	16	K2	5
b)	Elaborate the slip power recovery schemes for three phase induction motor with suitable diagrams.	16	K2	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VII [Part Time]

Mechanical Engineering

16PTMEE25 – PRODUCTION PLANNING AND CONTROL

(Regulations 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. List the objectives of method study.	2	K1	1
2. What is meant by Ergonomics?	2	K1	1
3. Give examples for single and multi-facility location.	2	K1	1
4. What is break even analysis?	2	K1	1
5. Define CRAFT.	2	K1	3
6. What is meant by unit load concept?	2	K1	3
7. Mention the various steps involved in the production planning.	2	K1	2
8. What are the forecast errors?	2	K1	2
9. List out the major functions of production control.	2	K1	3
10. List any four objectives of inventory control.	2	K1	3

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Explain the steps involved in work study.	8	K2	2
ii) Write short notes on the following.	8	K2	2
(i) Micro motion			
(ii) Memo motion study			
(OR)			
b) i) Explain the flow process chart with suitable example.	8	K2	2
ii) Briefly explain PMTS.	8	K2	2
12. a) i) What are the different types of plant layout used in manufacturing? Describe about computer aided layout design.	10	K2	1
ii) What are the factors involved in locating the plant?	6	K2	1
(OR)			

Q. No		M	BTL	CO
b) i)	Explain briefly about the Brown and Gibson model of plant location.	10	K2	1
ii)	Potential locations X,Y and Z have the cost structures shown below. The ABC company has a demand of 1,30,000 units of a new product. Three potential locations X,Y and Z having following cost structures shown are available. Select which location is to be selected and also identify the volume ranges where each location is suited Potential locations X, Y and Z have the cost structures shown below. The ABC company has a demand of 1,30,000 units of a new product. Three potential locations X, Y and Z having the following cost structure shown are available. Select which location is to be selected and also identify the volume ranges where each location is suited?	6	K2	1

	Location X	Location Y	Location Z
Fixed costs	Rs.1,50,000	Rs.3,50,000	Rs.9,50,000
Variable costs	Rs.10	Rs.8	Rs.6

13. a)	How the material handling affects facility location decision? Explain with any two suitable examples.	16	K2	1
	(OR)			
b)	What are the 10 principles of material handling? Explain in detail.	16	K2	3
14. a) i)	Explain the fundamentals of MRP I.	10	K2	4
ii)	Explain any two forecasting methods used in industry for production planning with simple example.	6	K2	3
	(OR)			
b) i)	Discuss the important modules in ERP software.	10	K2	4
ii)	Explain the methodology adopted in implementing ERP.	6	K2	4
15. a) i)	Explain the phases of production planning and control.	10	K2	3
ii)	List out the function of Production planning and control.	6	K2	3
	(OR)			

Q. No		M	BTL	CO
b) i)	A manufacturing has to supply his customer 3600 units of his product per year. Shortages are not permitted. Inventory carrying cost amount Rs.12/unit/annum. The set up cost run is Rs.80. Find (i) Economic order quantity (ii) Optimum number of orders per annum (iii) Average annual inventory cost and (iv) Optimum period of supply per optimum order.	10	K2	4
ii)	Briefly explain about simplification and specialization.	6	K2	4

Registration Number :

Government College of Engineering, Salem
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M.E. Degree Examinations – April/May 2025

Semester: III (Full Time)

Welding Technology

18WTE51 - CORROSION AND SURFACE ENGINEERING

(Regulations 2018/2018 A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

1. Name the factors influencing corrosion.
2. What is Galvanic Corrosion?
3. Define Stress Corrosion Cracking.
4. Illustrate the salient features of Inhibitors.
5. Identify two best applications of Stainless steels in corrosion.
6. Summarize the types of corrosion that occur in composites.
7. Differentiate between Electro and electroless coatings.
8. Comment on the classification of coatings for wear resistance.
9. Distinguish between thin film and overlay coatings.
10. What are the applications of Diamond coatings?

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

M

11.	a)	Describe the causes, mechanism and prevention of Pitting and crevice corrosion.	(16)
		(OR)	
	b)	List the mechanism, causes, techniques of prevention of SCC and IGC.	(16)
12.	a)	Describe pitting corrosion test and HIC test in detail.	(16)
		(OR)	
	b)	Explain the design modifications for corrosion prevention and cathodic protection and its applications.	(16)
13.	a)	Explain the corrosion behavior in Aluminum and copper alloys.	(16)
		(OR)	
	b)	Explain the corrosion behavior in Nickel and Titanium base alloys.	(16)

Q. No	M
14. a) Summarize the Electro and Electronics Plating of Nickel.	(16)
(OR)	
b) Summarize the salient features of hard facing and selection of coatings for wear resistance.	(16)
15. a) Analyze in detail the salient features of laser and electron beam hardening.	(16)
(OR)	
b) Analyze the Thermal Evaporation Sputtering and Ion Plating methods.	(16)

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: I [Full Time]

Mechanical Engineering

12PH101 – ENGINEERING PHYSICS

(Regulations 2012)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

1. State magnetostriction effect.
2. Define standard reverberation time.
3. Mention any four medical applications of laser.
4. Define critical angle in optical fibre.
5. Distinguish between convection and radiation.
6. Define thermal conductivity.
7. Write the physical significance of wave function.
8. Mention the advantages of electron microscope over the optical microscope.
9. Write the applications of photo diode.
10. What is Liquid Crystal Display?

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

M

11.	a)	Describe the construction and working of a Piezoelectric generator with a neat circuit diagram.	(16)
		(OR)	
	b)	Discuss the factors affecting acoustics of buildings and their remedies.	(16)
12.	a)	Explain the working principle of He-Ne laser. Draw the suitable energy level diagram.	(16)
		(OR)	
	b)	Explain the propagation of light through optical fiber. Hence obtain the expressions for acceptance angle and numerical aperture.	(16)

Q. No	M
13. a)	Describe the Searle's method to determine the thermal conductivity of a good conductors. (16)
(OR)	
b)	Explain with relevant theory the measurement of the coefficient of thermal conductivity of a bad conductor by Lee's disc method. (16)
14. a)	Derive the expressions for Schrodinger time independent and time dependent equations. (16)
(OR)	
b)	Obtain an expression for a particle in one dimensional box and obtain its Eigen value and Eigen function. (16)
15. a)	Explain the construction and working of Light Emitting Diode. (16)
(OR)	
b)	Brief about the construction and working of solar cell. (16)

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VII [Part Time]

Civil Engineering

12CEE01 – HYDROLOGY

(Regulations 2012)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

1. Enlist the various forms of precipitation?
2. What are the methods available to find the average depth of precipitation over an area?
3. Define evapotranspiration.
4. What are infiltrometer and mention its types?
5. Distinguish between hyetograph and hydrograph.
6. What are the methods to determine the unit hydrograph?
7. Enlist the types of flood routing?
8. How can you classify flood control measures?
9. What are the assumptions made in derivation of Dupuits equations?
10. What is artificial recharge?

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M
11. a) i) Explain with the help of a neat sketch about the hydrological cycle with its various components	(8)
ii) What is meant by Probable Maximum Precipitation? Describe the methods of estimating PMP. What are its design applications?	(8)
(OR)	
b) i) Describe the working principle of a non-recording type rain gauge with neat sketch, Mentioning its advantages and disadvantages.	(8)
ii) How is precipitation measured? Discuss the three methods which convert the point precipitation to areal precipitation and comment on the best method.	(8)

Q. No**M**

12. a) i) Explain with neat sketch the various methods of estimation of evaporation. (8)
- ii) Define infiltration. Describe how infiltration capacity rate can be measured using double ring infiltrometer. How is better than a tube infiltrometer. (8)

(OR)

- b) i) Explain with neat sketches how to evaporation is measured using evaporation pan. (8)
- ii) State the Horton's equation for infiltration capacity curve and sketch with salient components of the curve. (8)
13. a) i) Describe briefly the procedure of preparing a D-hour unit hydrograph for a catchment. (8)
- ii) A 3-hour unit hydrograph for a basin has the following ordinates. (8)
Using any suitable method, determine the 9-hour unit hydro graph.

Time	0	3	6	9	12	15	18	21	24	27	30
Discharge	0	12	75	132	180	210	183	156	135	144	96

(OR)

- b) i) List the factors affecting a flood hydrograph. Discuss the role of these factors. (8)
- ii) The ordinates of one hour UH given at one-hour intervals are (m^3/sec) 0, 3, 8.5, 16, 20, 17, 12.5, 9.5, 7.5, 5.5, 3.5, 2, 1 and 0. Determine and plot the 2 hours UH by S-Curve method. (8)
14. a) i) Describe the various empirical methods used for the estimation of peak flood. (8)
- ii) Describe the Muskingum method of channel routing. Assume the values of the coefficients K and X for the reach. (8)
- (OR)**
- b) i) Describe the method of estimating a T'-year flood using Gumbel's method of distribution. (8)
- ii) Explain the various methods of flood control in brief. (8)
15. a) i) Discuss the principle of recuperation test of an open well with a neat sketch. (8)
- ii) Derive an expression for the steady state discharge of well fully percolated into a confined aquifer. (8)

Q. No

M

(OR)

- b) i) Explain with neat sketches various types of aquifers. (8)
- ii) A 30 cm diameter well completely penetrates an artesian aquifer. The thickness of strainer is 25 m. Determine the discharge from the well when the draw down in the well is 4 m and the coefficient of permeability is 45 m/day. Assume radius of influence as 350 m. (8)

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: II [Part Time]

Electronics and Communication Engineering

16PTEC201 – ENGINEERING ELECTROMAGNETICS

(Regulations 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. State Coulombs law.	2	K1	1
2. Give the relationship between potential gradient and electric field.	2	K3	1
3. Give the application of Stoke's theorem.	2	K1	2
4. What is the relation between magnetic flux density and magnetic field intensity?	2	K3	2
5. What is the energy stored in inductor having current of 3A flowing through the inductor of 100mH?	2	K3	3
6. What is the equivalent capacitance of two capacitors C1 and C2 connected in series?	2	K3	3
7. What is the difference between conduction current and displacement current?	2	K3	4
8. Formulate the significance of ratio of conduction current density and displacement current density.	2	K3	4
9. Give the expressions for propagation constant, intrinsic impedance if a wave propagates in a lossy dielectric.	2	K2	5
10. What is skin effect?	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Obtain the expression for the electric field intensity of an infinite long straight line carrying uniform line charge density ρ_L .	16	K1	1
(OR)			
b) Derive an expression for potential due to infinite uniformly charged line and also derive potential due to electric dipole.	16	K1	1

Q. No		M	BTL	CO
12. a)	From the Biot-Savart's law, write the expression for magnetic field intensity at a point P and distance R from the infinitely long straight current carrying conductor.	16	K3	2
	(OR)			
b)	Derive the expression for Ampere circuital law. Apply the law for any one application with necessary illustrations.	16	K3	2
13. a)	Derive the boundary conditions of the normal and tangential components of magnetic field at the Inter face of two media with different dielectrics.	16	K3	3
	(OR)			
b)	Formulate the expression for a parallel plate capacitor. Also derive the equation for capacitance of general spherical capacitor, isolated sphere coated with dielectric.	16	K3	3
14. a)	Explain and illustrate Maxwell's equations for static fields in both their integral and differential forms.	16	K2	4
	(OR)			
b)	Derive and explain the following	16	K2	4
	(i) Poynting vector			
	(ii) Average and complex poynting vector			
	(iii) Instantaneous poynting vector			
15. a)	Derive the wave equation for the electric and magnetic fields for free space conditions.	16	K2	5
	(OR)			
b)	Derive the equations for a plane electromagnetic wave incident normally on a planar dielectric interface.	16	K2	5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VII [Part Time]

Electrical and Electronics Engineering

16PTEE701 – ELECTRICAL ENERGY UTILIZATION, CONSERVATION AND ENERGY AUDITING

(Regulations 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Write the various types of electric power generation from renewable energy sources?	2	K1	1
2. What is the significance of load duration curve?	2	K1	1
3. State the laws of illumination.	2	K2	2
4. Why energy efficient lamps are preferred?	2	K2	2
5. Specify the requirements of a good heating material.	2	K2	3
6. Write any two applications of electric arc welding.	2	K1	3
7. List the main requirements of an ideal traction system.	2	K1	4
8. What type of electric motor is used for electric traction? Why?	2	K1	4
9. What are the advantages of electric drives?	2	K1	5
10. What is meant by load equalization?	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Draw a layout for a thermal power plant and explain the functions of each component. Indicate its merits and demerits.	16	K4	1
(OR)			
b) A consumer takes a steady load of 250 kW at a P.F of 0.8 lagging for 10 hours/day for 300 days per year. Estimate the annual payment under each of the following tariffs.	16	K3	1
i) Rs. 1.20 per kWh + Rs. 1200 per kVA per year			
ii) Rs. 120 per kWh + Rs. 1200 per kW per year + 25 paise per kVARh.			

Q. No		M	BTL	CO
12. a)	A lamp having a uniform C.P. of 200 in all directions is provided with a reflector which directs 60 % of the total light uniformly on to a circular area of 10 m diameter. The lamp is hung 6 m above the area. Calculate a) The illumination at the centre and edge of the surface with and without the reflector. b) The average illumination over the area without the reflector.	16	K4	2
	(OR)			
b)	Explain the various factors to be taken into account for designing schemes for street lighting and sports ground lighting.	16	K2	2
13. a)	i) Calculate the energy required to melt one metric ton of brass in a single – phase Induction furnace. If the time taken is 1.5 hr, find the power input to the furnace.	8	K4	3
	Specific heat of brass = 0.094			
	Latent heat of fusion of brass = 38 kcal / kg.			
	Melting point of brass = 920° C.			
	Furnace efficiency = 80%,			
	Initial Temperature = 20° C			
	ii) Explain the working of Ajax Wyatt vertical core type induction furnace with neat sketch.	8	K2	3
	(OR)			
b) i)	Explain the principle dielectric heating.	8	K2	3
ii)	Enlist the advantages of AC arc welding machines.	8	K2	3
14. a)	A train is required to run between two stations 1.8 kms apart at an average speed of 45 km/hr. The run is to be made into simplified quadrilateral speed-time curve. If the maximum speed is to be limited to 65 km / hr, acceleration = 3 km/hr/sec, coasting retardation 0.2 km/hr/sec and braking retardation 3 km /hr /sec, determine the duration of acceleration, coasting and braking periods.	16	K4	4
	(OR)			
b)	Discuss the control methods employed for traction motors with neat diagram.	16	K3	4

Q. No		M	BTL	CO
15. a)	i) Discuss the different factors that contribute for selection of motors for industrial application.	8	K3	5
	ii) What is called individual drive and group drive? Compare the merits and demerits of it.	8	K2	5
	(OR)			
b) i)	Draw the power circuit used for speed control of DC drive using Thyristors and explain the working.	8	K2	5
	ii) How regenerative braking is employed in DC drive using Thyristors, Explain with neat diagram.	8	K3	5



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B.E. Degree Examinations – April/May 2025

Semester: IV [Part Time]

Mechanical Engineering

16PTME402 – MECHATRONICS

(Regulations 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. List the functions of the mechatronics system design.	2	K1	1
2. List any four types of sensors and mention their features.	2	K1	1
3. List the various components of the pneumatic system.	2	K1	2
4. What are the factors to be considered when selecting compressors?	2	K1	2
5. How is a servo motor controlled?	2	K1	3
6. What are the factors to be considered while selecting a motor?	2	K1	3
7. List the rules for writing a ladder logic diagram.	2	K1	4
8. Name any two applications of Counters.	2	K1	4
9. Compare the traditional design with the mechatronics design.	2	K2	5
10. How does a car park barrier work?	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain in detail about the emerging areas of mechatronics.	16	K2	1
(OR)			
b) Explain the different ways fluid pressure can be measured with suitable sketches.	16	K2	1
12. a) Explain in detail the electromechanical and hydro-mechanical systems with suitable examples.	16	K2	2
(OR)			
b) Explain in detail about pneumatic system using appropriate block diagram.	16	K2	2
13. a) Explain the construction and working principle of the AC servo motor with a suitable sketch.	16	K2	3

(OR)

Q. No		M	BTL	CO
b)	Explain the basic components required for a mechanical actuation system using a simple circuit.	16	K2	3
14. a)	Outline the architecture of PLC with a neat sketch and explain the functions of its elements.	16	K2	4
	(OR)			
b)	Explain the following with suitable examples:	16	K2	4
	i) Up Counter			
	ii) Down Counter			
15. a)	Design a mechatronics system for an Engine Management System with a neat sketch.	16	K4	5
	(OR)			
b)	Design a mechatronics system for a bottling system where bottles are segregated by defects at the crown of the bottle when moving on a conveyor system.	16	K4	5

Registration Number:

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: II [Part Time]

Civil Engineering

16PTCE201 – BASIC STRUCTURAL STEEL DESIGN

(Regulations 2016/2016A)

(IS 800:2007 and relevant code or Tables may be Permitted)

Time: 3 Hours

Maximum Marks: 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What are the advantages of Limit state method?	2	K1	1
2. Define Fatigue.	2	K1	1
3. List the reasons for riveted connections becoming obsolete?	2	K1	2
4. List the advantages of welded connections.	2	K1	2
5. Outline the modes of failure in Tension member?	2	K2	3
6. What are the uses of lug angles?	2	K1	3
7. Define Slenderness Ratio.	2	K1	4
8. What is the use of providing column base?	2	K1	4
9. What is meant by Castellated beam? List its advantages.	2	K1	5
10. Draw a sketch showing the failure mode of laterally unsupported beams.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) How do you classify Structures? Explain.	8	K1	1
ii) What are the different Structural loads? Explain.	8	K2	1
(OR)			
b) i) Draw Stress Strain curve of Mild Steel and explain the salient features.	8	K1	1
ii) Illustrate Limit state method of design.	8	K2	1
12. a) i) What are the metal joining methods using Bolts? Explain.	8	K1	2
ii) Determine the dimensions of a doubly bolted lap joint for plates 16 mm thick to carry its full load. Assume permissible axial tension in plate as 150 N/mm ² .	8	K4	2

(OR)

Q. No		M	BTL	CO
b)	i) List the types of Welded Joint. Explain them in detail.	8	K1	2
	ii) Design the fillet weld for connecting ISA 80 X 80 X 8 mm to a 10 mm thick gusset plate, if the weld is to be done on three sides. The factored tensile load in the member is 350 kN.	8	K4	2
13. a)	Design a tension member to carry a factored force of 340 kN. Use 20 mm diameter block bolts and a gusset plate of 8 mm thick.	16	K4	3
	(OR)			
b)	Tension member of a truss consist of two angle 75 x 50 x 6 mm which are provided on either side of a 10 mm thickest plate. 20 mm diameter bolts are used in one row for connecting the member to the gusset plate. Determine the design tensile strength of the member.	16	K4	3
14. a)	Design a column using rolled steel section to carry a factored axial load of 300 kN. The column is 6 m long and effectively held in position and restrained against rotation at both ends.	16	K4	4
	(OR)			
b)	Design an 8 m long built up laced column to carry a factored axial load of 1250 kN. The columns restrained in position but not in direction in each end. Provide single lacing system making connection with 16 mm diameter bolts of grade 4.6. The column shall consist of two channels placed toe to toe at suitable spacing.	16	K4	4
15. a)	Design a laterally restrained cantilever beam of effective span 2 m carrying a factored point load of intensity 400 kN at the free end. Assume a bearing length of 70 mm.	16	K4	5
	(OR)			
b)	Determine the design bending strength of ISLB 350 @ 486 N/m considering the beam to be (a) laterally supported (b) laterally unsupported. The design shear force V is less than design strength. The unsupported length of beam is 3.0 m. the steel is of grade Fe 410.	16	K4	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations - April/May 2025

Semester: III [Part Time]

Electronics and Communication Engineering

16PTEC304 - TRANSMISSION LINES AND WAVEGUIDES

(Regulations 2016/2016 A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Write down the primary constants and secondary constants for the line of zero dissipation.	2	K1	1
2. For a given length of coaxial cable with a distributed capacitance $C=24.15\text{pF/m}$ and a distributed inductance $L=483.12\text{nH/m}$, determine the velocity of propagation.	2	K3	1
3. State the expressions for inductance L and capacitance C of an open wire line.	2	K1	3
4. Calculate the characteristic impedance of a quarter wave transformer to match a load of 100Ω to a source of 250Ω .	2	K3	3
5. Catalogue the characteristics of TEM wave.	2	K2	4
6. Write the expression for the characteristic wave impedance for the TE and TM waves between parallel planes.	2	K1	4
7. Find the characteristic impedance of TM_{11} mode in a rectangular waveguide with $a = 9\text{ cm}$ and $b = 4.5\text{ cm}$ at 3 GHz .	2	K3	4
8. Which is the dominant mode in rectangular wave guide?	2	K2	4
9. Mention the applications of cavity resonators.	2	K1	5
10. Bring out the relationship between quality factor and bandwidth of a resonator.	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Derive the transmission line differential equations and obtain the general solutions for the voltage and current on the transmission line.	10	K2	1
ii) A transmission line has $R = 6\Omega/\text{km}$, $L = 2.2\text{ mH/km}$, $C = 0.005\mu\text{F/km}$ and $G = 0.05\mu\text{mho/km}$. Determine the characteristic impedance, attenuation and phase constants.	6	K3	1

(OR)

Q. No	M	BTL	CO
b) i) The attenuation on a 50Ω distortion less line is 0.01 dB/m . The line has a capacitance of 0.1 nF/m . Determine the resistance, inductance and conductance of the line.	6	K3	2
ii) Derive expression for the attenuation constant and phase constant of a transmission line in terms of R, L, G and C.	10	K2	1
12. a) With neat sketch, derive an expression for an input impedance, voltage and current on the dissipation less lines.	16	K3	3
(OR)			
b) For the characteristic impedance of 50Ω with a receiving end impedance of $(100 + j 120)\Omega$, determine the following using smith chart:	16	K3	3
(i) Standing wave ratio.			
(ii) Load admittance.			
(iii) Impedance of the transmission line at the maximum and minimum of the stationary waves along the line.			
(iv) Distance between load and first voltage maximum for a transmission line if the wavelength of the electrical signal along the line is 2.5 m .			
13. a) Derive the field components of the wave propagating between parallel planes.	16	K2	4
(OR)			
b) Derive the electromagnetic field expressions for TM waves guided by a parallel plane of perfectly conducting structure.	16	K2	4
14. a) Describe the field components of TE wave in a rectangular wave guide with necessary expressions and also plot the field configurations for the TE_{10} mode.	16	K2	4
(OR)			
b) A rectangular wave guide measuring $a = 4.5 \text{ cm}$ and $b = 3 \text{ cm}$ internally has a 9 GHz signal propagated in it. Calculate the wave length, phase and group velocities and characteristic wave impedance for TM_{11} model.	16	K2	4
15. a) Describe the principle and operation of rectangular cavity resonators and also explain the Q factor.	16	K2	5
(OR)			
b) For the $\text{TM}_{m,n}$ circular waveguide, determine the field components, cutoff frequency, cutoff wavelength, propagation constant, phase velocity, group velocity and characteristic impedance.	16	K2	5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Part Time]

Electrical and Electronics Engineering

16PTEE601 – MICROPROCESSOR AND MICROCONTROLLER

(Regulations 2016/2016A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. After the execution of RIM instruction, the accumulator content is 77H. What information does it convey?	2	K2	1
2. Mention the function of ALU in the 8085 architecture.	2	K1	1
3. What is the function of Bus High Enable signal in 8086 microprocessor?	2	K1	2
4. How many flags are included in 8086 programming model?	2	K1	2
5. Specify the memory capacity of microcontroller 8051.	2	K1	6
6. Write the function of the DPTR register in the 8051 microcontroller.	2	K1	6
7. What is the use of DIP switch in 8085 based system?	2	K1	4
8. State the difference between weighted and R-2R ladder DAC.	2	K1	3
9. Write format for control word register of 8255.	2	K2	4
10. What is the used of 8251 USART.	2	K2	4

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Draw the interrupt structure of 8085 microprocessor and explain its function.	16	K2	1
(OR)			
b) Summarize the different blocks and their roles in architecture of 8085 Microprocessor.	16	K2	1
12. a) Explain the different addressing modes of 8086 Microprocessor.	16	K2	2
(OR)			

Q. No		M	BTL	CO
	b) Explain the operations of instructions queue residing in BIU of 8086 Microprocessor.	16	K2	2
13. a)	Describe the architecture of 8051 Microcontroller with neat diagram.	16	K2	3
	(OR)			
	b) Discuss about the organization of internal RAM and special function registers of 8051 microcontroller in detail.	16	K2	3
14. a)	With suitable diagram explain the keyboard interfacing with 8051 microcontroller.	16	K2	4
	(OR)			
	b) Describe in brief the ADC interfacing with 8051 microcontroller.	16	K4	4
15. a)	i) Write the features of 8279 keyboard display interfacing IC.	8	K2	5
	ii) Specify the functions of interfacing IC's.	8	K1	5
	(OR)			
b) i)	Explain in detail the mode Operation of 8255 Interface IC.	8	K2	5
	ii) Draw the block diagram of 8254 programmable timer IC.	8	K1	5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV [Part Time]

Mechanical Engineering

16PTME403 – DESIGN OF TRANSMISSION SYSTEMS

(Regulations 2016/2016A)

(Usage of approved Design data book is Permitted)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define the term "Crowning of pulley"	2	K1	1
2. Mention the losses in belt drives.	2	K2	1
3. State the law of gearing.	2	K2	2
4. Classify the main types of gear tooth failure.	2	K2	2
5. Write short notes on Crown gear and Miter gear.	2	K2	3
6. List the advantages and disadvantages of worm gear drive.	2	K1	3
7. List any two methods used for changing speeds in gearbox.	2	K1	4
8. What are the applications of lead screw in automobile?	2	K1	4
9. List the significance of pressure angle in cam design.	2	K1	5
10. What is meant by self-locking brake?	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Design a flat belt drive to transmit 110 kW for a system consisting of two pulleys of diameters 0.9 m and 1.2 m respectively, for a centre distance of 3.6 m, belt speed of 20 m/s and coefficient of friction is 0.3. There is a slip of 1.2% at each pulley and 5% friction loss at each shaft with 20% overload.	16	K3	1
(OR)			
b) Design a chain drive to actuate a compressor from a 12 kW electric motor at 900 rpm, the compressor begin 250 rpm, Minimum center distance should be 1000 mm, the chain tension may be adjusted by shifting the motor on rails. The compressor is to work 8 hour/day.	16	K3	1

Q. No		M	BTL	CO
12. a)	Design a spur gear pair to transmit 22.5 kW at 900 rpm. Speed reduction ratio is 2.5. Material for pinion and wheel are C15 steel and cast iron grade 30 respectively. Take pressure angle 20 degree and working life of gear is 10,000 hours.	16	K3	2
	(OR)			
b)	Design a pair of helical gears to transmit 10 kW at 1000 rpm of the pinion and wheel are made of C15 steel and cast iron grade 30 respectively. The pinion is to transmit 22 kW power at 900 rpm. The gear ratio is 2.5, take pressure angle of 20° and helix angle is 15°. Give details of drive in tubular form.	16	K3	2
13. a)	Design a bevel gear to transmit 3.5 kW with driving shaft speed is 200 rpm. Speed ratio requires is 4. The drive is non-reversible. Pinion is made of steel and wheel made of CI. Assume a life of 25,000 Hrs.	16	K3	3
	(OR)			
b)	Design a worm gear drive to transmit 22.5 kW at a worm speed of 1440 rpm. Velocity ratio is 24:1. An efficiency of at least 85% is desired. The temperature raise should be restricted to 40°C. Determine the required cooling area.	16	K3	3
14. a)	Design a 9 speed gear box for the following data. Minimum speed: 180 rpm, Maximum speed: 1800 rpm. Using standard step ratio, draw the speed diagram, kinematic layout. Also find the number of teeth on each gear.	16	K3	4
	(OR)			
b)	Develop a detail design procedure for power screws of screw jack.	16	K3	4
15. a)	A plate clutch with maximum diameter 60 mm has maximum lining pressure of 0.35 MPa. The power to be transmitted at 400 rpm is 135 kW and $\mu=0.3$. Find inside diameter and spring force required to engage the clutch. Springs with spring index 6 and material spring steel with safe shear stress 600 MPa are used. Find the diameters if 6 spring are used.	16	K4	5
	(OR)			

Q. No

M BTL CO

- b) An internal expanding shoe brake has the following dimensions: Diameter of the drum = 300 mm, distance between the fulcrum centers is 80 mm, distance of fulcrum centers and that of cam axis, both from the drum center = 100 mm, distance of the line of action of braking force from the cam axis = 90 mm, distance between the points where the cam acts on the two brake shoes = 30 mm. Each shoe subtends an angle of 90° at the drum Centre. If the braking force is 750 N and the coefficient of friction is 0.3, Find the braking torque on the drum. Assume the reaction between the brake shoes and the drum passes through the point bisects the contact angle. Also assume that forces exerted by the cam ends on the two shoes are equal.

16 K4 5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Electronics and Communication Engineering

22ECPE64 – MACHINE LEARNING

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Mention two major applications of Machine Learning.	2	K1	1
2. What is the need for cross-validation in supervised learning?	2	K2	1
3. Write any two differences between Logistic Regression and Linear Regression.	2	K2	2
4. Define Random Forest.	2	K1	2
5. What is Cluster Validity?	2	K1	3
6. Write the steps of the EM algorithm.	2	K1	3
7. What is the Markov Model assumption?	2	K1	4
8. Differentiate between Maximum A Priori (MAP) and Maximum Likelihood (ML) methods.	2	K1	4
9. What is the limitation of traditional Machine Learning compared to Deep Learning?	2	K1	5
10. What is a Recurrent Neural Network (RNN) used for?	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) In a small online shop, two products are sold: Product X and Product Y.	8	K3	1

The sales data for two weeks is recorded:

Week	Units of X Sold	Units of Y Sold
1	20	30
2	15	25

Each unit of:

Product X earns ₹100 profit

Product Y earns ₹150 profit

(a) Represent the sales data and profit rates using matrices.

(b) Using matrix multiplication, find the total profit made in each week.

Q. No

M BTL CO

- ii) A communication source emits four symbols with probabilities:

$$P(A)=0.5$$

$$P(B)=0.25$$

$$P(C)=0.15$$

$$P(D)=0.10$$

Calculate the entropy of the source.

(OR)

- b) i) A factory has three machines:

- Machine A produces 30% of the items,
- Machine B produces 45% of the items,
- Machine C produces 25% of the items.

The defect rates are:

- Machine A: 2% defective
- Machine B: 3% defective
- Machine C: 5% defective.

An item is chosen at random and found to be defective.

What is the probability that it was produced by Machine C?

- ii) Given the function:

$$f(x,y,z) = x^2 + y^2 + z^2$$

- Find the gradient of f.
- Evaluate the gradient at the point (1,2,3).
- What is the magnitude of the gradient at that point?

12. a) A company collects the following data on their advertisement spending and sales revenue:

Ad Spend (X in ₹ Thousands)	Sales Revenue (Y in ₹ Thousands)
10	25
20	45
30	65
40	85
50	110

- Using Least Squares Method, find the best-fit line $y=mx+c$.
- Predict the Sales Revenue if Ad Spend is ₹35,000.
- Interpret what the slope m and intercept c mean in this business context.

(OR)

Q. No

M BTL CO

b) A hospital records patients based on:

16 K4 2

- Body Temperature ($^{\circ}\text{C}$)
- Cough Severity (1-10 scale)

Training data:

Patient	Temperature	Cough Severity	Diagnosis
1	98.6	2	Cold
2	101.0	7	Flu
3	102.2	9	COVID-19
4	97.5	1	Cold
5	99.0	3	Cold
6	100.5	6	Flu

A new patient comes with:

- Temperature = 100.0°C
- Cough Severity = 5

Using $K = 3$ and Euclidean distance, predict the diagnosis for the patient.

13. a) For the given mean-centered 2D dataset:

16 K4 3

$(3,2), (2,3), (-2,-3), (-3,-2)$

- Compute the covariance matrix for the dataset.
- Find the eigenvalues and eigenvectors of the covariance matrix.
- Identify the principal component and explain its significance.
- Project all data points onto the first principal component, and list the resulting 1D values.

(OR)

b) For the given 4 points in 2D space:

16 K4 3

$P_1(1,2), P_2(2,2), P_3(5,5), P_4(6,6)$

- Calculate the Euclidean distance between all pairs of points and form a distance matrix.
- Perform Agglomerative Hierarchical Clustering using single linkage (minimum distance).
- Show the clustering process step by step.
- Draw the dendrogram showing the cluster merge

Q. No

M BTL CO

14. a) For the given training dataset:

16 K4 4

Outlook	Temperature	Humidity	Play Tennis
Sunny	Hot	High	No
Sunny	Hot	High	No
Overcast	Hot	High	Yes
Rainy	Mild	High	Yes
Rainy	Cool	Normal	Yes
Rainy	Cool	Normal	No
Overcast	Cool	Normal	Yes
Sunny	Mild	High	No
Sunny	Cool	Normal	Yes

Assume we want to predict Play Tennis for a day with:

Outlook = Sunny, Temperature = Cool, Humidity = Normal

- Calculate prior probabilities for each class.
- Calculate likelihood for each attribute using frequency-based estimation.
- Use the Naïve Bayes formula to compute posterior probabilities.
- Predict the class label.

(OR)

b) For the given simple HMM with the following:

16 K4 4

- States: Rainy (R), Sunny (S)
- Observations: Walk (W), Shop (T), Clean (C)
- Initial probabilities: $P(R)=0.6$, $P(S)=0.4$
- Transition probabilities:

From/To	R	S
R	0.7	0.3
S	0.4	0.6

- Emission probabilities:

State	Walk (W)	Shop (T)	Clean (C)
R	0.1	0.4	0.5
S	0.6	0.3	0.1

observed sequence: Walk, Shop, Clean

Tasks:

- Use the Forward Algorithm to compute the probability of the observed sequence.
- Clearly define and use a value for each time step.
- Interpret the final probability.

Q. No		M	BTL	CO
15. a)	i) Explain the architecture of a Multi-Layer Perceptron (MLP) with a neat diagram.	8	K1	5
	ii) Describe the Back propagation algorithm in detail. Clearly outline the steps involved in the forward pass, error calculation, and weight update.	8	K1	5
	(OR)			
b) i)	Explain the architecture and working of a Convolutional Neural Network (CNN) with a diagram.	8	K1	5
	ii) Briefly explain the role of Recurrent Neural Networks (RNNs) in sequence modeling.	8	K1	5

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B.E. Degree Examinations – April/May 2025

Semester: VIII [Full Time] / VI [Part Time]

Electrical and Electronics Engineering

18EEP19/22PTEEE41 – SPECIAL ELECTRICAL MACHINES

(Regulations 2018/2018A/2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Mention the features of Synchronous Reluctance motor.	2	K2	1
2. Draw the Torque-Speed characteristics of Synchronous Reluctance motor.	2	K2	1
3. Name the rotor position sensors used in the position sensing of PMBLDC motor.	2	K1	2
4. Write the torque equation of PMBLDC motor.	2	K1	2
5. Why surface mounted PMSM is not suitable for high speed applications?	2	K2	3
6. Define cogging torque in PMSM	2	K1	3
7. What causes the acoustic noise in SRM operation and how it is minimized?	2	K2	4
8. Switched Reluctance Motors are designed to operate with magnetic saturation. Give reason.	2	K2	4
9. Define step angle in a stepper motor.	2	K1	5
10. Differentiate variable reluctance and a hybrid stepper motor.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain briefly the working principle of Synchronous Reluctance motor and analyze its performance characteristics.	16	K2	1
(OR)			
b) Discuss about the rotor types of synchronous reluctance motor and draw the phasor diagram representation of synchronous reluctance motor.	16	K2	1
12. a) Describe the driving principle for 120° mode of operation of PMBLDC motor control.	16	K4	2
(OR)			
b) With neat diagram explain in detail about the various power controllers used in PMBLDC motor.	16	K4	2

Q. No		M	BTL	CO
13. a)	Discuss in detail the working principle of Permanent Magnet Synchronous Motor and derive the EMF and torque equation.	16	K2	3
	(OR)			
b)	Discuss the torque-speed characteristics and explain the converter volt-ampere requirements of PMSM.	16	K2	3
14. a)	Describe the working principle of Switched Reluctance Motor and analyze the performance characteristics.	16	K2	4
	(OR)			
b)	Draw and explain the functional blocks of microprocessor based closed loop control of SRM.	16	K2	4
15. a) i)	Explain in detail the various modes of excitation of Variable Reluctance stepper motor.	10	K2	5
	ii) Mention few advantages of hybrid stepper motors over variable reluctance type.	6	K2	5
	(OR)			
b) i)	Discuss the construction of multi-stack stepper motor.	10	K2	5
	ii) Briefly explain the function of drive circuit in the operation of stepper motor.	6	K2	5

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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Mechanical Engineering

22MEPE11 – AUTOMOBILE ENGINEERING

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. List any four characteristics of a good chassis.	2	K1	1
2. Comment about pollution norms motor vehicle act.	2	K2	1
3. List the composition of LPG and CNG.	2	K1	2
4. Write the advantages of hydrogen fuel used in automobiles.	2	K1	2
5. Mention few important causes of axle failures.	2	K1	3
6. Why Synchronizer is required in the automotive transmission system?	2	K3	3
7. Write the functions of steering system in an automobile.	2	K2	4
8. What do you understand by Traction control?	2	K2	4
9. Draw a simplified wiring circuit for the ignition system of a car.	2	K1	5
10. Compare Dash board and instrumentation panel.	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Summarize the main forces and its effects which oppose the motion of vehicle.	8	K1	1
ii) Discuss the frame type chassis construction with neat sketch.	8	K2	1
(OR)			
b) i) Elaborate the effect of power to weight ratio on the performance of an automobile.	8	K1	1
ii) Draw the layout of four-wheel drive and list its advantages and disadvantages.	8	K2	1
12. a) i) Examine the Performance, Combustion and Emission Characteristics of CI engines with these alternate fuels.	8	K2	2

Q. No		M	BTL	CO
	ii) Analyze various methods to reduce the level of pollutants in the exhaust gases.	8	K4	2
	(OR)			
b) i)	Explain the operation of hydrogen fueled vehicle with neat sketch.	8	K2	2
	ii) Compare Performance, Combustion and Emission Characteristics of bio-diesel with diesel.	8	K4	2
13. a) i)	Analyze the construction of a torque tube propeller shaft.	8	K4	3
	ii) Elaborate the construction & working principle of a differential with a neat sketch.	8	K2	3
	(OR)			
b) i)	Analyze the working of single plate clutch.	8	K4	3
	ii) Explain about gear shifting mechanism with neat diagram.	8	K2	3
14. a) i)	Explain the steering geometry with neat sketch.	8	K2	4
	ii) Discuss the working of a diagonal braking system with a layout.	8	K4	4
	(OR)			
b) i)	Explain the Ackerman principle of steering with neat sketch.	8	K2	4
	ii) Elaborate the working principle of antilock braking system.	8	K4	4
15. a) i)	Summarize the working principle of electronic ignition system.	8	K1	5
	ii) How do automotive electronics contribute to a vehicle's safety?	8	K4	5
	(OR)			
b) i)	Summarize the importance of Electronic Control Unit (ECU).	8	K1	5
	ii) How do automotive electronics contribute to a vehicle's performance?	8	K4	5

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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Electrical and Electronics Engineering

22EEPE15 – BIOLOGY FOR ELECTRICAL ENGINEERS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Mention the role of glucose in the process of glycolysis.	2	K1	1
2. What is the function of photosynthetic pigments in photosynthesis?	2	K2	1
3. Draw and label the single and double helical structure of DNA, indicating the key components.	2	K3	2
4. Write the difference between a nucleoside and a nucleotide.	2	K2	2
5. What is the role of biological membranes in cell function?	2	K3	3
6. Compare weak acids and bases with strong acids and bases in terms of their dissociation in water and their impact on biological systems.	2	K2	3
7. Name any two types of cellular adaptations to injury.	2	K2	4
8. How do the effects of inflammation differ in the healing process compared to disease progression?	2	K2	4
9. Differentiate between passive and active natural immunity with suitable examples.	2	K2	5
10. How can the principle of ELISA be applied to detect specific antibodies or antigens in a sample during immunological testing?	2	K3	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Describe the classification of carbohydrates. Include examples of each type and their key characteristics.	8	K1	1
ii) Explain the two phases of glycolysis in detail.	8	K2	1
(OR)			
b) i) Elucidate the different types of reactions involved in glycolysis.	8	K1	1
ii) Explain how chlorophyll and other pigments work together to drive the process of photosynthesis.	8	K2	1

Q. No		M	BTL	CO
12. a)	i) Describe the classification of proteins based on their structure and function.	8	K4	2
	ii) Explain the interrelationship between the structural components of nucleic acids and their ability to store and transmit genetic information.	8	K4	2
	(OR)			
b) i)	Compare the structural differences between DNA and the three types of RNA, and analyze how these differences reflect their roles in the cell."	8	K4	2
	ii) Differentiate between single and double-helical DNA in terms of structural organization, hydrogen bonding, and base pairing. Analyze how these differences impact biological function	8	K4	2
13. a)	i) Explain how the structure of water molecules leads to its properties as a solvent in biological systems.	8	K2	3
	ii) Examine the role of key electrolytes in physiological processes.	8	K4	3
	(OR)			
b) i)	Explain the concept of buffers and their role in maintaining the pH of biological systems	8	K2	3
	ii) Examine the structure and function of biological membranes	8	K4	3
14. a)	i) List and define different types of cellular adaptations to injury with examples.	8	K1	4
	ii) Explain the process of inflammation and outline the role of chemical mediators in it.	8	K5	4
	(OR)			
b) i)	Describe the phases of fracture healing and their biological significance	8	K1	4
	ii) Explain the clinical importance of distinguishing between benign and malignant tumours for treatment planning.	8	K5	4
15. a)	i) Discriminate between bacterial and viral infections using structural and morphological features.	8	K3	5
	ii) Examine the advantages and limitations of using a Transmission Electron Microscope (TEM) versus a Scanning Electron Microscope (SEM).	8	K4	5
	(OR)			
b) i)	Elucidate the differences between Radioimmunoassay (RIA) and ELISA for detecting small amounts of antigen in a patient's sample.	8	K3	5
	ii) Examine the role of bacterial capsules, viral envelopes, and fungal spores in disease development.	8	K4	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Electrical and Electronics Engineering

22EEPE16 – ADAPTIVE CONTROL

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q.No	M	BTL	CO
1. Recall the four types of adaptive control schemes.	2	K1	1
2. What is the significance of exponential forgetting in Least Square method?	2	K2	1
3. What are the different ways to design systems with gain-scheduling?	2	K3	2
4. Recall the main drawback of transient response method of tuning of PID controllers.	2	K1	2
5. State the 'Certainty Equivalence Principle'.	2	K1	3
6. What is the effect of cancellation of process zero in indirect self-tuner?	2	K1	3
7. What is the difference between the minimum-variance controller and the moving-average controller?	2	K2	4
8. List the key characteristics of predictive self-tuning regulators.	2	K3	4
9. State Lyapunov's stability theorem for time-varying systems.	2	K1	5
10. What are the relations between Model Reference Adaptive Control and Self-Tuning Regulator?	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q.No	M	BTL	CO
11. a) i) What is an adaptive controller? Outline the steps for the construction of an adaptive controller.	6	K1	1
ii) Discuss in detail any two applications of adaptive control system.	10	K2	1

(OR)

Q.No		M	BTL	CO
	b) i) Describe briefly about process models in the formulation of an adaptive control problem.	6	K1	1
	ii) Explain in detail the parametric identification by Recursive Least Square estimation. Differentiate between ARMAX and ARIMAX.	10	K2	
12. a)	i) With neat block diagram, explain the principle of gain scheduling.	8	K3	2
	ii) Explain the method of tuning of PID regulators based on relay feedback.	8	K4	2
	(OR)			
b) i)	Illustrate how to use the method of nonlinear transformation for a second-order system.	8	K3	2
	ii) Interpret the various applications of gain-scheduling.	8	K4	2
13. a)	Elaborate on Minimum-degree pole placement method for design of adaptive controllers. Interpret an algorithm using the above method to obtain the indirect self-tuning regulator.	16	K2	3
	(OR)			
b)	Illustrate a direct self-tuning regulator algorithm for estimation of parameters of nonminimum-phase systems. Also, discuss briefly about how to modify the adaptive controllers to deal with disturbances.	16	K2	3
14. a)	Explain in detail the derivation of minimum-variance controllers for i) minimum-phase first order system, and ii) nonminimum-phase first order system.	16	K3	4
	(OR)			
b)	Illustrate the properties of minimum-variance and moving-average self-tuners with two examples.	16	K3	4
15. a)	Derive the MIT rule to obtain a Model Reference Adaptive System. Illustrate, with an example, how to obtain a simple adaptive controller. Also, discuss any one method for determining the adaptation gain.	16	K4	5
	(OR)			
b)	Design a MRAS controller for a first order system using Lyapunov method. State the conditions to be met to ensure parameter convergence.	16	K4	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Electronics and Communication Engineering

22ECPE62 – COMPUTER ARCHITECTURE

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. How cost affects computer architecture decisions?	2	K2	1
2. In what ways do pitfalls influence computer design?	2	K2	1
3. Why are fast multiplication techniques necessary?	2	K2	2
4. What is the significance of integer division in computing?	2	K1	2
5. How does pipelining improve performance?	2	K2	3
6. List the significance of performance considerations in the design of modern processors.	2	K1	3
7. Distinguish between RAM and ROM.	2	K2	4
8. How does a hard drive store data?	2	K2	4
9. List the characteristics of DSA.	2	K1	5
10. Highlight the differences between CNN and RNN.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Analyze the various classes of computers by comparing their characteristics and applications.	8	K3	1
ii) Explore different ways to increase the dependability of computing systems.	8	K3	1
(OR)			
b) i) Examine the impact of power and energy trends in integrated circuits.	8	K3	1
ii) Investigate the role of quantitative principles in effective computer design.	8	K3	1
12. a) Explain the Booth's algorithm with a detailed example.	16	K4	2
(OR)			
b) Analyze the impact of truncation on the accuracy of floating point operations.	16	K4	2

Q. No		M	BTL	CO
13. a)	Discuss the microprogrammed control unit with a block diagram.	16	K2	3
	(OR)			
b)	Analyze how superscalar operations improve computational speed.	16	K2	3
14. a)	i) Examine the ten advanced optimizations of cache performance and discuss their impact on overall system performance.	8	K4	4
	ii) Describe the concepts of virtual memory and its implementation using paging.	8	K2	4
	(OR)			
b) i)	Detail the design principles of memory hierarchy and its impact on overall system performance.	8	K4	4
	ii) Explain the functionality and role of secondary storage devices in preserving data.	8	K2	4
15. a)	i) Explain the structure and working of a deep neural network with an example.	8	K2	5
	ii) Explain the microarchitecture of TPUs and discuss how it interacts with the TPU ISA?	8	K4	5
	(OR)			
b) i)	Describe the architecture and learning process of a multilayer perceptron.	8	K2	5
	ii) Explore the operational benefits of using Google's TPU over conventional CPU.	8	K4	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VIII [Full Time]

Metallurgical Engineering

18MT801 – TOTAL QUALITY MANAGEMENT

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define the term 'quality management system'.	2	K1	1
2. What are the main objectives of quality policies?	2	K3	1
3. Differentiate the product audit and the process audit.	2	K1	2
4. What is the role of quality control?	2	K3	2
5. What is the main concept of six sigma?	2	K1	3
6. Define the term 'TQM'.	2	K1	3
7. What are the statistical methods for quality control?	2	K2	4
8. What is meant by SPC techniques?	2	K2	4
9. How does internal audit differ from external audit?	2	K3	5
10. What are the advantages of Supply Chain Quality Management?	2	K3	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Explain the various aspects on the development of quality management system.	8	K2	1
ii) Discuss in detail the various quality policies and quality planning.	8	K2	1
(OR)			
b) i) Explain the steps involved in successful functional strategic planning.	8	K2	1
ii) Explain the concept of measurements and bench marking.	8	K2	1
12. a) i) Describe the auditing procedures for product, process and system in a particular manufacturing industry.	8	K3	2
ii) Explain the procedures for the preparation of performance evaluation chart.	8	K3	2

(OR)

Q. No		M	BTL	CO
	b) i) Define the following terms: (i) Quality Cost preventions (ii) Appraisal and (iii) failure costs. Highlight the merits and demerits of each one.	8	K3	2
	ii) Discuss about any one method used to analysis the corrective and preventive actions.	8	K3	2
13. a)	i) Discuss about the concepts of business excellence models.	8	K4	3
	ii) What are the TQM tools and discuss them in detail.	8	K4	3
	(OR)			
b) i)	Explain the salient features of QFD and highlight its significance.	8	K4	3
	ii) What is meant by 5S and discuss its benefits and effectiveness to manufacturing industry.	8	K4	3
14. a)	i) Discuss the outcome of various control charts and their functions.	8	K3	4
	ii) Describe the philosophy of statistical process control and describe its effect.	8	K3	4
	(OR)			
b) i)	Explain the implementation and documentation of quality systems.	8	K3	4
	ii) Discuss the procedure of ISO-9000 certification.	8	K3	4
15. a)	i) Discuss in detail about the quality circle with a diagram neatly.	8	K4	5
	ii) Discuss the effect of training programs conducted for the employees in a firm.	8	K4	5
	(OR)			
b) i)	Explain in detail about the behavioral management innovations with suitable examples.	8	K4	5
	ii) What is SQC?and discuss its applications with suitable examples.	8	K4	5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VIII [Full Time]

Mechanical Engineering

18MEPE63 – ROBOTICS

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Describe about work envelope.	2	K1	1
2. Write any two laws of robotics.	2	K1	1
3. What is an end effector? Give some examples of Robot End Effector.	2	K2	2
4. List the types of drive systems used in robots.	2	K2	2
5. What is triangulation?	2	K1	3
6. Name some feedback devices used in robotics.	2	K1	3
7. Write the meaning of the command DMOVE (<4, 5, 6><30, -45, 90>).	2	K1	4
8. Differentiate between Forward kinematics and reverse kinematics.	2	K2	4
9. How does RGV differs from AGV?	2	K2	5
10. How do you calculate the robot economics by rate of investment method?	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Describe any four basic robot configurations with neat sketch and narrate individual merits, demerits.	16	K3	1
(OR)			
b) i) Sketch a robot wrist and indicate wrist pitch, wrist yaw and wrist roll.	8	K3	1
ii) Explain about major parts of a robot with their functions.	8	K3	1
12. a) Enumerate the design and selection of various grippers in robotics.	16	K4	2
(OR)			
b) Analyze about the robot drive system selection procedure in detail.	16	K4	2

Q. No		M	BTL	CO
13. a)	Explain the segmentation methods used in vision system with suitable example.	16	K3	3
	(OR)			
b)	Describe the classification of sensors and the factors to be considered for its selection.	16	K3	3
14. a)	Write a VAL program for pick- and-place operation on the conveyor system. It consists of two conveyors running parallel with centre distance of 600 mm at same level. An industrial robot is fixed centrally between the conveyors. The robot is used to transfer work pieces from conveyor 1 to 2 at a constant speed. Draw a schematic view of the system. Assume all necessary dimension.	16	K3	4
	(OR)			
b)	Derive the forward and reverse kinematics for RRL robot.	16	K3	4
15. a)	Suppose the total investment on the robot is estimated to be Rs. 50,000. There is one shift operation of 2000 hours and 1 man replaced. Assuming labour rate inducing direct overheads to be Rs.80/hour, robot running costs including maintenance and depreciation to be Rs.1,00,000 and added value of increased output be Rs.1,20,000. Determine the payback period.	16	K3	5
	(OR)			
b)	Explain and apply the Equivalent Uniform Annual Cost (EUAC) and Rate of Return (ROR) methods in the context of evaluating investment decisions for robotic or automated systems. Illustrate how these methods assist in comparing alternatives.	16	K3	5

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Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VIII [Full Time]

Mechanical Engineering

18MEPE53 – NUCLEAR ENGINEERING

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What is called mass defect? Give its significance.	2	K1	1
2. Define radio activity.	2	K1	1
3. How much power is generated by the fissioning of 1g of U ²³⁵ per day?	2	K3	2
4. List the different types of nuclear reactor design.	2	K1	2
5. List the role of fuel fabrication in nuclear fuel cycle.	2	K1	3
6. What are the criteria for selecting a good solvent for extraction?	2	K1	3
7. Classify the different types of coolant with examples.	2	K2	4
8. Define critical size of the reactor.	2	K1	4
9. List the major reasons for nuclear accidents that classified under moderate frequency.	2	K1	5
10. Name the primary objectives of reactor instrumentation safety system in nuclear powerplant.	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Illustrate in detail about Binding energy and semi-empirical mass formula with illustration.	16	K2	1
(OR)			
b) Define half life, mean life and decay constant. What are their significance in nuclear engineering? Explain in detail.	16	K2	1
12. a) List out the desirable properties of a nuclear fuel. Compare the properties of Uranium in its various forms as a nuclear fuel	16	K2	2
(OR)			
b) Demonstrate the method of production of enriched Uranium.	16	K2	2

Q. No		M	BTL	CO
13. a)	Explain the various stages of reprocessing of irradiated fuel.	16	K2	3
	(OR)			
b)	Demonstrate the characteristics of the spent fuel and also explain the role of solvent extraction in reprocessing.	16	K2	3
14. a)	Analyze the design objects and main objects of Prototype Fast Breeder Reactor.	16	K4	4
	(OR)			
b)	Examine in detail advanced heat transfer issues for gas cooled and liquid metal cooled reactors	16	K4	4
15. a)	Outline the nuclear fuel cycle and explain the different types of wastes coming out at different stages and also explain the different radiation hazards.	16	K3	5
	(OR)			
b)	Suggest the suitable methods used for treating and disposing the low level solid waste, high level liquid waste.	16	K3	5

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Government College of Engineering, Salem
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B.E. Degree Examinations - April/May 2025

Semester: VIII [Full Time]

Electronics and Communication Engineering

18ECPE802 - MULTIMEDIA COMPRESSION TECHNIQUES

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO										
1. Define entropy. How entropy is related for the performance measure of statistical encoding?	2	K2	1										
2. Mention the models used in lossless compression schemes.	2	K1	1										
3. Outline How does Shannon-Fano differ from Huffman in constructing the code tree?	2	K2	2										
4. Given the following set of symbols and their corresponding binary codes:	2	K3	2										
<table><tr><th>Symbol</th><th>Code</th></tr><tr><td>A</td><td>0</td></tr><tr><td>B</td><td>10</td></tr><tr><td>C</td><td>110</td></tr><tr><td>D</td><td>111</td></tr></table>				Symbol	Code	A	0	B	10	C	110	D	111
Symbol	Code												
A	0												
B	10												
C	110												
D	111												
Is this a Prefix code? Justify your answer.													
5. Mention the applications of G.722 and give the sampling rate and bit rate used in G.722.	2	K1	3										
6. What is the function of a vocoder in speech processing and give one application of vocoders in modern communication systems.	2	K2	3										
7. List two advantages of JPEG-2000 over JPEG and give the name of wavelet transform used in JPEG-2000.	2	K2	4										
8. What does SPIHT stand for? Mention one key feature that makes SPIHT efficient in image compression.	2	K2	4										
9. Name one advantage of wavelet-based compression over DCT - based methods.	2	K3	4										
10. What are I-frames, P-frames, and B-frames in MPEG compression?	2	K1	4										

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
11. a)	An image compressed from 5 MB to 500 KB shows visible artifacts. Another method compresses it to 2 MB with no artifacts. Which method has a higher compression ratio and why might it be less preferred?	16	K3	1

Write brief notes on the following;

- i) Measures of performance
- ii) structure quantizers
- iii) Lossless and lossy compression.

(OR)

b)	Justify the need for quantization in multimedia compression techniques? Discuss in detail about vector quantization with suitable diagrams.	16	K3	1
12. a)	A set of symbols and their corresponding probabilities are shown below:	16	K4	2

Symbol	Probability
A	0.3
B	0.2
C	0.1
D	0.15
E	0.25

Encode the message "**BADE**" using arithmetic coding. Show all the steps clearly and comment on the efficiency of arithmetic coding for this message.

(OR)

Q. No

M BTL CO

- b) Set of symbols and their corresponding probabilities are shown below:

Symbol	Probability
P	0.35
Q	0.20
R	0.15
S	0.18
T	0.12

- i. Construct the Huffman tree and derive binary codes for each symbol.
 - ii. Encode the message "PRQST" using the generated Huffman codes.
 - iii. Calculate the average codeword length.
 - iv. Calculate the entropy of the source.
 - v. Comment on the redundancy and efficiency of this Huffman code.
13. a) Describe the block diagram of MPEG audio compression algorithm. With frame structure, discuss about all the three standalone audio compression strategies. 16 K2 3
- (OR)**
- b) With neat block diagram and describe how filter banks are used to divide audio signals into sub-bands. Mention its advantages and applications. 16 K2 3
14. a) What is Delta Modulation? Explain its principle and operation with necessary block diagram. Also discuss the limitations. Compare it with DPCM and PCM. 16 K2 4
- (OR)**
- b) Discuss in brief about various phases of compression process involved in the image compression algorithm. 16 K2 4
15. a) Explain the representation of a digital video signal. Also discuss about the various sampling formats represented by 4:4:4, 4:2:2. With suitable block diagram. 16 K2 4
- (OR)**
- b) Draw the block diagram of H.261 encoder for video compression and discuss. What is the idea behind MPEG -2 and MPEG-3 video standards? 16 K2 4

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VIII [Full Time]

Computer Science and Engineering

18CSPE801 – INFORMATION SECURITY

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. List out the multiple layers of security that a successful organization should have in place to protect its operations.	2	K4	1
2. What are the three components of the C.I.A. triangle? What are they used for?	2	K1	1
3. Identify the difference between threat and attack.	2	K3	2
4. State the purpose of Digital Millennium Copyright Act.	2	K1	2
5. In risk management strategies, why must periodic review be a part of the process?	2	K4	3
6. Define residual risk. How residual risk remains after safeguards are implemented?	2	K2	3
7. List out the inherent problems with ISO 17799.	2	K1	4
8. State the advantages of VISA international security model.	2	K1	4
9. What is the purpose of port scanners? List out the port numbers for SMTP, DNS, HTTP and SNMP.	2	K3	5
10. How does a signature-based IDPS differ from a behavior-based IDPS?	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Discuss about the critical characteristics of information security with example.	16	K2	1
(OR)			
b) Describe the various phases of traditional systems development life cycle in detail.	16	K2	1

Q. No		M	BTL	CO
12. a)	Explain any seven categories of threats with example. Consider the statement: an individual threat agent, like a hacker, can be a factor in more than one threat category. If a hacker hacks into a network, copies a few files, defaces the Web page, and steals credit card numbers, how many different threat categories does this attack fall into?	16	K4	2
	(OR)			
b)	Explain in detail about various types of attacks with scenarios.	16	K4	2
13. a)	Explain in detail about the components of risk identification.	16	K2	3
	(OR)			
b)	Explain in detail about the various risk control strategies.	16	K2	3
14. a)	Elucidate the NIST security models and the documents that can assist in the design of a security framework.	16	K4	4
	(OR)			
b)	Examine in detail the components of Contingency Planning.	16	K4	4
15. a)	Explain the various scanning and analysis tools with examples.	16	K4	5
	(OR)			
b)	Describe about various physical security controls. What is considered the most serious threat within the realm of physical security? Why is it valid to consider this threat the most serious?	16	K4	5

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B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Computer Science and Engineering

22CSPE103 – WEB TECHNOLOGY

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What is the use of domain name service DNS?	2	K1	1
2. What is Document Type Declaration?	2	K1	1
3. Define external style sheet and embedded style sheet.	2	K2	2
4. List out the data types supported by the JavaScript.	2	K1	2
5. Name some HTML intrinsic event attributes and write when it is called.	2	K2	3
6. What is HTTP session and tell how it is created?	2	K2	3
7. Write a simple XML code that displays the output "Web Technology".	2	K5	4
8. Compare JSP and Servlets.	2	K4	4
9. What is the use of Web Service description Language WSDL?	2	K1	4
10. Define XML schema.	2	K1	4

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Draw and explain the different fields of HTTP request and response message in detail.	8	K1	1
ii) What are the three types of Lists supported by the HTML? Write the HTML code to create each type of List for the subjects you studied in the current semester.	8	K3	1
(OR)			
b) i) Explain the process of server configuration and tuning in detail.	8	K1	1
ii) How forms are created in HTML? Create a form that enters the customer feedback on shopping and gives the acknowledgement after submitting the form.	8	K3	1

Q. No		M	BTL	CO
12. a)	i) Briefly discuss about cascading of style sheet rules and inheritance of style properties with sample code.	8	K4	2
	ii) Explain how functions are created and used in JavaScript? Write a JavaScript function that returns a random number between 1 and 1000.	8	K3	2
	(OR)			
b) i)	Draw and explain CSS box model with different areas and edges.	8	K4	2
	ii) How objects are used with JavaScript? Write a code that swaps two names using object references.	8	K3	2
13. a)	Explain in detail about DOM event handling with event objects and event listeners. Write a program that handles movement of Mouse Events and show the output.	16	K2	3
	(OR)			
b)	Briefly discuss about servlets and concurrency with thread and threading issues. Write a servlet synchronization program that synchronized Counter Reader and Counter Writer processes which reads and updates the webpage visit count.	16	K2	3
14. a)	Elaborate in detail how XPath is used for specifying a collection of elements within an XML documents with location paths.	16	K4	4
	(OR)			
b)	Explain the concept of JSP that supports Model-View-Controller paradigm with sample code.	16	K4	4
15. a)	Create a Java web service program for the currency conversion between three currencies (Dollar, Rupees & Euros). Given an input in one currency the web service should return the equivalent amount in other two currencies.	16	K3	4
	(OR)			
b)	Explain in detail about Simple Object Access Protocol and discuss the communication with object data.	16	K3	4

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(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: VIII [Full Time]

Civil Engineering

18CE801 – CONSTRUCTION MANAGEMENT

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define work task.	2	K1	1
2. Recall the precedence relationship among activities.	2	K1	1
3. List the three time estimates used for determining the activity duration.	2	K1	2
4. Infer the constraints in scheduling.	2	K2	2
5. Define project budget.	2	K1	3
6. List the uses of S-curve.	2	K1	3
7. List the applications of quality circle.	2	K1	4
8. What are the causes of accidents in construction industry?	2	K1	4
9. How the accuracy is necessary in information?	2	K1	4
10. Summarize the advantages and disadvantages of centralized database management system.	2	K2	4

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

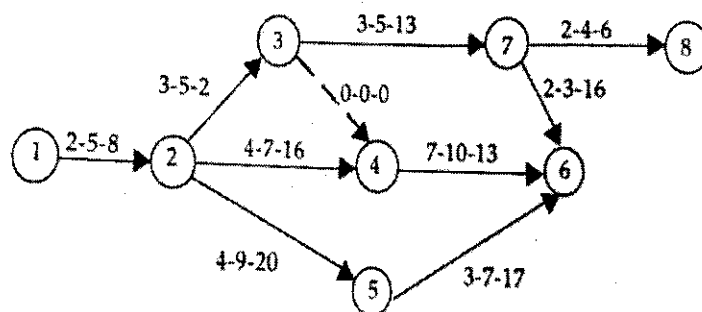
Q. No	M	BTL	CO
11. a) i) Explain the basic concepts in the development of construction planning.	8	K2	1
ii) Interpret the choice of construction technology.	8	K2	1
(OR)			
b) i) How will you calculate activity duration? Explain in detail.	8	K2	1
ii) Illustrate the estimation of resources requirement for work activities.	8	K2	1

Q. No

M BTL CO

12. a) The Pessimistic time, most probable time and optimistic time of the activities in the network are shown in below. Calculate the project completion time, float and critical path.

16 K4 2



(OR)

- b) Categorize the techniques used for scheduling a project with uncertain duration? Explain any one of them in detail? 16 K4 2
13. a) Identify how the cost control for a project is carried out. 16 K3 3
- (OR)
- b) Explain about Schedule control with its significance. 16 K3 3
14. a) List the importance of quality and safety in construction and explain them in detail. 16 K1 4
- (OR)
- b) Recall the methods of statistical quality controls with examples and explain them. 16 K1 4
15. a) Elaborate the various sets of information collected and their use in regard to construction project information. 16 K3 5
- (OR)
- b) Identify the conceptual and relational models for organizing databases and explain them. 16 K3 5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: VI [Full Time]

Civil Engineering

22CEPE02 – ADVANCED STEEL STRUCTURES

(Regulations 2022)

(IS 800:2007, SP 16, IS 875:1987 PART I, PART II, PART III, IS 801:1975, IS 811:1987 are permitted)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Differentiate flexible connection and rigid connection.	2	K2	1
2. What is mean by framed connection?	2	K1	1
3. Differentiate bearing stiffener and transverse stiffener.	2	K2	2
4. Explain local buckling.	2	K1	2
5. What is mean by beam-column?	2	K1	5
6. What are the causes of bending moments in column?	2	K1	5
7. What are all the types of truss based on configuration? And draw one example for each of them.	2	K1	3
8. Determine the live load on the roof of a steel truss if the angle of pitch is 16°.	2	K3	3
9. Draw the various section available in light gauge steel structural members.	2	K1	5
10. Explain the codal provisions available for the design of light gauge steel structural members.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) An ISMB 450 is to be connected to the flange of a column ISHB300 @618 N/m. The reaction transmitted by the beam is 120 kN. Design as unstiffened seated connection. Use M20 black bolts.	16	K3	4
(OR)			
b) Design stiffened seat angle for a reaction of 250 kN from beam of ISMB 400. This beam has to be connected to a column of size ISHB 200. Assume Fe 410 grade steel and shop welding.	16	K3	4

Q. No		M	BTL	CO
12. a)	Design a welded plate girder of span 24m to carry a superimposed load of 35 kN/m. Avoid use of bearing and intermediate stiffeners. Use Fe410 steel. No need to design connection.	16	K3	2
b)	Design a simply supported gantry girder to carry an electric overhead travelling crane, given: Span of gantry girder = 6.5 m, Span of crane girder = 16 m, Crane capacity = 250 KN, Self-weight of crane girder excluding trolley = 200 KN, Self-weight of trolley = 50 KN, Minimum hook approach = 1m, Distance between wheels = 3.5m, Self-weight of rails = 0.3 KN/m.	16	K3	2
13. a)	Explain briefly about P-Δ effects or structure effects.	16	K2	5
	(OR)			
b)	A non-sway column in a building frame with flexible joints is 4-m high and subjected to the following load and moment: Factored axial load 500 kN, Factored moment M_z at top of column = 270 kNm and at bottom of column = 45.0 kNm. Design a suitable beam-column assuming $f_y = 250$ MPa. Take the effective length of the column as 0.8L along both the axes.	16	K2	5
14. a)	Determine the design loads on the purlins of an industrial building near Visakhapatnam. given: Class of building: General with life of 50 years. Terrain: Category 2. Maximum dimension: 40 m. Width of building: 15 m. Height at eave level: 8 m. Topography: less than 3°. Permeability: Medium Span of truss: 15 m Pitch: 1/5 Sheeting: A.C. sheets. Spacing of purlins: 1.35 m. Spacing of trusses: 4 m.	16	K3	3

(OR)

Q. No		M	BTL	CO
b)	Design an I-section purlin for an Industrial building to support a galvanized corrugated Iron sheet. given: Spacing of the truss: 6 m Inclination of main rafter: 30° Spacing of purlin: 1.5 m Height of purlin: 1.5 m Weight of corrugated sheeting = 130 N/m ² Live load = 0.6 kN/m ² wind load = 1.8 kN/m ² Yield stress of steel=250 MPa	16	K3	3
15. a)	Discuss the following: a) Local buckling b) Lateral torsional buckling c) Concept of elastic width d) Cold-formed steel (OR)	16	K2	5
b)	A hat of 100 mm x 80 mm x 5 mm section with a 30 mm lip is to be used as concentrically loaded column of effective length 4.0 m. Determine the allowable load. Take $f_y = 235 \text{ N/mm}^2$.	16	K2	5

Registration Number:

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: III [Full Time]

Civil Engineering

22MA301 – TRANSFORMS AND NUMERICAL METHODS

(Regulations 2022)

Time: 3 Hours

Maximum Marks: 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Find the Fourier cosine transform of $f(x) = \begin{cases} 1, & 0 < x < a \\ 0, & \text{otherwise} \end{cases}$	2	K1	1
2. State the Fourier integral theorem.	2	K1	1
3. Find Laplace transform of $\frac{\sin t}{t}$	2	K2	2
4. State the convolution theorem in Laplace transform.	2	K1	2
5. Write the order and condition of convergence for Newton-Raphson method.	2	K1	3
6. Construct the divided difference table of $f(x) = x^3 + x + 2$ for the arguments 1, 3 and 6.	2	K2	3
7. Given that $y' = x + y, y(0) = 1$. Find $y(0.2)$ by Euler's method	2	K2	4
8. Write Adam's predictor corrector formula	2	K1	4
9. Classify the P.D.E $x f_{xx} + y f_{yy} = 0, x > 0, y > 0$.	2	K2	5
10. Write the Crank-Nicholson explicit difference scheme to solve $u_{xx} = au_t$	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Determine the Fourier transform of $f(x)$ where $f(x) = \begin{cases} 1 - x^2 & \text{if } x \leq 1 \\ 0 & \text{if } x > 1 \end{cases}$. Hence evaluate $\int_0^\infty \frac{\sin s - s \cos s}{s^3} \cos \frac{s}{2} ds$.	8	K3	1
ii) Using Fourier sine transform, prove that $\int_0^\infty \frac{s^2 ds}{(s^2 + a^2)(s^2 + b^2)} = \frac{\pi}{2(a+b)}$	8	K3	1
(OR)			
b) i) Find Fourier transform of $e^{- x }$, using parseval's identity prove that $\int_0^\infty \frac{dx}{(x^2 + 1)^2} = \frac{\pi}{4}$.	8	K3	1
ii) Find Fourier sine transform of $f(x) = \frac{e^{-ax}}{x}$.	8	K3	1

Q. No	M	BTL	CO
12. a) i) Using Laplace transform, solve $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = e^{-t}$ given $y(0) = 1, y'(0) = 0$	10	K3	2
ii) Verify initial and final value theorem for $f(t) = 3e^{-2t}$ (OR)	6	K2	2
b) i) Find inverse Laplace transform of $\frac{s^2}{(s^2+a^2)(s^2+b^2)}$ using convolution theorem.	10	K3	2
ii) Find $L(te^{-2t}\sin t)$	6	K2	2
13. a) i) Find the positive root of $x = \cos x$ by Newton's method.	8	K3	3
ii) Solve the following system of equations by Gauss-Seidel method $10x - 5y - 2z = 3; 4x - 10y + 3z = -3; x + 6y + 10z = -3.$ (OR)	8	K3	3
b) i) Determine y at $x = 43$ by Newton's method using the following data x: 40 50 60 70 80 90 y: 184 204 226 250 276 304	8	K3	3
ii) Solve by Gauss elimination method, $x + 2y + z = 3, 2x + 3y + 3z = 10, 3x - y + 2z = 13$	8	K3	3
14. a) i) Find the first derivative of y at $x=1.1$ x: 1.0 1.1 1.2 1.3 1.4 y: 43.1 47.7 52.1 56.4 60.8	8	K2	4
ii) Using R-K. method of order 4, find $y(0.7)$ if $y' = y - x^2$ given $y(0.6) = 1.7379$ (OR)	8	K3	4
b) i) Evaluate $I = \int_0^6 \frac{1}{1+x} dx$ using Simpson's 1/3 rule by dividing the range of integration into six equal parts	8	K2	4
ii) Determine $y(2)$ by using Milne's method, given that $y' = \frac{x+y}{2}, y(0) = 2, y(0.5) = 2.636, y(1) = 3.595, y(1.5) = 4.968$	8	K3	4
15. a) Solve $u_{xx} = u_{tt}$ given $u(x, 0) = 0, u_t(x, 0) = 0, u(0, t) = 0$ and $u(1, t) = 100 \sin \pi t$, Find the values of 'u' for four time steps with $h=0.25$. (OR)	16	K3	5
b) Solve $u_{xx} + u_{yy} = 0$ over the square mesh of side 4 units satisfying the following boundary conditions. (i) $u(0, y) = 0$ for $0 \leq y \leq 4$, (ii) $u(4, y) = 12 + y$ for $0 \leq y \leq 4$, (iii) $u(x, 0) = 3x$ for $0 \leq x \leq 4$, (iv) $u(x, 4) = x^2$ for $0 \leq x \leq 4$,	16	K3	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations - April/May 2025

Semester: III [Full Time]

Computer Science and Engineering

22MA303 - PROBABILITY AND NUMERICAL METHODS

(Regulations 2022)

(Statistical Tables are Permitted)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. The mean of Binomial distribution is 20 and standard deviation is 4. Find the distribution.	2	K2	1
2. Find the moment generating function (MGF) of Poisson distribution.	2	K1	1
3. Define skewness and kurtosis.	2	K1	2
4. The median and mode for a given set of data points is 20 and 30 respectively. Find out the mean.	2	K2	2
5. What are type I and type II errors?	2	K1	3
6. State any two uses of Chi-square test.	2	K1	3
7. Write the iterative formula in secant method.	2	K1	4
8. Compare Gauss elimination method and Gauss-Seidel method.	2	K1	4
9. State any two properties of divided differences.	2	K1	5
10. Using Newton's backward difference formula, write the formulae for $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = x_n$.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) The annual rainfall in inches in a certain region has a normal distribution with a mean of 40 and variance of 16. What is the probability that the rainfall in a given year is between 30 and 48 inches?	8	K3	1

Q. No		M	BTL	CO																						
	ii) The time (in hours) required to repair a machine is exponentially distributed with parameter $\lambda = \frac{1}{2}$. What is the probability that the required time is i) exceeds 2 hours ii) exceeds 5 hours.	8	K3	1																						
	(OR)																									
b)	Given that the joint p.d.f. of (X, Y) is $f(x, y) = \begin{cases} x + y, & 0 < x < 1, 0 < y < 1 \\ 0, & \text{otherwise} \end{cases}$. Compute the co-efficient of correlation between X and Y.	16	K3	1																						
12. a)	The first four moments of a distribution about the value 4 of the variable are $-1.5, 17, -30$ and 108 . Find the moments about mean, β_1 and β_2 . Find also the moments about the origin.	16	K3	2																						
	(OR)																									
b) i)	Fit a straight line $y = a + bx$ for the following data.	10	K3	2																						
	<table><tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>y</td><td>2</td><td>6</td><td>7</td><td>8</td><td>10</td><td>11</td></tr></table>	x	1	2	3	4	5	6	y	2	6	7	8	10	11											
x	1	2	3	4	5	6																				
y	2	6	7	8	10	11																				
ii)	For a distribution Karl Pearson's coefficient of skewness is 0.64 , standard deviation is 13 and mean is 59 . Find mode and median.	6	K3	2																						
13. a) i)	The IQ's of 10 girls are respectively $120, 110, 70, 88, 101, 100, 83, 98, 95$ and 107 . Test whether the population mean IQ is 100 .	8	K2	3																						
ii)	The theory predicts the proportion of beans, in the four groups A, B, C, D should be $9:3:3:1$. In an experiment with 1600 beans the numbers in the four groups were $882, 313, 287$ and 118 . Does the experimental result support the theory?	8	K3	3																						
	(OR)																									
b) i)	Two independent samples of sizes 10 and 8 from a normal population had the following values.	8	K2	3																						
	<table><tr><td>Sample-I</td><td>5</td><td>6</td><td>8</td><td>1</td><td>12</td><td>4</td><td>3</td><td>9</td><td>6</td><td>10</td></tr><tr><td>Sample-II</td><td>2</td><td>3</td><td>6</td><td>8</td><td>10</td><td>1</td><td>2</td><td>8</td><td>-</td><td>-</td></tr></table>	Sample-I	5	6	8	1	12	4	3	9	6	10	Sample-II	2	3	6	8	10	1	2	8	-	-			
Sample-I	5	6	8	1	12	4	3	9	6	10																
Sample-II	2	3	6	8	10	1	2	8	-	-																
	Do the estimates of population variance difference at 5% significance.																									
ii)	A normal population has a mean of 6.48 and S.D. of 1.5 . In a sample of 400 members, mean is 6.75 . Is the difference significant?	8	K3	3																						

Q. No		M	BTL	CO														
14. a)	i) Using Newton-Raphson method, find the positive root of $x^3 - 6x + 4 = 0$.	8	K3	4														
	ii) Solve by Gauss elimination method, $10x - y + 2z = 4$, $x + 10y - z = 3$, $2x + 3y + 20z = 7$. (OR)	8	K2	4														
b)	i) Solve by Gauss-Seidel Method, $5x + 2y + z = 12$, $x + 4y + 2z = 15$, $x + 2y + 5z = 20$.	8	K3	4														
	ii) Find the root of $x^3 - 4 = 0$ by using the bisection method.	8	K2	4														
15. a)	i) Using Newton's forward interpolation formula, find $y(43)$ from the following data:	8	K3	5														
	<table border="1"> <tr> <td>x</td> <td>40</td> <td>50</td> <td>60</td> <td>70</td> <td>80</td> <td>90</td> </tr> <tr> <td>y</td> <td>184</td> <td>204</td> <td>226</td> <td>250</td> <td>276</td> <td>304</td> </tr> </table>	x	40	50	60	70	80	90	y	184	204	226	250	276	304			
x	40	50	60	70	80	90												
y	184	204	226	250	276	304												
	ii) Find the Lagrange's polynomial of degree 3 to fit the data: $y(0) = -12$, $y(1) = 0$, $y(3) = 6$ and $y(4) = 12$. Hence, find $y(2)$. (OR)	8	K3	5														
b)	i) Using Newton's divided difference formula find the polynomial $f(x)$ and $f(6)$ from the following data:	8	K3	5														
	<table border="1"> <tr> <td>x</td> <td>1</td> <td>2</td> <td>7</td> <td>8</td> </tr> <tr> <td>$f(x)$</td> <td>1</td> <td>5</td> <td>5</td> <td>4</td> </tr> </table>	x	1	2	7	8	$f(x)$	1	5	5	4							
x	1	2	7	8														
$f(x)$	1	5	5	4														
	ii) Evaluate $\int_0^1 \frac{dx}{1+x}$ using the trapezoidal and Simpson's 1/3 rd rule by taking $h = 0.25$	8	K3	5														

Registration Number:

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: III [Full Time]

Electronics and Communication Engineering

22MA304 – FOURIER SERIES, COMPLEX VARIABLES AND TRANSFORMS

(Regulations 2022)

Time: 3 Hours

Maximum Marks: 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. State Dirichlet's condition for the expansion of Fourier series.	2	K1	1
2. Find the RMS value for $f(x) = x^2$ in $(0, 2l)$.	2	K2	1
3. If $F[f(x)] = F(s)$, then $F[f(ax)] = \frac{1}{a}F\left(\frac{s}{a}\right); a > 0$.	2	K1	2
4. Find the Fourier cosine transform for $f(x) = e^{-2x}, x > 0$.	2	K1	2
5. Show that an analytic function with constant Real part is constant.	2	K2	3
6. Find the image of $ z = 1$ under the mapping $w = z + (2 + 2i)$.	2	K2	3
7. Evaluate $\int_C \frac{5z^2 + 6z + 2023}{(z-1)^2} dz$, where C is the circle $ z = \frac{5}{2}$.	2	K2	4
8. Identify and classify the singularity of the function $f(z) = \frac{\sin z}{z}$.	2	K2	4
9. Find the Z- transform for $\frac{1}{n!}$.	2	K1	5
10. Obtain a difference equation by eliminating arbitrary constant 'a' from $y_n = 3^n + a$.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Find the Fourier series expansion for the function $f(x) = x + x^2$ in the interval $(-\pi, \pi)$ and deduce that $\sum_{n=1}^{\infty} \frac{1}{n^2} = \frac{\pi^2}{6}$.	16	K2	1
(OR)			
b) Find the half-range cosine series for $f(x) = \pi x - x^2$ in $0 < x < \pi$ and deduce that $\frac{1}{1^4} + \frac{1}{2^4} + \dots = \frac{\pi^4}{90}$.	16	K2	1
12. a) Find the Fourier transform of $f(x) = \begin{cases} a^2 - x^2 & x < a \\ 0 & x > a > 0 \end{cases}$.	16	K3	2
Hence deduce that $\int_0^{\infty} \frac{\sin t - t \cos t}{t^3} dt = \frac{\pi}{4}$. Using Parseval's identity, show that $\int_0^{\infty} \left(\frac{\sin t - t \cos t}{t^3}\right)^2 dt = \frac{\pi}{15}$.			
(OR)			

Q. No		M	BTL	CO
b) i)	Find the Fourier sine transform of $f(x) = e^{-ax}$ and hence find the Fourier cosine transform for $xe^{-ax}; x > 0$.	8	K3	2
ii)	Evaluate: $\int_0^{\infty} \frac{dx}{(x^2+16)(x^2+25)}$	8	K3	2
13. a) i)	If $f(z) = u + iv$ is an analytic function, then prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) f(z) ^2 = 4 f'(z) ^2$.	8	K2	3
ii)	Find the image of $ z - 3i = 3$ under the transformation $w = \frac{1}{z}$.	8	K3	3
	(OR)			
b) i)	Determine the bilinear transformation that maps the points $-1, 0, 1$, in the z plane onto the points $0, i, 3i$ in the w plane.	8	K2	3
ii)	Determine the analytic function $w = u + iv$ if $u = e^{2x}(x \cos 2y - y \sin 2y)$.	8	K3	3
14. a)	Expand $f(z) = \frac{z}{(z+1)(z+2)}$ in Laurent's series valid for (i) $ z < 1$ (ii) $1 < z < 2$ (iii) $ z > 2$.	16	K3	4
	(OR)			
b)	Using Contour integration on unit circle, evaluate $\int_0^{2\pi} \frac{d\theta}{(5+4 \sin \theta)}$.	16	K3	4
15. a) i)	Find the Z-transform of $f(n) = \frac{2n+3}{(n+1)(n+2)}$.	8	K2	5
ii)	Find $Z^{-1} \left[\frac{z^2}{(z+2)(z^2+4)} \right]$ using partial fraction.	8	K3	5
	(OR)			
b) i)	Find $Z^{-1} \left[\frac{z^2}{(z-a)^2} \right]$ using convolution theorem.	8	K2	5
ii)	Solve by using Z- transform $y_{n+2} - 7y_{n+1} + 12y_n = 2^n$ given that $y(0) = 0$ and $y(1) = 0$.	8	K3	5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: III [Full Time]

Mechanical Engineering

22MA305 – FOURIER SERIES, BOUNDARY VALUE PROBLEMS AND TRANSFORMS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Obtain a_n of the half range cosine series of $f(x) = (x+1)^2$ in $(-1, 0)$.	2	K2	1
2. Find the RMS value of the Fourier series of $f(x) = x^2 - x, 0 < x < 1$.	2	K2	1
3. Find the nature of PDE $f_{xx} + 2f_{xy} + f_{yy} + 2f_x - f_y + x + 2y = 0$.	2	K1	2
4. Write down the suitable solutions for one dimensional heat equation $\rho C_p \frac{\partial u}{\partial t} = \kappa \frac{\partial^2 u}{\partial x^2}$, where thermal conductivity (κ), density (ρ) and specific heat (C_p) are 10, 1 and 2 respectively.	2	K1	2
5. Find the Laplace transform of $f(t) = \sinh at, t \geq 0$.	2	K1	3
6. Find $L^{-1} \left[\log \left(\frac{s+1}{s-1} \right) \right]$.	2	K1	3
7. State Fourier integral theorem.	2	K1	4
8. If $F[f(x)] = F(s)$, then show that $F[f(x-2)] = e^{2is} F(s)$.	2	K1	4
9. Prove that $Z \left[\frac{1}{n!} \right] = e^{1/z}$.	2	K2	5
10. If $Z[f(t)] = F(z)$ then, prove that $Z[f(t+T)] = zF(z) - zf(0)$.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Find the Fourier series to represent the function $f(x)$ given by $f(x) = \begin{cases} x & \text{for } 0 < x \leq \pi \\ 2\pi - x & \text{for } \pi \leq x < 2\pi \end{cases}$ hence deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{8}$.	8	K2	1
ii) Obtain the half-range cosine series for $f(x) = (x-1)^2$ in the interval $0 < x < 1$.	8	K2	1

(OR)

Q. No		M	BTL	CO
b) i)	Determine the Fourier series for the function $f(x) = \begin{cases} x-1, & -\pi < x < 0 \\ x+1, & 0 < x < \pi \end{cases}$	8	K2	1
ii)	Find the Fourier series for $f(x) = x^2$ in $-\pi < x < \pi$. Hence show that $\frac{1}{1^4} + \frac{1}{2^4} + \frac{1}{3^4} + \dots = \frac{\pi^4}{90}$.	8	K2	1
12. a)	A string stretched and fastened to two points l apart. Motion is started by displacing the string into the form $50x(l-x)$ from which it is released at time $t = 0$. Find the displacement of any point on the string at a distance x from one end at time t .	16	K3	2
	(OR)			
b)	The ends A and B of a rod 30cm long have their temperatures kept at 20°C and 80°C until steady state prevails. The temperature at the end B is then suddenly reduced to 60°C and that of A is raised to 40°C and maintained so. Find the temperature distribution.	16	K3	2
13. a) i)	Verify the initial and final value theorem for the function $f(t) = 1 + e^{-t}(\sin t + \cos t)$, by Laplace transformation.	8	K3	3
ii)	Find the inverse Laplace transform of the function $\frac{1}{(s^2 + \omega^2)^2}$, using convolution.	8	K2	3
	(OR)			
b) i)	Find the Laplace transform of the rectangular wave function of period $2b$ given by $f(t) = \begin{cases} 1, & 0 < t < b \\ -1, & b < t < 2b \end{cases}$ with $f(t + 2b) = f(t)$	8	K3	3
ii)	Find $L^{-1}\left[\frac{1}{s^2(s^2+4)}\right]$.	8	K2	3
14. a)	Find the Fourier transform of the function $f(x) = \begin{cases} a^2 - x^2, & x < a \\ 0, & x > a > 0 \end{cases}$ Hence deduce that (i) $\int_0^\infty \frac{\sin t - t \cos t}{t^3} dt = \frac{\pi}{4}$ and (ii) $\int_0^\infty \left(\frac{\sin t - t \cos t}{t^3}\right)^2 dt = \frac{\pi}{15}$.	16	K3	4
	(OR)			
b) i)	Find Fourier cosine transform of $f(x) = e^{-a^2 x^2}$, $x \geq 0$, $a > 0$	8	K3	4
ii)	Using Fourier transform, evaluate $\int_0^\infty \frac{x^2}{(x^2+4)} dx$.	8	K3	4
15. a) i)	Find $Z\left[\frac{1}{(n+1)(n+2)}\right]$.	8	K2	5
ii)	Using convolution theorem, evaluate inverse Z-transform of $\left[\frac{3z^2}{(z-1)(3z-9)}\right]$.	8	K3	5
	(OR)			

Q. No	M	BTL	CO
b) i) Find $Z^{-1} \left[\frac{z(z+1)}{(z-1)^3} \right]$ by residue method.	8	K2	5
ii) Derive the difference equation from $y_n = (A + Bn)2^n$.	8	K3	5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: III [Full Time]

Metallurgical Engineering

22MA306 – LINEAR ALGEBRA AND TRANSFORMS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define vector space.	2	K1	1
2. Determine whether the set $W = \{(a_1, a_2, a_3) \in \mathbb{R}^3 a_1 = a_3 + 2\}$ is a subspace under the operations of vector addition and scalar multiplication defined on $\mathbb{R}^3$.	2	K2	1
3. Define: Inner product space.	2	K1	2
4. List out any two properties of adjoint of a linear operator.	2	K1	2
5. Evaluate $L(t^5 e^{-4t})$.	2	K3	3
6. Find inverse Laplace transform of $\left(\frac{3}{s^2 + 2s}\right)$	2	K2	3
7. Show that $F[e^{tax} f(x)] = F(s + a)$	2	K2	4
8. State the Fourier transform of the derivatives of a function.	2	K1	4
9. Prove that $Z(na^n) = \frac{az}{(z-a)^2}$	2	K2	5
10. State initial and final value theorem of Z-transform.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Let X and Y be vector spaces over a field F . Let $V = \{(x, y) x \in X \text{ and } y \in Y\}$. Prove that V is a vector space over F with the operations $(x_1, y_1) + (x_2, y_2) = (x_1 + x_2, y_1 + y_2)$ and $c(x_1, y_1) = (cx_1, cy_1), \forall x_1, x_2 \in X, y_1, y_2 \in Y \text{ and } c \in F$	8	K2	1
ii) Check whether the vectors $V_1 = (1, 2, 1); V_2 = (2, 1, 0); V_3 = (1, -1, 2)$ form a linearly dependent or linearly independent in $V_3(\mathbb{R})$	8	K2	1

(OR)

Q. No		M	BTL	CO
b) i)	Let $T: \mathbb{R}^2 \rightarrow \mathbb{R}^3$ be defined by $T(x, y) = (x - y, x, 2x + y)$. Let $B = \{e_1, e_2\}$, where $e_1 = (1, 0)$; $e_2 = (0, 1)$ be the basis for $\mathbb{R}^2$ and $B' = \{(1, 1, 0), (0, 1, 1), (2, 2, 3)\}$ be a basis for $\mathbb{R}^3$. Find the matrix of T in the basis.	8	K2	1
ii)	State and prove rank-nullity theorem.	8	K2	1
12. a) i)	Let V be the set of all continuous real valued functions defined in the closed interval $[0, 1]$. The linear product on V is defined by $\langle f, g \rangle = \int_0^1 f(t)g(t)dt$. Prove that V is an inner product space.	8	K2	2
ii)	Let $V = P_2(\mathbb{R})$ be the inner product space with inner product defined by $\langle f, g \rangle = \int_{-1}^1 f(t)g(t)dt$ starting with the standard basis $B = \{1, x, x^2\}$. Construct an orthonormal basis by Gram-schmidt process.	8	K3	2
(OR)				
b) i)	A linear operator on $\mathbb{R}^2(\mathbb{R})$ with standard inner product is defined by $T(x, y) = (x + 2y, x - y)$. Find $T^*(x, y)$ and $T^*(1, 2)$	8	K2	2
ii)	By least square find a linear function and error for the following data $\{(1, 0), (2, 1) \text{ and } (3, 3)\}$	8	K3	3
13. a) i)	Evaluate $L(f(t))$, where $f(t) = \begin{cases} \cos t, & 0 \leq t < \pi \\ 0, & t > \pi \end{cases}$	8	K4	3
ii)	Evaluate $L^{-1}\left(\frac{1}{s^2(s^4+4)}\right)$	8	K4	3
(OR)				
b) i)	Solve $y'' + 2y' - 3y = 3, y(0) = 4, y'(0) = 7$ using Laplace transform.	8	K4	3
ii)	Using convolution, solve the initial value problem $y'' + 9y' = \sin 3t, y(0) = 0, y'(0) = 0$	8	K4	3
14. a) i)	Find the Fourier transform of $f(x) = \begin{cases} 1 - x^2, & \text{if } x \leq 1 \\ 0, & \text{if } x > 1 \end{cases}$	8	K2	4
ii)	Find the Fourier cosine transform of $f(x) = \begin{cases} 3, & \text{if } 0 < x < 1 \\ 2 - x, & \text{if } 1 < x < 2 \\ 0, & \text{if } x > 2 \end{cases}$	8	K3	4
(OR)				

Q. No		M	BTL	CO
b) i)	Find the Fourier sine transform of $\frac{e^{-ax}}{x}$	8	K2	4
ii)	Using Parseval's identity, prove that $\int_0^\infty \frac{dt}{(a^2+t^2)(b^2+t^2)} = \frac{\pi}{2ab(a+b)}$	8	K3	4
15. a) i)	Find the Z-transform of $\frac{1}{n(n+1)}$, for $n \geq 1$	8	K2	5
ii)	Evaluate $Z^{-1} \left[\frac{z}{(z+1)(z-1)^2} \right]$	8	K4	5
(OR)				
b) i)	Find $Z^{-1} \left[\frac{z^2}{(z-a)(z-b)} \right]$ using convolution theorem.	8	K2	5
ii)	Solve using Z-transforms technique the difference equation $y_{n+2} + 4y_{n+1} + 3y_n = 3^n$ with $y_0 = 0, y_1 = 1$	8	K4	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV[Full Time]
Metallurgical Engineering

18CEOE04 – MECHANICS OF DEFORMABLE BODIES

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

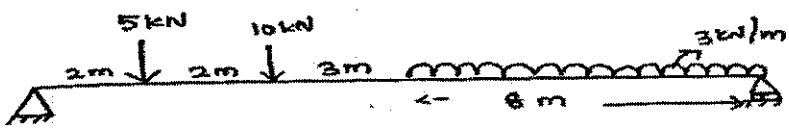
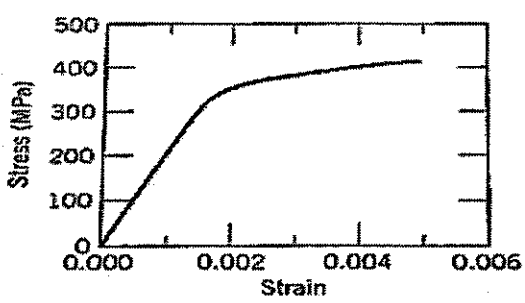
Answer **ALL** Questions

Q. No	M	BTL	CO
1. Distinguish between isotropic and anisotropic materials.	2	K2	1
2. List the advantages of composite bars.	2	K1	1
3. Define point of contra flexure?	2	K2	1
4. List the assumptions in theory of bending.	2	K1	1
5. Write the equation of torsion.	2	K2	1
6. Write down the formula for stiffness of an axial spring.	2	K2	1
7. Distinguish between stress strain curve and load deflection curve.	2	K2	2
8. How residual stresses are formed in members.	2	K2	2
9. Name the practical conditions where fatigue loading occurs.	2	K3	2
10. What is mean by isochronous curves?	2	K2	2

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) A pull of 7 kN has been applied to a 40 m long steel wire. Determine the diameter of wire can be used if tensile stress shall not exceed 150 MPa and extension of wire shall not exceed 20 mm. Take $E = 200 \text{ GPa}$.	16	K4	1
(OR)			
b) A compound bar consists of steel tube with 150 mm internal diameter and 170 mm external diameter and on outer brass tube of 170 mm internal diameter and 190 mm external diameter, subjected to an axial load of 900 kN, Determine the stresses in steel and brass if E for steel and brass is 200 GPa and 100 GPa.	16	K4	1

Q. No		M	BTL	CO
12. a)	Plot the shear force and bending moment diagram for the given beam Fig.1.	16	K3	1
 Fig.1				
(OR)				
b)	A steel beam of rectangular cross section of 200 mm X 300 mm (b X d), simply supported on a span of 6 m. Beam carries an UDL of 1.5 kN/m throughout the span. Calculate the maximum bending stress at, a) 2 m from support ii) mid span.	16	K3	1
13. a)	A hollow shaft of 60 mm external diameter subjected to a torque of 1145 Nm. If the maximum stress should not exceed 60 MPa, determine the internal diameter of the shaft.	16	K4	1
(OR)				
b)	A close coiled helical spring of 100 mm mean diameter is made up of 10 mm coil with 20 turns. If a spring subjected to an axial load of 150 N, determine stiffness, shear stress and deflection of the spring. Take $G = 84 \text{ GPa}$.	16	K4	1
14. a)	 Fig.2 For the stress strain curve shown Fig.2. above, - Mark elastic zone, plastic zone, break point, yield point - Calculate Young's modulus, Yield strength, ultimate strength.	16	K2	2
(OR)				
b)	Brief about stress concentration in compression and torsional members.	16	K2	2
15. a)	Explain in detail about fracture and stress concentration due to fatigue loading.	16	K2	2
(OR)				
b)	Explain various testing methods available for impact testing with neat sketches.	16	K2	2

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: I [Part Time]

Common to all Branches

22PTMA101/23PTMA101 – MATHEMATICS - I

(Regulations 2022/2023)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Find the particular integral of $y'' + 6y' + 9y = e^{-3x}$.	2	K2	1
2. Transform the equation $(2x + 3)^2 \frac{d^2y}{dx^2} - (2x + 3) \frac{dy}{dx} - 12y = 6x$ in to the linear differential equation with constant coefficients.	2	K2	1
3. Form a partial differential equation by eliminating the arbitrary constants from $z = (x + a)(y + b)$.	2	K2	2
4. Solve $(D^2 + 5DD' - 6D'^2)z = 0$.	2	K2	2
5. Find the unit normal to the surface $x^3 - xyz + z^3 = 1$ at the point (1, 1, 1).	2	K1	3
6. State Stoke's theorem.	2	K1	3
7. Find the image of the circle $ z = 2$ under the transformation $w = 3z$.	2	K2	4
8. Show that $f(z) = xy + iy$ is not differentiable anywhere.	2	K1	4
9. Find $\oint_C \frac{z+2}{z} dz$, where C is the circle $ z = 2$ in the z -plane.	2	K2	5
10. Find the singular points of $\frac{z+3}{z^2+1}$.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Solve $y'' - 5y' + 6y = 5 + \cosh 3x$	8	K2	1
ii) Solve $(D^2 + 1)y = \operatorname{cosec} x$ by the method of variation of parameters.	8	K2	1
(OR)			
b) i) Solve $x^2 \frac{d^2y}{dx^2} - x \frac{dy}{dx} + y = \sin(\log x)$.	8	K2	1
ii) Solve $(D^2 - 2D - 1)y = e^x \cos x$.	8	K2	1

Q. No		M	BTL	CO
12. a)	i) Form the partial differential equation by eliminating the arbitrary function from $f(x + y + z, x^2 + y^2 + z^2) = 0$.	8	K3	2
	ii) Solve $(D^2 - 3DD' + 2D'^2)z = e^{2x-y} + \sin(x - 2y)$.	8	K2	2
	(OR)			
b)	i) Solve : $x(y - z)p + y(z - x)q = z(x - y)$.	8	K3	2
	ii) Solve $(D^2 + DD' - 6D'^2)z = y + \cos x$.	8	K2	2
13. a)	i) Show that $\vec{F} = (y^2 + 2xz^2)\vec{i} + (2xy - z)\vec{j} + (2x^2z - y + 2z)\vec{k}$ is irrotational and hence find its scalar potential.	8	K3	3
	ii) Find the directional derivative of $\phi = x^2yz + 4xz^2$ at the point $P(1, -2, -1)$ in the direction of $\vec{i} + \vec{j} + 2\vec{k}$.	8	K3	3
	(OR)			
b)	Verify Gauss divergence theorem for $\vec{F} = 4xz\vec{i} - y^2\vec{j} + yz\vec{k}$ over the rectangular parallelopiped bounded by $x = 0, x = 1, y = 0, y = 1, z = 0, z = 1$.	16	K3	3
14. a)	i) If $w = f(z)$ is a regular function of z , prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) \log f(z) = 0$.	8	K2	4
	ii) If $v = e^{-x}(x \cos y + y \sin y)$ is imaginary part of the analytic function $f(z) = u + iv$, determine $f(z)$.	8	3	4
	(OR)			
b)	i) Find the image of the strip $1 < x < 2$ under the map $w = \frac{1}{z}$.	8	K2	4
	ii) Find the bilinear transformation which maps the points $-2, 0, 2$ into the points $w = 0, i, -i$.	8	K3	4
15. a)	i) Find the Laurent's series expansion of the function $f(z) = \frac{z}{(z-1)(z-3)}$ valid in the region $1 < z < 3$.	8	K3	5
	ii) Using Cauchy residue theorem, evaluate $\int_C \frac{z^2 dz}{(z-1)(z+2)}$ where C is $ z = 3$.	8	K3	5
	(OR)			
b)	Evaluate $\int_0^{2\pi} \frac{d\theta}{2 + \cos \theta}$ by contour integration.	16	K3	5

Registration Number :

Government College of Engineering, Salem
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M.E. Degree Examinations – April/May 2025

Semester: I [Full Time]

Computer Aided Design

22CDC13 – ADVANCED MECHANICS OF MATERIALS

(Regulations 2022)

(Use of approved data book is permitted)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define the term "State of stress" at a point.	2	K1	1
2. Recall the generalized Hooke's law for a linear elastic isotropic material.	2	K1	1
3. What is meant by shear centre?	2	K1	2
4. Explain term of a section.	2	K2	2
5. Contrast circumference and radial stresses.	2	K2	3
6. What is the assumptions made in Winkler-Bach Theory.	2	K1	3
7. Infer the advantages of hollow shaft over solid shaft.	2	K2	4
8. State St.Venants Principle.	2	K1	4
9. List the methods of analyzing contact stress.	2	K1	5
10. What is meant by a "bilinear rectangle" in the context of interpolation?	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Stress components at a point P in a plane stress problem are, $\sigma_{xx} = 150 \text{ MPa}$, $\sigma_{yy} = -100 \text{ MPa}$ and $\tau_{xy} = 50 \text{ MPa}$. Find the values of all principal strains at its directions at point P. Take the value of $E = 210 \text{ GPa}$ and $\nu = 0.25$.	16	K3	1
(OR)			
b) Consider a thin large rectangular plate, with a small hole at the centre, subjected to uniform tensile stress from its two ends. Find the variations of stress components around the hole by Airy's stress function method.	16	K3	1

Q. No

M BTL CO

12. a) Examine the shear centre of the section shown in Fig.1

16 K4 2

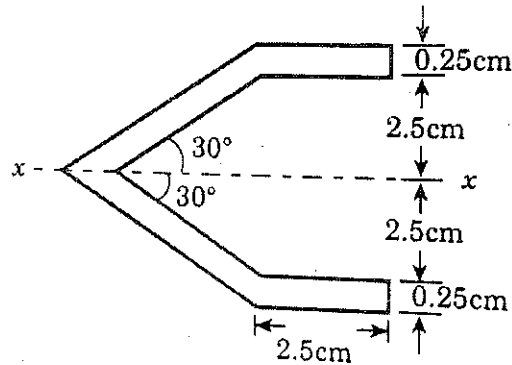


Fig.1

(OR)

- b) Categorize the stresses at points A,B,C of the cross section of the beam shown in the Fig.2.

16 K4 2

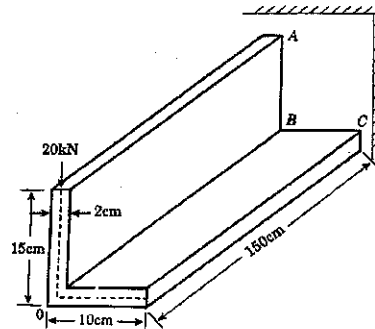


Fig.2.

13. a) Identify the ratio of the maximum tensile and compressive stresses in a curved bar subjected to pure bending. The bar is rectangular cross section with depth 10mm, width 15mm and radius of curvature of 125 mm.

16 K3 3

(OR)

- b) The dimensions of 100 kN crane hook are shown in the Fig.3. Estimate the stresses at the inside and outside fibers of the hook on a horizontal diameter passing through the centre of curvature.

16 K3 3

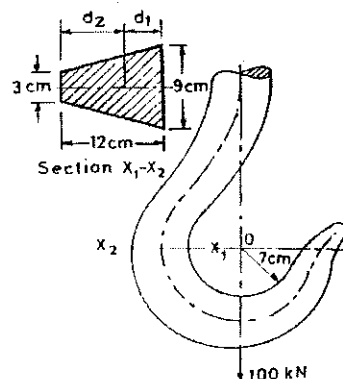


Fig.3

Q. No

M BTL CO

14. a) The thin walled cellular section shown in the Fig.4. is subjected to a torque of 50 N-m. If $G = 100 \text{ GPa}$, Compute (i) the sharing of torque by the two cells (ii) maximum shear stress in each cell and (iii) angular twist per unit length. The thickness of all walls is 2 mm.

16 K3 4

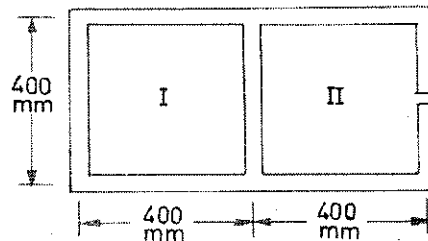


Fig. 4

(OR)

- b) A hollow aluminium tube of rectangular cross section shown in the Fig.5 is subjected to a torque of 56.5 kN-m along its longitudinal axis. Determine the shearing stresses and the angle of twist. Take $G = 28 \text{ GPa}$.

16 K3 4

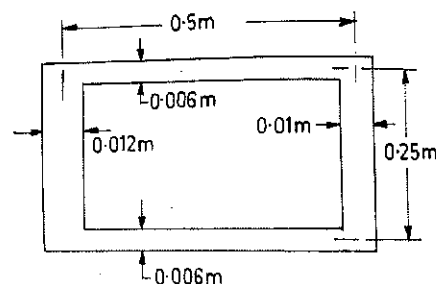


Fig. 5

15. a) A hardened steel ball bearing (Ball A) with diameter 20 mm is pressed against another identical ball bearing (Ball B) with a force of 2000 N. Subsequently, the same Ball A is pressed against a flat steel plate with the same force.

16 K4 5

For both cases:

- Calculate the maximum contact pressure
- Determine the radius of the contact area
- Calculate the maximum shear stress and its depth below the surface
- Discuss the practical implications of your findings for bearing design.

Young's modulus (E) for steel = 210 GPa

Poisson's ratio (ν) for steel = 0.3

(OR)

Q. No

M BTL CO

- b) A thin rectangular steel plate with dimensions 500 mm x 300 mm and thickness 10 mm is subjected to the following loads:

16 K4 5

A uniform tensile load of 20 MPa applied along the longer edges,

A linearly varying shear load from 0 MPa at the top to 10 MPa at the bottom along the shorter edges

Using the finite element method, Calculate:

- a) The maximum principal stress and its location
- b) The maximum shear stress and its location
- c) The maximum displacement and its location

Given:

Young's Modulus (E) of steel = 200 GPa

Poisson's Ratio (ν) of steel = 0.3

Registration Number :

Government College of Engineering, Salem
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M.E. Degree Examinations – April/May 2025

Semester: I [Full Time]

Power Electronics And Drives

22PEC12 – ANALYSIS OF POWER CONVERTERS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
1.	Justify how a free-wheeling diode improves power factor in a converter.	2	K2	1
2.	Compare non-circulating mode dual converter and circulating mode dual converter.	2	K1	1
3.	What is the effect of chopping frequency on load ripple current?	2	K2	2
4.	What is flux walking in push-pull circuit?	2	K1	2
5.	What methods are used to control the frequency and output voltage of an inverter?	2	K1	3
6.	What are the factors to be considered in the selection of switching devices for inverters?	2	K2	3
7.	In a m-level diode clamped inverter how many main switching devices and clamping diodes are present?	2	K2	4
8.	List the advantages of space vector modulation techniques.	2	K2	5
9.	Compare VSI and CSI.	2	K1	4
10.	Mention few applications of load commutated inverter.	2	K3	4

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
11. a)	A single-phase fully controlled bridge converter is connected to RLE load and it is supplied from 230 V, 50 Hz ac supply. The average load current is 7.5 A which is constant over the working range. Determine the firing angle for a) $E = 110$ V and b) $E = -110$ V. Assume $R = 5$ W and $L = 3$ mH. Specify which source is delivering power to load in cases (a) and (b). When the output current is constant, determine the input power factor for both cases (a) and (b).	16	K3	1

(OR)

Q. No		M	BTL	CO
b)	Draw the circuit diagram of a three phase bridge converter with RL load. Explain its working principle at $\alpha = 30^\circ$. Derive the expression for average output voltage.	16	K3	1
12. a)	Explain the operation of the forward converter and illustrate the design procedure.	16	K4	2
	(OR)			
b)	A boost converter has input voltage of 5 V and it operates at 25 kHz. When the average output voltage $V_o = 12$ V, the average load current $I_o = 0.8$ A, $L = 100 \mu\text{H}$, and $C = 147 \mu\text{F}$, determine (a) duty cycle, (b) ripple current of inductor ΔI , (c) the maximum current flow through inductor I_{max} , (d) ripple voltage across capacitor and (e) critical values of L and C.	16	K4	2
13. a)	A single phase bridge inverter has a resistive load $R=2.4$ ohm and the DC input voltage of 48 V. Determine a) RMS output voltage at fundamental frequency b) Output power c) I_{av} and I_m of each transistor d) Peak reverse blocking voltage of each transistor e) HF and DF at the LOH.	16	K3	3
	(OR)			
b)	Discuss the different techniques adopted to eliminate harmonics generated by inverter circuits.	16	K3	5
14. a)	With a neat circuit diagram and waveforms, explain the working of 180 degree conduction mode operation of three phase inverter with star and delta connection load.	16	K2	3
	(OR)			
b)	Explain the operation of flying capacitor multilevel inverter with necessary details. Also discuss its features, advantages and disadvantages.	16	K2	3
15. a)	Explain the operation of six step current source inverter with inductive load.	16	K2	4
	(OR)			
b)	A single phase auto sequential CSI is fed from 220V DC source. The load is $R=10$ ohm. Thyristor have taken a factor of safety of 2. Determine the value of source inductance assuming a maximum current change of 0.5 A in one cycle. Neglect all losses. Find also the values of commutating capacitors.	16	K2	4

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time]

Civil Engineering

22CE401/18CE401 - STRENGTH OF MATERIALS

(Regulations 2022/2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Compare Moment Area method and Double Integration method.	2	K2	1
2. State Castigliano's second theorem.	2	K1	1
3. Outline the advantages of continuous beam over simply supported beam.	2	K2	2
4. Write down the general form of Clapeyron's three moment theorem for continuous beam.	2	K1	2
5. State the assumptions followed in Euler's theory.	2	K1	3
6. Define buckling load of a column.	2	K1	3
7. State the reasons for unsymmetrical bending.	2	K1	4
8. How will you determine the product of inertia?	2	K1	4
9. Determine the Hoop's stress for the inner surface of a thick cylinder subjected to an internal pressure of 45MPa. Hoop's stress on the outer surface is 120MPa.	2	K3	5
10. Write down the different theories of failure.	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) A beam AB of length 8m is simply supported at ends. It carries a point load of 6 kN at 2m from end A and an udl of 10kN/m for length of 3m from the end B. Determine deflection at the midspan, maximum deflection and slope at A using Double Integration method. Assume $I = 10 \times 10^{-6} \text{ m}^4$.	16	K3	1

(OR)

Q. No		M	BTL	CO
b)	A simply supported beam AB of span 12 m carries loads of 100 kN and 120 kN at 4 m and 6 m respectively from B. Determine the deflection and slope under the loads using Moment Area method. Assume $E = 200\text{GPa}$ and $I = 150 \times 10^6 \text{ mm}^4$.	16	K3	1
12. a)	A continuous beam of three successive spans of 6 m, 8 m and 4 m and carries of 40 kN, 100 kN/m and 80 kN/m respectively on the spans. Determine the bending moments and reactions at the supports by the theorem of three moments. Plot the bending moment and shear force diagrams.	16	K3	2
	(OR)			
b)	Determine the fixing moments and support reactions of a fixed beam AB of length 6 m carrying an udl of 4 kN/m over the left half of the span.	16	K3	2
13. a)	A mild steel tube 4 m long, 3 cm internal diameter and 4mm thick is used as a strut with both ends hinged. Determine the collapsing load. What will be the crippling load if both the ends are built in and one end is built in with the other end is free?	16	K3	3
	(OR)			
b)	The external and internal diameter of a hollow cast iron column are 5cm and 4cm respectively. If the length of the column is 3m and both of its ends are fixed. Determine the crippling load using Rankine's formula. Assume values of $f_c = 550\text{N/mm}^2$ and $a = 1/6000$ in Rankine's formula.	16	K3	3
14. a)	Derive an expression to determine deflection of beam due to unsymmetrical bending.	16	K4	4
	(OR)			
b)	A channel section has flanges 100 mm x 15 mm and 180 mm x 10 mm. It is standing in position with flanges horizontal. Calculate the position of shear centre from the centroid of web on neutral axis.	16	K4	4

Q. No**M BTL CO**

15. a) A thick cylindrical shell 4 m long which is closed has an internal diameter of 2 m and a wall thickness of 25 mm. Calculate the circumferential, longitudinal stresses induced and changes in the volume of shell, if it is subjected to an internal pressure of 2N/mm^2 . Assume $E = 200\text{GPa}$ and Poisson's ratio as 0.3.

16 K3 5

(OR)

- b) A mild steel shaft 120 mm diameter is subjected to a maximum torque of 20 kNm and a maximum bending moment of 12 kNm at a particular section. Determine the factor of safety according to the maximum shear stress theory if the elastic limit in simple tension is 200MN/m^2 .

16 K3 5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: VII [Full Time]

Civil Engineering

18CE601 – ADVANCED STRUCTURAL ANALYSIS

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks: 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. List the causes for sway in portal frames.	2	K1	1
2. Write down the general slope-deflection equations and state what each term represents.	2	K1	1
3. Inter point of contraflexure with an example.	2	K2	2
4. Define carry over moment.	2	K1	2
5. Write down the equation for the degree of static indeterminacy of the pin jointed frames the notations used.	2	K1	3
6. Relate flexibility and stiffness of a structure.	2	K1	3
7. Define Kinematic redundancy.	2	K1	4
8. List the properties of rotation matrix.	2	K1	4
9. What is mean by discretization?	2	K1	5
10. List out the advantages and disadvantages of FEM.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Analyse the two-span continuous beam loaded as shown in fig.1 by the slope deflection method.	16	K4	1

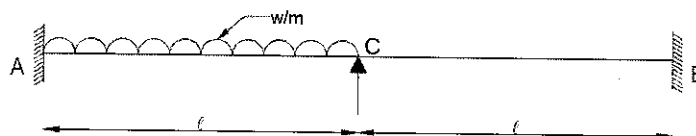


Fig.1

(OR)

Q. No

M BTL CO

- b) Analyse the portal frame ABCD shown in fig.2 by slope deflection method.

16 K4 1

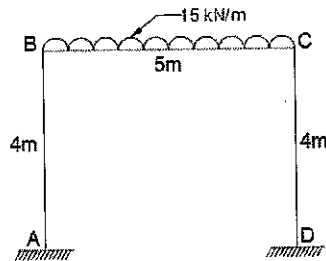


Fig.2

12. a) Analyse the continuous beam shown in fig.3 by moment distribution method. Take $EI = \text{Constant}$.

16 K4 2

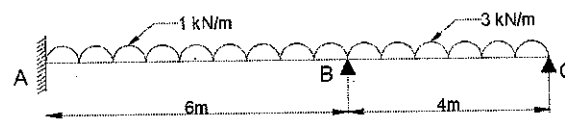


Fig.3

(OR)

- b) Analyse the frame shown in fig.4 by moment distribution method.

16 K4 2

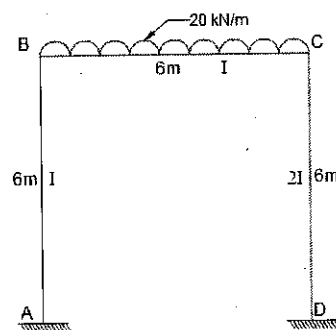


Fig.4

13. a) Analyze the continuous beam shown in fig.5 using force method.

16 K4 3

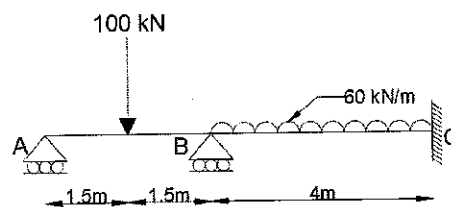


Fig.5

(OR)

Q. No

M BTL CO

- b) Analyze the given portal frame shown in fig.6.

16 K4 3

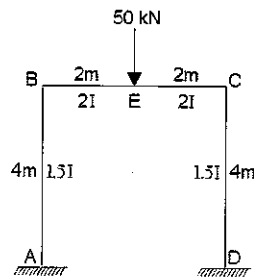


Fig.6

14. a) Analyze the continuous beam shown in fig.7.

16 K4 4

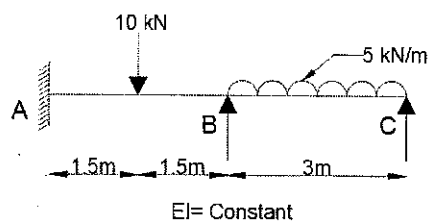
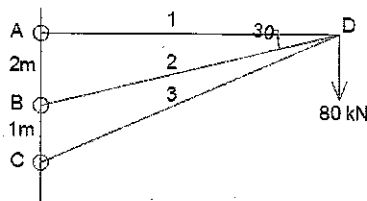


Fig.7

(OR)

- b) Using matrix stiffness method, analyse the truss for the member forces in the truss loaded as shown in fig.8.

16 K4 4



MEMBER	AE	L
AD	400	400
BD	461.9	461.9
CD	800	800

Fig.8

15. a) i) Explain the basic procedures required in adopting FEM.
ii) What is discretisation? Outline the guidelines for discretisation.

8 K2 5

8 K2 5

(OR)

- b) i) Derive the stiffness matrix for plane truss element using elementary approach method.
ii) Derive the stiffness matrix for plane beam element using shape functions.

8 K2 5

8 K2 5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time]

Computer Science and Engineering

22MA401 – DISCRETE MATHEMATICS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

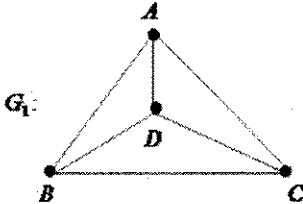
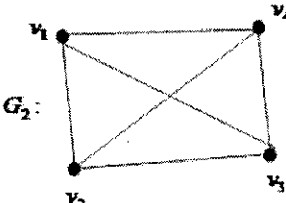
Answer **ALL** Questions

Q. No		M	BTL	CO
1.	Write the symbolic representation of "If it rains today, then I buy an umbrella".	2	K1	1
2.	Give the symbolic form of "Some men are giant".	2	K1	1
3.	State pigeonhole principle.	2	K1	2
4.	Find the recurrence relation of the sequence $S(n) = a^n$; $n \geq 1$.	2	K1	2
5.	Define a complete graph and give an example.	2	K1	3
6.	Draw a graph that is a Euler graph but not Hamiltonian.	2	K3	3
7.	Give an example of semi-group but not a monoid.	2	K1	4
8.	Define a field with example.	2	K1	4
9.	Show that in a Boolean algebra $ab' + a'b = 0$ if and only if $a = b$.	2	K2	5
10.	Define Lattices.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
11. a)	i) Show that the expression $(p \wedge q) \vee (\neg p \wedge q) \vee (p \wedge \neg q) \vee (\neg p \wedge \neg q)$ is a tautology by using truth tables.	8	K2	1
	ii) Obtain the principal disjunctive normal form of $(\neg P \rightarrow R) \wedge (Q \leftrightarrow R)$ by using equivalences.	8	K1	1
	(OR)			
b) i)	Show that $(P \rightarrow Q) \wedge (Q \rightarrow R) \Rightarrow (P \rightarrow R)$.	8	K1	1
	ii) Use indirect method of proof to show that $(\forall x)(P(x) \vee Q(x)) \Rightarrow (\forall x)P(x) \vee (\exists x)Q(x)$.	8	K2	1

Q. No		M	BTL	CO
12. a)	i) Use mathematical induction to show that $\sum_{k=1}^{\infty} k^2 = \frac{n(n+1)(2n+1)}{6}$.	8	K3	2
	ii) Use the method of generating function to solve $a_n = 3a_{n-1} + 1, n \geq 1, a_0 = 1$.	8	K3	2
	(OR)			
b) i)	Find the number of integers between 1 and 250 that are divisible by any of the integers 2,3,5 and 7.	8	K3	2
	ii) Solve the recurrence relation $a_n - 5a_{n-1} + 6a_{n-2} = 0$ where $a_0 = 0, a_1 = 1$.	8	K3	2
13. a)	i) Show that in any graph G, the number of vertices of odd degree is even.	8	K2	3
	ii) Prove that in a simple graph with n vertices and k components can have maximum of $\frac{(n-k)(n-k+1)}{2}$ edges.	8	K5	3
	(OR)			
b) i)	Examine whether the following pairs of graphs G_1, G_2 given below are isomorphic or not.	8	K2	3
	 G_1  G_2			
	ii) Show that if a graph with n vertices is self-complementary, then $n = 0$ or $1 \pmod{4}$.	8	K5	3
14. a)	i) If $*$ is the binary operation on the set R of real numbers defined by $a * b = a + b + 2ab$, show that $(R, *)$ is a commutative monoid.	8	K2	4
	ii) Let $H = \{[0], [4], [8]\}$ is a subgroup of $(\mathbb{Z}_{12}, +_{12})$, find all the cosets of H .	8	K4	4
	(OR)			
b) i)	State and prove Lagrange's theorem.	8	K4	4
	ii) If $(G, *)$ is an abelian group, show that $(a * b)^2 = a^2 * b^2$.	8	K2	4
15. a)	i) Show that every chain is a distributive lattice.	8	K4	5
	ii) If a, b are any two elements in a complemented distributive lattice L , then show that the following are equivalent: $a \leq b, \quad a * b' = 0, \quad a' \oplus b = 1, \quad b' \leq a'.$	8	K4	5
	(OR)			

Q. No		M	BTL	CO
b) i)	Show that every distributive lattice is modular but not conversely.	8	K4	5
ii)	Let $D_{30} = \{1, 2, 3, 5, 6, 10, 15, 30\}$ with a relation $x \leq y$ if and only if x divides y . Find	8	K4	5
	a) All lower bounds of 10 and 15			
	b) GLB of 10 and 15			
	c) All upper bounds of 10 and 15			
	d) LUB of 10 and 15			
	e) Draw the Hasse diagram for D_{30} .			

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time]

Electronics and Communication Engineering

22MA402 – PROBABILITY AND STOCHASTIC PROCESSES

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. If $P(A) = 0.5$, $P(B) = 0.3$ and $P(A \cap B) = 0.15$, find $P(A/\bar{B})$.	2	K2	1
2. State total probability of an event.	2	K1	1
3. Let X be binomial random variable with $E[X] = 5$ and $Var(X) = 2$. Determine the distribution.	2	K2	2
4. Find the Moment generating function of $f(x) = \begin{cases} \frac{2}{3} & \text{at } x = 1 \\ \frac{1}{3} & \text{at } x = 2 \\ 0 & \text{Otherwise} \end{cases}$.	2	K2	2
5. The joint probability mass function of two random variables X and Y is given by $p(x,y) = \begin{cases} kxy, & x = 1,2,3; y = 1,2,3 \\ 0 & \text{otherwise} \end{cases}$. Determine the value of the constant k .	2	K2	3
6. Find the marginal density function of X if $f(x,y) = \frac{2}{5}(2x + 3y)$, $0 \leq x \leq 1, 0 \leq y \leq 1$.	2	K2	3
7. State Liapounoff's form of central limit theorem.	2	K1	4
8. State strong law of large numbers.	2	K1	4
9. Define Wide sense stationary Process.	2	K1	5
10. Define Power spectral density.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Let 5 men out of 100 and 25 women out of 1000 are colour blind. A colour blind person is chosen at random. What is the probability of his being male. (Assume that males and females are in equal proportion)	8	K2	1

Q. No **M** **BTL** **CO**

- ii) A continuous random variable X that can assume any value between $x = 2$ and $x = 5$ has a density function given by $f(x) = k(1 + x)$. Find $P(X < 4)$.

(OR)

- b) i) A discrete random variable has the following probability distribution.

x	-2	-1	0	1	2	3
$p(x)$	0.1	k	0.2	$2k$	0.3	$3k$

- i) Find the value of k .
 ii) Find $P(X < 2)$
 iii) $P(-2 < X < 2)$
 iv) Find the distribution function of X .
 v) Find the mean value of X .

- ii) If a random variable X has the m.g.f, $M_X(t) = \frac{2}{2-t}$, find the variance of ' X '.

12. a) i) Out of 800 families with 4 children each how many families would be expected to have i) 2 boys and 2 girls ii) At least 1 boy iii) at most 2 girls iv) children of both genders.

- ii) An electric firm manufactures light bulbs that have a length of life which is normal distributed with mean $\mu = 800$ hours and standard deviation $\sigma = 40$ hours. Find the probability that a bulb burns between 778 and 834 hours?

(OR)

- b) i) The average seasonal rainfall in a place is 16 inches with a S.D. of 4 inches. What is the probability that in a year the rain fall in that place will be between 20 and 24 inches?

- ii) Suppose the duration ' X ' in minutes of long-distance calls from military office, follows exponential law with p.d.f.

$$f(x) = \begin{cases} \frac{1}{5} e^{-\frac{x}{5}} & x > 0 \\ 0 & \text{otherwise} \end{cases}$$

Find (1) $P(X > 5)$, (2) $P(3 \leq X \leq 6)$, means of X and variance of X .

Q. No		M	BTL	CO						
13. a)	i) The joint probability distribution of X and Y is given by $p(x, y) = \frac{x+y}{21}; x = 1, 2, 3; y = 1, 2$. Find all the marginal distributions and $E(X)$. ii) Suppose the number of red lights Alex encounters each day to work is on average 4.8. Alex really will be late if he encounters 8 or more red lights. Let X be the number of lights he gets on a given day. Give a bound for $P(X \geq 8)$ using Chebyshev's inequality, if we also assume $Var(X) = 2.88$.	8	K3	3						
	(OR)									
b) i)	If X and Y have joint p.d.f $= \begin{cases} x+y & ; 0 < x < 1, 0 < y < 1 \\ 0 & otherwise \end{cases}$ Check whether X and Y are independent.	8	K3	3						
	ii) A biased coin, which lands heads with probability $1/10$ each time it is flipped, is flipped 200 times consecutively. Give an upper bound on the probability that it lands heads at least 120 times.	8	K3	3						
14. a)	i) The lifetime of a certain brand of an electric bulb may be considered as random variable with mean $1200h$ and standard deviation $250h$. Using Central limit theorem, find the probability that the average life time of 60 bulbs exceed $1250h$. ii) If $X_1, X_2, \dots, X_n$ are Poisson variates with parameter $\lambda = 2$, use central limit theorem to estimate $P(120 \leq S_n \leq 160)$ where $S_n = X_1 + X_2 + \dots + X_n$ and $n = 75$.	8	K4	4						
	(OR)									
b) i)	Let $X_n \sim \text{uniform}(0, \frac{1}{n})$. Show that $X_n \xrightarrow{L^r} 0$, for any $r \geq 1$.	8	K4	4						
	ii) Consider a sequence $\{X_n, n = 1, 2, \dots\}$ such that	8	K3	4						
	<table border="1"> <tr> <td>X_n</td><td>0</td><td>n^2</td></tr> <tr> <td>$P(X_n)$</td><td>$1 - \frac{1}{n}$</td><td>$\frac{1}{n}$</td></tr> </table>	X_n	0	n^2	$P(X_n)$	$1 - \frac{1}{n}$	$\frac{1}{n}$			
X_n	0	n^2								
$P(X_n)$	$1 - \frac{1}{n}$	$\frac{1}{n}$								
	Show that i) $X_n \xrightarrow{p} 0$ (ii) X_n does not converge in the r^{th} mean for any $r \geq 1$.									

Q. No		M	BTL	CO
15. a)	i) Let the random process be $X(t) = \cos(t + \varphi)$ where φ is a random variable with density function $f(\varphi) = \frac{1}{\pi}, -\frac{\pi}{2} < \varphi < \frac{\pi}{2}$. Check whether the processes is stationary or not.	8	K3	5
	ii) The autocorrelation function of the random telegraph signal process is given by $R(\tau) = a^2 e^{-2\lambda \tau }$. Determine the power density spectrum of the random telegraph signal.	8	K3	5
	(OR)			
b) i)	The power spectral density of the random process $\{X(t)\}$ is given by $S(\omega) = \begin{cases} \pi & \omega < 1 \\ 0 & \text{Elsewhere} \end{cases}$. Find its autocorrelation function.	8	K3	5
	ii) The autocorrelation function for a stationary ergodic process with no periodic components is $R_{XX}(\tau) = 25 + \frac{4}{1+6\tau^2}$. Find the variance of the random process $\{X(t)\}$.	8	K3	5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time]

Electrical and Electronics Engineering

22EE401 – SYNCHRONOUS AND INDUCTION MACHINES

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Distinguish between salient pole rotor and smooth cylindrical type rotor in synchronous generator.	2	K3	1
2. What is the use of slip test in synchronous generator?	2	K1	1
3. What operating principle in synchronous motor makes constant speed operation?	2	K1	2
4. List out the methods of starting used for synchronous motor?	2	K1	2
5. How ratings of three phase induction motor is specified?	2	K2	5
6. Under what conditions is the direct on line starting of three phase cage induction motors preferred?	2	K3	5
7. Write the condition for maximum torque under running conditions in a three phase induction motor.	2	K2	3
8. Draw the slip-torque characteristics of three phase induction motor.	2	K2	3
9. Single phase induction motor is not self-starting. Why?	2	K2	4
10. Write any four applications of Hysteresis motor.	2	K1	4

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Derive the EMF expression (Line voltage and Phase voltages) for three phase delta connected alternator with full pitched coil and concentrated winding.	8	K2	1

Q. No		M	BTL	CO
	ii) A 100 kVA, 3000 V, 50 Hz 3-phase star-connected alternator has effective armature resistance of 0.2Ω . The field current of 40 A produces short-circuit current of 200 A and an open-circuit EMF of 1040 V (line value). Calculate the full-load voltage regulation at 0.8 power factor lagging using EMF method.	8	K2	1
	(OR)			
b) i)	Elaborate the two reaction theory as applied to salient pole synchronous machines.	8	K2	1
	ii) A 3000 kVA, three phase, star connected, 6600 V, 8 pole, 50 Hz synchronous generator has synchronous reactance of 20 % and is running in parallel with infinite bus. Calculate the synchronizing power and the corresponding torque per mechanical degree of phase displacement at full load, 0.8 power factor lagging.	8	K2	1
12. a) i)	Derive an expression for torque developed in a cylindrical-rotor synchronous motor in terms of load angle and synchronous impedance.	10	K3	2
	ii) Show that the locus of stator current for a constant output of a three phase synchronous motor connected to a constant voltage, constant frequency bus-bar is a circle.	6	K3	2
	(OR)			
b) i)	How synchronous motor can be made to operate at leading or lagging power factors with suitable phasor diagrams.	10	K3	2
	ii) What is called synchronous condenser? Show the region of operation of the condenser on the V curves.	6	K3	2
13. a)	A three phase balanced AC supply is given to the three phase star connected induction motor with distributed winding. What type of magnetic field produced in the motor? Derive its mathematical expressions.	16	K3	5
	(OR)			
b)	Compare the performance of different types of starters used for three phase Squirrel cage Induction motor in terms of starting current, starting torque with its rated conditions. Derive the necessary mathematical expressions.	16	K3	5

Q. No		M	BTL	CO
14. a)	A three phase induction motor having a 6-pole, star connected stator winding operates with 400V, 50Hz AC supply. The rotor resistance and standstill reactance are 0.12Ω and 0.85Ω per phase respectively. The ratio of stator to rotor turns is 1.8. Full load slip is 4%. Calculate the developed torque at full load, maximum torque and speed at maximum torque.	16	K4	3
	(OR)			
b)	A 22 kW, 415 V, 50 Hz, three phase star connected induction motor has the following test data: No-load test 415 V 9 A power factor=0.2 Blocked rotor test 200 V 50 A power factor=0.4 Draw a circle diagram and determine (a) line current (b) power factor (c) slip and (d) efficiency at full load. The stator and rotor copper losses are divided equally in the blocked rotor test.	16	K4	3
15. a)	i) Derive the torque-speed characteristics for single phase induction motor with the help of double revolving field theory.	8	K1	4
	ii) Identify the different starting methods used for single phase induction motor? Explain any one method with diagram.	8	K1	4
	(OR)			
b) i)	Draw the equivalent circuit for shaded pole single phase induction motor and mention the significance of equivalent circuit parameters.	8	K1	4
	ii) Explain the operation of repulsion motor with neat diagram.	8	K1	4

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time]

Mechanical Engineering

22ME401 / 18ME401 – KINEMATICS OF MACHINERY

(Regulations 2022/2018/2018A)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. State kutzbach criteria to plane mechanism.	2	K2	1
2. Classify Kinematic Pairs.	2	K2	1
3. What is meant by rubbing velocity?	2	K1	2
4. With simple sketch, indicate the different types of instantaneous centres.	2	K2	2
5. Define cam. Give examples of cam.	2	K1	3
6. What is pressure angle with respect to cams?	2	K1	3
7. State the law of gearing.	2	K2	4
8. Differentiate simple gear train with compound gear train.	2	K2	4
9. What are the advantages of V – belt drive over flat belt drive?	2	K1	5
10. What are the different types of friction clutches?	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Explain the crank and slotted lever quick return mechanism for shaper with neat sketch.	16	K2	1
(OR)			
b) In which mechanism, the following inversions are there? Also sketch and explain the following inversions.	16	K2	1
a) Coupling rod locomotive			
b) Rotary internal combustion engine			
c) Elliptical Trammel			
d) Scotch Yoke mechanism			

Q. No	M	BTL	CO
12. a) The crank and connecting rod of a theoretical steam engine are 0.5 m and 2 m long respectively. The crank makes 180 rpm in the clockwise direction. When it has turned 45° from the inner dead centre position, determine: a) Velocity of piston b) Angular velocity of connecting rod c) Velocity of point E on the connecting rod 1.5 m from the gudgeon pin d) Velocity of rubbing at the pins of the crank shaft, crank and crank cross head when the diameters of their pins are 50 mm and 60 mm and 30 mm respectively.	16	K3	2
(OR)			
b) In a four bar chain ABCD, link AD is fixed and the crank AB rotates at 10 radians per second clockwise. Length of links are AB = 60 mm, BC = CD = 70 mm, DA = 120 mm. When angle DAB = 60° and both B and C lie on the same side of AD, calculate 1. Angular velocities (magnitude and direction) of BC and CD; and 2. Angular acceleration of BC and CD.	16	K3	2
13. a) A cam, with a minimum radius of 50 mm, rotating clockwise at a uniform speed, is required to move the knife-edged follower the motion as described below: (a) to move outwards through 40 mm during 100° rotation of the cam; (b) to dwell for next 80° (c) to return to its starting position during next 90° and (d) To dwell for the rest period of revolution. Draw the profile of the cam, when the line of stroke of the follower passes through the centre of the cam shaft and the follower motion is to take place with Uniform acceleration and uniform retardation. Determine the maximum velocity and acceleration of the follower when the cam shaft rotates at 900 r.p.m.	16	K3	3
(OR)			
b) Layout the profile of a cam operating a roller reciprocating follower for the following data. Lift of follower = 30mm; Angle during the follower dwell rise period = 120° ; Angle during the follower dwell after rise = 30° ; Angle during the follower return period = 150° . Angle during which follower dwell after return = 60° ; minimum radius of cam = 25 mm; Roller diameter = 10 mm. The motion of follower is Simple Harmonic Motion during rise and uniform acceleration and deceleration during the return period.	16	K3	3

Q. No		M	BTL	CO
14. a)	A pair of gears, having 40 and 20 teeth respectively, are rotating in mesh, the speed of the smaller being 2000 rpm. Determine the velocity of sliding between the gear teeth faces at the point of engagement, at the pitch point, and at the point of disengagement if the smaller gear is driver. Assume that the gear teeth are 20 involute form, addendum length is 5 mm and the module is 5 mm. Also find the angle through which the pinion turns while any pairs of teeth are in contact.	16	K4	4
	(OR)			
b)	The sun planet gear of an epicyclic gear train, the annular D has 100 internal teeth, the sun gear A has 50 external teeth and planet gear B has 25 external teeth. The gear B meshes with gear D and gear A. The gear B is carried on arm E, which rotates about the center of annular gear D. If the gear D is fixed and arm rotates at 20-rpm, then find the speeds of gear A and B.	16	K4	4
15. a)	i) State the laws of static and dynamic friction.	6	K4	5
	ii) Two pulleys, one 450 mm diameter and the other 200 mm diameter are on parallel shaft 1.95 m apart and are connected by a crossed belt. Examine the length of the belt required and the angle of contact between the belt and each pulley. What power can be transmitted by the belt when the larger pulley rotates at 200 rev/min, if the maximum permissible tension in the belt is 1 kN, and the co-efficient of friction between belt and pulley is 0.25?	10	K4	5
	(OR)			
b)	i) A 60 mm diameter shaft running in a bearing carries a load of 2000 N. if the co-efficient of friction between the shaft and bearing is 0.03. Find the power transmitted when it runs at 1440 rpm.	6	K4	5
	ii) A single dry plate clutch transmits 7.5 kW at 900 rpm. The axial pressure is limited to 0.07 N/mm ² . If the co-efficient of friction is 0.25, find 1. Mean radius and face width of the friction lining assuming the ratio of the mean radius to the face width as 4 and 2. Outer and inner radii of the clutch plate.	10	K4	5

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV [Full Time]

Metallurgical Engineering

22MA403 – PROBABILITY AND STATISTICAL METHODS

(Regulations 2022)

(Statistical tables to be Permitted)

Time: 3 Hours

Maximum Marks: 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. A box contains 4 bad and 6 good tubes. Two are drawn out from the box at a time. One of them is tested and found to be good. What is the probability that the other one is also good?	2	K1	1
2. A continuous random variable X has a probability density function $f(x) = 3x^2, 0 \leq x \leq 1$. Find 'a' such that $P(X \leq a) = P(X > a)$.	2	K2	1
3. Write down the condition for Poisson distribution is a limiting case of binomial distribution.	2	K1	2
4. Use Chebyshev's inequality to prove that $P(X = \mu) = 1$, if $Var(X) = 0$	2	K2	2
5. State the properties of joint probability distribution function.	2	K1	3
6. Consider the random variables X and Y given that $\sigma_x = 2, \sigma_y = 3$ and $Cov(X, Y) = 5$, then find $Var(3X - 2Y + 5)$.	2	K2	3
7. For a distribution Karl Pearson's coefficient of skewness is 0.64, standard deviation is 13 and mean is 59.2 Find mode and median.	2	K3	4
8. Write down the normal equation for fitting a curve $y = a + bx$.	2	K3	4
9. Define Null hypothesis.	2	K1	5
10. State the conditions under which χ^2 -test of goodness of fit is valid.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) A bag contains 5 balls and it is not known how many of them are white. Two balls are drawn at random from the bag and they are noted to be white. What is the chance that all the balls in the bag are white?	8	K2	1

Q. No		M	BTL	CO
	ii) A discrete random variable X has the probability mass function $P(X = x) = \frac{x}{15}, x = 1, 2, 3, 4, 5$. Find (i) $P(X = 1 \text{ or } X = 2)$, (ii) $P\left(\frac{1}{2} < X < \frac{5}{2} / X > 1\right)$. (OR)	8	K2	1
b) i)	A continuous random variable X has probability density function $f(x) = \frac{1}{2}x^2e^{-x}, x \geq 0$. Find the r^{th} raw moment and hence find first four moments about origin.	12	K2	1
	ii) State Baye's theorem of probability.	4	K2	1
12. a) i)	One percent of jobs arriving at a computer system need to wait until weekends for scheduling, owing to core size limitations. Find the probability that among a sample of 200 jobs there are no jobs and exactly two jobs that have to wait until weekends.	8	K2	2
	ii) The savings bank account of a customer showed an average balance of Rs.150 and a S.D of Rs.50. Assuming that the account balances are normally distributed. i) What percentage of account is over Rs.200? ii) What percentage of account is between Rs.120 and Rs.170?	8	K2	2
	(OR)			
b) i)	A die is cast until 6 appear. What is the probability that it must be cast (i) at least five times, (ii) more than five times?	8	K2	2
	ii) The daily consumption of milk in excess of 20,000 liters is approximately distributed as Gamma variable with parameter $k = 2$ and $\lambda = \frac{1}{10000}$. If the city has a daily stock of 30,000 liters on a given day, find the probability that the stock is insufficient.	8	K2	2
13. a) i)	X and Y are two random variables having the joint density function $f(x, y) = \frac{1}{27}(2x + y)$, where x and y can assume only the integer values 0, 1 and 2. Find the conditional probability of Y for $X = x$.	6	K2	3
	ii) The joint probability density function of two random variables X and Y are given by: $f(x, y) = \begin{cases} \frac{9(1+x+y)}{2(1+x)^4(1+y)^4}, & 0 \leq x, y < \infty \\ 0, & \text{otherwise} \end{cases}$. Find the marginal distributions of X and Y , and the conditional distribution of Y for $X = x$.	10	K2	3
	(OR)			

Q. No

M BTL CO

- b) i) For the following bivariate probability distribution of X and Y , find (i) $P(X \leq 1, Y = 2)$, (ii) $P(X \leq 1)$, (iii) $P(Y = 3)$ and $P(Y \leq 3)$.

8 K2 3

$Y \backslash X$	1	2	3	4	5	6
0	0	0	$1/32$	$2/32$	$2/32$	$3/32$
1	$1/16$	$1/16$	$1/8$	$1/8$	$1/8$	$1/8$
2	$1/32$	$1/32$	$1/64$	$1/64$	0	$2/64$

- ii) The random variable (X, Y) has the joint probability density function, $f(x, y) = \begin{cases} x + y; & 0 \leq x \leq 1 \text{ and } 0 \leq y \leq 1 \\ 0; & \text{elsewhere} \end{cases}$. Prove that $Cov(X, Y) = -\frac{1}{144}$.

8 K2 3

14. a) i) The first four raw moments of a distribution are 2, 136, 320, and 40,000. Find out coefficients of skewness and kurtosis.

8 K3 4

- ii) Fit a parabola of second degree to the following data:

8 K3 4

X	0	1	2	3	4
Y	1	1.8	1.3	2.5	6.3

(OR)

- b) i) Calculate the first four moments distribution about mean from the following data:

8 K3 4

x	0	1	2	3	4	5	6	7	8
y	1	8	28	56	70	56	28	8	1

- ii) Fit a straight line to the following data:

8 K3 4

X	1	2	3	4	6	8
Y	2.4	3	3.6	4	5	6

15. a) i) In two large populations, there are 30 and 25 percent respectively of blue-eyed people. Is this difference likely to be hidden in samples of 1200 and 900 respectively from the two populations?

8 K4 5

- ii) Samples of two types of electric light bulbs were tested for length of life and following data were obtained:

8 K4 5

	Type-I	Type-II
Sample No.	$n_1 = 8$	$n_2 = 7$
Sample Means	$\bar{x}_1 = 1234 \text{ hrs}$	$\bar{x}_2 = 1036 \text{ hrs}$
Sample S. Ds	$s_1 = 36 \text{ hrs}$	$s_2 = 40 \text{ hrs}$

Is the difference in the means sufficient to warrant that type-I is superior to type-II regarding length of life?

(OR)

Q. No**M****BTL****CO**

- b) i) The means of two single large samples of 1000 and 2000 members are 67.5 inches and 68.0 inches respectively. Can the samples be regarded as drawn from the same population of standard deviation 2.5 inches? (Test at 5% LOS)

8

K4

5

- ii) The following figures show the distribution of digit in numbers chosen at random from a telephone directory:

8

K4

5

i	0	1	2	3	4	5	6	7	8	9
O_i	1026	1107	997	966	1075	933	1107	972	964	853

Test whether the digits may be taken to occur equally frequently in the directory.

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV [Part Time]

Civil Engineering

23PTCE401 – DESIGN OF REINFORCED CONCRETE ELEMENTS

(Regulations 2022)

(IS 456 – 2000, SP 16 to be Permitted)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
1.	What are the three methods of design of reinforced concrete structural elements	2	K1	1
2.	Write a short note on balanced section.	2	K1	1
3.	What is the importance of flanged beams?	2	K2	2
4.	Why corner reinforcement are provided in a two way slab? And sketch the edge and middle strips of a two way slab.	2	K3	2
5.	Define bond stress.	2	K2	3
6.	Differentiate shear failure and bending failure.	2	K2	3
7.	What are the specifications for pitch of lateral ties in column?	2	K1	4
8.	What are the points to be considered while designing longitudinal reinforcement for columns?	2	K2	4
9.	Write any two situations in which combined footings are preferred to isolated footings?	2	K3	5
10.	What is the minimum tread and rise in residential and public building?	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
11. a) i)	Compare and explain about under reinforced section and over reinforced section for Limit state method and also discuss the terms of a. Lever arm b. Neutral axis c. Moment of resistance in working stress method of design.	16	K3	1

(OR)

Q. No	M	BTL	CO
b) Determine the position of neutral axis and the moment of resistance of a beam 300 mm wide and 550 mm effective depth. It is reinforced with 3 bars of 16 mm diameter. Use M20 grade of concrete and Fe 415 grade of steel. Adopt working stress method.	16	K3	1
12. a) Calculate the ultimate moment of resistance of a tee – beam having the following section properties. Width of flange = 1300 mm Thickness of flange = 100 mm Width of rib = 325 mm Effective depth = 600 mm Area of steel = 4000 mm ² M20 grade concrete and Fe 415 HYSD bars.	16	K4	2
(OR)			
b) Design a simply supported RC slab for an office floor of size 4 m x 10 m with 230 mm wall thickness all around. It carries a superimposed load of 3.5 kN/m ² with a floor finish of 2 kN/m ² . Sketch the reinforcement details. Adopt M 20 grade concrete and Fe 415 grade HYSD bars.	16	K4	2
13. a) A reinforced concrete beam of rectangular section with a width of 350 mm and overall depth 700 mm is subjected to an ultimate torsional moment of 100 kNm together with an ultimate bending moment of 200 kNm. Adopting M20 grade concrete and Fe 415 HYSD bars and assuming top and bottom covers of 50 mm and side covers of 25 mm, design suitable longitudinal and transverse reinforcements for the section.	16	K4	3
(OR)			
b) A reinforced concrete beam of rectangular section has a width of 250 mm and an effective depth of 500 mm. The beam is reinforced with 4 bars of 25 mm dia on the tension side. Two of the tension bars are bent up at 45° near the support section. In addition the beam is provided with two legged stirrups of 8 mm dia at 150 mm center near the supports. Adopt M25 grade concrete and Fe 415 Steel. Estimate the ultimate shear of the support section.	16	K4	3

Q. No**M BTL CO**

14. a) Design the reinforcement in short column 400 mm x 600 mm subjected to an ultimate axial load of 1600 kN together with ultimate moments of 120 kNm and 90 kNm about the major and minor axis respectively. Use M20 grade concrete and Fe 415 HYSD bars.

16 K1 4

(OR)

- b) Determine the reinforcement required for a circular column having 450 mm diameter subjected to a factored axial pull of 1200 kN and factored moment of 100 kNm. Use M25 grade concrete and Fe 415 grade steel and also discuss various assumptions used in the limit state methods of design of compression members

16 K1 4

15. a) A reinforced concrete column 400 mm by 400 mm supports an axial service load of 1000 kN. The safe bearing capacity of the soil at site is 200 kN/m². Adopt M 20 grade concrete and Fe 415 HYSD bars, design a suitable footing for the column and sketch the details of reinforcements.

16 K3 5

(OR)

- b) Design a waist slab type dog-legged staircase for an office building for the following data. Assume the stairs to be supported on 230 mm thick masonry walls at the outer edges of the landing, parallel to the risers. Use M20 grade concrete and Fe 415 steel.

16 K3 5

Height between floor = 3.5 m

Riser = 155 mm, Tread = 280 mm

Width of flight = Landing width = 1.3 m

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: IV [Part Time]

Electronics and Communication Engineering

23PTEC401 – DIGITAL COMMUNICATION

(Regulations 2023)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define Pulse Amplitude Modulation.	2	K1	1
2. Distinguish between PCM and DPCM.	2	K2	1
3. What is Inter Symbol Interference?	2	K1	2
4. Define Eye Pattern and its use.	2	K1	2
5. List any two digital modulation techniques.	2	K1	3
6. What is the main difference between coherent and non-coherent detection?	2	K2	3
7. What is meant by a discrete memory less channel?	2	K1	4
8. What is the purpose of the Viterbi Algorithm?	2	K2	4
9. What is a pseudo-noise (PN) sequence?	2	K1	5
10. Name the multiple access techniques used in wireless communication.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Derive the expression for the probability of error in a correlation receiver.	16	K1	1
(OR)			
b) Explain PCM, DPCM, and Delta modulation with neat diagrams.	16	K1	1
12. a) Explain the concept of adaptive equalization to enhance baseband data transmission quality in detail.	16	K2	2
(OR)			
b) Apply eye diagram analysis to evaluate the quality of a received baseband digital signal. Explain how the eye pattern helps identify timing errors, noise, and inter-symbol interference in a communication system.	16	K2	2

Q. No		M	BTL	CO
13. a)	Apply coherent detection techniques to analyze the performance of BPSK in an AWGN channel. Include signal space representation and bit error probability.	16	K3	3
	(OR)			
b)	Apply the principles of carriers and symbol synchronization to a QPSK system and analyze its performance.	16	K3	3
14. a)	Apply the steps to encode a message using a (7,4) linear block code and show the process of error detection at the receiver using a syndrome decoder.	16	K3	4
	(OR)			
b)	Apply the Viterbi algorithm to decode a convolutionally encoded message. Provide state diagram, path metrics, and traceback explanation.	16	K3	4
15. a)	Apply the principles of Direct Sequence Spread Spectrum using BPSK and PN sequences to illustrate how spreading improves signal robustness.	16	K3	5
	(OR)			
b)	Apply multiple access techniques such as TDMA and CDMA to a cellular communication system and compare their performance in terms of user capacity and interference.	16	K3	5

Registration Number :

Government College of Engineering, Salem
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M.E. Degree Examinations – April/May 2025

Semester: II [Full Time]

Computer Aided Design

22CDC21 – FINITE ELEMENT METHOD IN DESIGN

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Differentiate between initial value and boundary value problems.	2	K1	1
2. Define shape functions and state their importance in FEM.	2	K1	1
3. State the difference between C^0 and C^1 continuity.	2	K2	2
4. What is the penalty method in FEM? Mention one advantage.	2	K2	2
5. List any two differences between plane stress and plane strain conditions.	2	K2	3
6. Differentiate between sub-parametric and super-parametric elements.	2	K2	3
7. What is meant by mode superposition method?	2	K2	4
8. Write the Lagrange equation for a single degree-of-freedom system.	2	K2	4
9. Define the potential function used in FEM for flow analysis.	2	K1	5
10. What are thermo-elastic contact problems? Give an example.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Derive the shape functions for a quadratic 1D bar element using natural coordinates and explain their significance in finite element interpolation.	16	K2	1
(OR)			
b) Write detailed notes on coordinate transformation and Gauss-Legendre numerical integration in FEM.	16	K2	1
12. a) Formulate and derive the stiffness matrix for a 1D beam element using Hermite shape functions ensuring C^1 continuity. Explain the importance of higher-order continuity in beam modeling.	16	K3	2

(OR)

Q. No

M BTL CO

- b) For a tapered plate of uniform thickness $t = 10 \text{ mm}$ as shown in Fig. 1. find the displacements at the nodes by forming it into two element model. The bar has:

Mass density: $\rho = 7800 \text{ kg/m}^3$

Young's Modulus: $E = 2 \times 10^5 \text{ MN/m}^2$

In addition to self-weight, the plate is subjected to a point load $P = 10 \text{ kN}$ at its centre.

Also, determine the reaction force at the support.

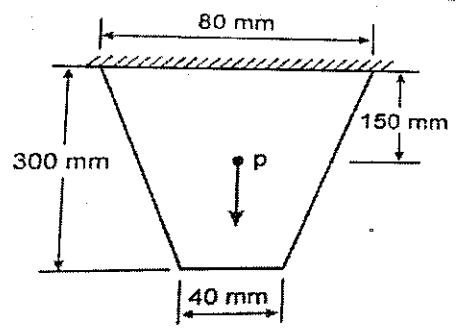


Fig.1

13. a) Derive the element stiffness matrix equation for a 4-noded isoparametric quadrilateral element. Explain the use of natural coordinate system, shape functions, Jacobian matrix, strain-displacement matrix, and integration using Gauss quadrature in the formulation.

16 K3 3

(OR)

- b) For the axisymmetric elements shown in Fig. 2 determine the stiffness matrix. Let $E = 2.1 \times 10^5 \text{ N/mm}^2$ and $\nu = 0.25$. The co-ordinates shown in Figure are in millimeters.

16 K3 3

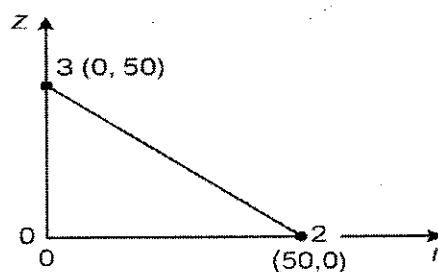


Fig. 2

Q. No

M BTL CO

14. a) A bar of length $2L$, modulus of elasticity E , mass density ρ , and cross-sectional area A is fixed at one end and free at the other, as shown in Fig. 3. Using finite element formulation, determine the first two natural frequencies of axial vibration.

16 K3 4

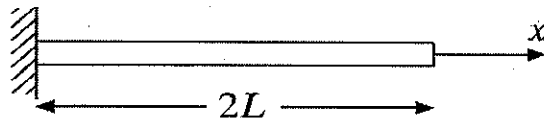


Fig.3

(OR)

- b) A stepped steel bar is clamped at one end and has two different cross-sectional areas along its length: $A_1 = 1200 \text{ mm}^2$, for the first 300 mm and $A_2 = 900 \text{ mm}^2$ for the next 400 mm, as shown in Fig. 4 Using the characteristic polynomial technique, determine the natural frequencies and mode shapes of vibration. Perform the calculations by hand and state all assumptions made.

16 K3 4

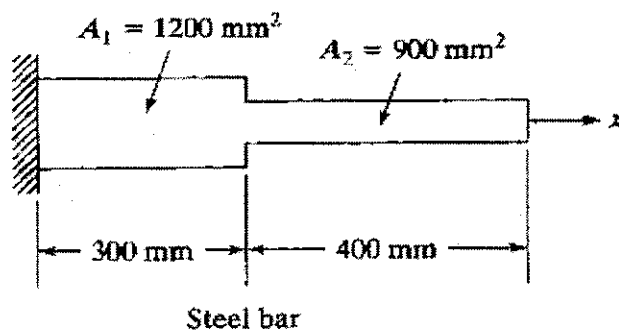


Fig. 4

15. a) Determine and plot the streamlines for flow in the Venturi meter shown in Fig.5. using FEM based on stream function formulation. The incoming velocity is $u_0 = 100 \text{ cm/s}$. Also, plot the velocity distribution at the section a-a.

16 K3 5

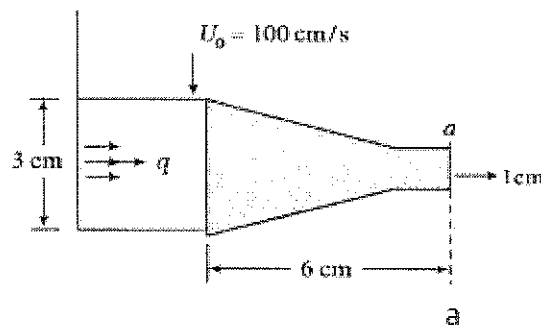


Fig.5

(OR)

Q. No

M BTL CO

- b) A long bar of rectangular cross section, having a thermal conductivity of $1.5 \text{ W/m}^\circ\text{C}$, is subjected to the boundary conditions shown in the Fig.6. Two opposite sides are maintained at a uniform temperature of 180°C ; one side is insulated, and the remaining side is exposed to a convection process with ambient temperature $T_\infty=25^\circ\text{C}$ and convection coefficient $h=50 \text{ W/m}^2\text{C}$. Using the finite element method, determine the temperature distribution in the bar.

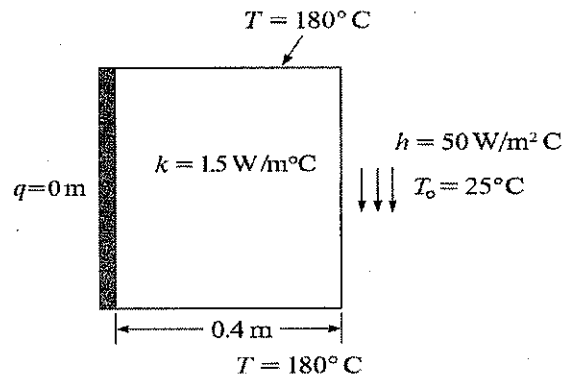


Fig.6.

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M.E. Degree Examinations – April/May 2025

Semester: II [Full Time]

Communication Systems

22COC21 – RF AND MICROWAVE CIRCUIT DESIGN

(Regulations 2022)

(Smith Chart needs to given)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define RF and Microwave frequencies.	2	K1	1
2. Differentiate between phase velocity and group velocity.	2	K2	1
3. What is the significance of power gain in RF amplifiers?	2	K2	2
4. What is negative resistance in the context of oscillator design?	2	K2	2
5. Mention any two commonly used biasing techniques for RF amplifiers.	2	K1	3
6. List the key constraints in the design of portable RF systems.	2	K1	3
7. What is the purpose of root locus analysis?	2	K1	3
8. What is power amplifier linearization?	2	K1	3
9. How the high pass filter is derived from low pass prototype using frequency transformation method?	2	K2	4
10. Write the expression for internal, external and loaded Quality factor for series resonator.	2	K1	4

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Describe the behavior of passive components - resistors, capacitors and inductors at high frequencies.	10	K2	1
ii) A line with zero dissipation has $R=0.04\Omega/\text{m}$, $C=2.45\text{ PF}/\text{m}$ and $L=1.5\mu\text{H}/\text{m}$. If the line is operated at 100MHz, find R_0 , α , β , λ and v .	6	K4	1
(OR)			
b) i) With neat diagrams, explain different types of transmission lines and their characteristics.	10	K2	1
ii) The current flowing through the micro strip line which is infinite and lossless is $i(t) = 0.6\cos(9\times 10^9t - 500z)$. Find the values of phase velocity, frequency, and wavelength and phasor expression of the current.	6	K4	1

Q. No		M	BTL	CO
12. a)	i) Discuss the different types of power gain equations relevant to RF amplifier design and their significance.	8	K2	2
	ii) What is the significance of stability of the design of an amplifier? Explain how smith charts can be used for determining the stability. Derive the equation to plot the stability circle on the smith chart.	8	K3	2
	(OR)			
b) i)	Explain the principle of one-port and two-port negative resistance oscillators.	8	K2	2
	ii) Explain the concept of a mixer with a neat diagram. Provide the circuit diagram and its equivalent representation to illustrate the working of single-ended and double-balanced diode mixers.	8	K3	2
13. a) i)	Using smith chart design all possible configurations of two element matching networks that match the source impedance $Z_s = (50+j25) \Omega$ to the load $Z_L = (25-j50) \Omega$. Assume a characteristic impedance of $Z_0 = 50\Omega$ and an operating frequency of 2GHz.	10	K4	3
	ii) Explain in detail about T and PI matching networks.	6	K2	3
	(OR)			
b) i)	Design a T matching network that transforms a load impedance $Z_L = (60-j30) \Omega$ in to a $Z_{in} = (10+j20) \Omega$ input impedance and that has a maximum nodal quality factor of 3. Compute the values for the matching network components, assuming that the matching is required at $f=1\text{GHz}$.	10	K4	3
	ii) Explain in detail on microstripline matching networks.	6	K2	3
14. a)	Compare the output waveform, efficiency, and linearity of Class A, AB, and B amplifiers under identical load conditions.	16	K2	3
	(OR)			
b)	Evaluate the trade-offs between efficiency and linearity in modern RF amplifier design. Discuss the methods to optimize both for a mobile communication system.	16	K2	3
15. a) i)	Explain in detail about transfer function, attenuation and phase response of different filter types, with necessary derivation.	8	K2	4

Q. No		M	BTL	CO
ii)	An $N = 3$ Chebyshev bandpass filter is to be designed with a 3dB pass band ripple for a communication link. The centre frequency is at 2.4 GHz and the filter has to meet a bandwidth requirement of 20%. The filter has to be inserted into a 50Ω characteristic line impedance. $g_0 = 1$, $g_1 = 3.3487$, $g_2 = 0.7117$, $g_3 = 3.3487$, $g_4 = 1$.	8	K4	4
	(OR)			
b) i)	Compare various resonator types in terms of quality factor, size, frequency range, and application.	8	K2	4
ii)	Given a frequency band 2.4 GHz (ISM band), select an appropriate resonator type for filter design and justify the choice based on performance and implementation feasibility.	8	K4	4

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

M.E. Degree Examinations – April/May 2025

Semester: II [Full Time]

Power Electronics and Drives

22PEC21 – MODELLING AND ANALYSIS OF ELECTRICAL MACHINES

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Draw the steady state equivalent circuit of a DC motor armature and write its power balance equation.	2	K2	1
2. Recall the functions of Interpoles in a DC machine.	2	K1	1
3. Enumerate the various losses that need to be considered in the performance evaluation of the induction motors.	2	K3	2
4. List the applications of rotor reference frame model of an induction motor.	2	K3	2
5. Show the practical range of triggering angle and the corresponding slip range for a phase-controlled induction motor drive.	2	K2	3
6. State the merits of Static Scherbius drive.	2	K1	3
7. Name the different switching techniques used in the phase-current control loops of the direct vector-control scheme of a 3-phase induction motor.	2	K1	4
8. What is the similarity between a vector-controlled induction motor drive and a separately excited DC motor drive?	2	K2	4
9. Classify the PM synchronous machines on the basis of the wave shape of their induced emf.	2	K4	5
10. What are the advantages of PM brushless DC machines?	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) A 25 kW, 125 V separately excited DC machine is operated at a constant speed of 3000 rpm with a constant field current such that the open circuit armature voltage is 125 V. The armature resistance is 0.02 Ω . Compute the armature current, terminal power, electromagnetic power and torque when the terminal voltage is 128 V.	8	K3	1
ii) Explain briefly the Commutator action in a DC machine.	8	K2	1

(OR)

Q. No		M	BTL	CO
	b) i) Explain the features of shunt-excited and series-excited DC machines.	8	K2	1
	ii) Describe the effects of armature reaction on the operation of a DC machine. Also discuss the remedies employed for decreasing the effects of armature reaction.	8	K3	1
12.	a) i) With the help of the equivalent circuit, derive the steady state performance equations of a 3-phase induction motor.	10	K4	2
	ii) Explain briefly about the transformation of a balanced 3-phase set of <i>abc</i> sequence into a balanced 2-phase set.	6	K3	2
	(OR)			
	b) i) Deduce the generalized model of a 3-phase induction motor in arbitrary reference frame.	10	K4	2
	ii) Draw the block diagram showing various stages in the dynamic modeling of a 3-phase induction machine. State the assumptions made.	6	K3	2
13.	a) i) With necessary diagrams, explain the principle of operation of slip-energy recovery scheme of a 3-phase induction motor.	8	K1	3
	ii) Discuss the modelling of a PWM Controlled induction motor drive.	8	K2	3
	(OR)			
	b) i) With neat diagrams, explain the operation of a phase controlled induction motor drive in the first and third quadrants of the torque-speed characteristics.	8	K1	3
	ii) Find the relationship between the dc link voltage and the stator frequency for the closed-loop implementation of a volts /Hz inverter-fed induction motor drive. The motor parameters are as follows: 5 hp, 200 V, 60 Hz, 3-phase, star connected, 4 pole, 0.86 pf and 0.82 efficiency, $R_s = 0.277 \Omega$.	8	K2	3
14.	a) i) With a neat phasor diagram, explain the principle of vector control of induction motor.	8	K3	4
	ii) Explain the flux weakening in rotor flux linkages controlled schemes of a vector controlled induction machine.	8	K4	4
	(OR)			
	b) i) Describe the flux and torque processor implementation in the direct vector control scheme of an inverter-fed induction motor drive.	8	K3	4
	ii) With a neat block diagram, explain briefly the implementation of the indirect vector-controlled induction motor drive.	8	K4	4

Q. No			M	BTL	CO
15.	a) i)	Derive the dynamic model of PM brushless DC motor in phase variables.	10	K4	5
	ii)	Describe the operating principle of interior permanent magnet synchronous machines (PMSM).	6	K1	5
		(OR)			
	b) i)	Obtain the dynamic model of Permanent Magnet Synchronous Machine (PMSM).	10	K4	5
	ii)	Explain briefly the control scheme for PM brushless DC machine drive.	6	K1	5

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M.E. Degree Examinations – April/May 2025

Semester: II [Full Time]

Structural Engineering

22STC21 – FINITE ELEMENT METHOD IN STRUCTURAL ENGINEERING

(Regulations 2022)

Time: 3 Hours

Maximum Marks: 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What are the limitations of finite element analysis?	2	K1	1
2. What is the difference between finite element method and Finite difference method?	2	K1	1
3. Define shape function.	2	K1	2
4. What do you mean by higher order element? And why are they preferred?	2	K1	2
5. Compare CST and LST	2	K2	3
6. Write down the stress-strain relationship matrix for plane stress condition.	2	K1	3
7. What is axisymmetric elements?	2	K1	4
8. Define plate element?	2	K1	4
9. Write down the stiffness matrix equation for four noded isoparametric quadrilateral elements?	2	K2	5
10. List any four FEM software.	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) The differential equation of a physical phenomenon is given by	16	K3	1

$$\frac{d^2y}{dx^2} + 500x^2 = 0, \quad 0 \leq x \leq 1$$

Trial Function, $y = a_1 (x - x^4)$

Boundary Conditions are, $y(0) = 0, y(1) = 0$

Calculate the value of the parameter a_1 by any three weighted residual methods.

Q. No

M BTL CO

(OR)

- b) Derive the expression to calculate the maximum deflection in a beam of length L with a point load P acting at the center by using Rayleigh Ritz method. Take moment of inertia as I and young's modulus as E .

16 K3 1

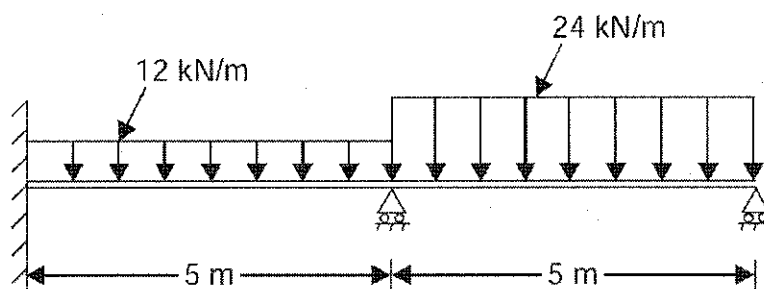
12. a) Derive the stiffness matrix of one dimension quadratic element.

16 K4 2

(OR)

- b) Analyze the beam shown in Figure by finite element method and determine the end reactions. $E = 2 \times 10^5 \text{ N/mm}^2$ and $I = 5 \times 10^6 \text{ mm}^4$

16 K4 2



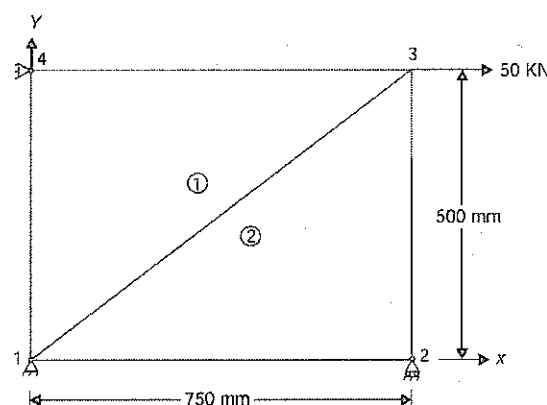
13. a) i) Derive the shape function for CST Element in terms of cartesian coordinates.

16 K4 3

(OR)

- b) Analyze the nodal displacements and element stresses in the propped beam shown in Figure. Idealize the beam into two CST elements as shown in the figure. Assume plane stress condition. Take $\mu = 0.25$, $E = 2 \times 10^5 \text{ N/mm}^2$, Thickness = 15mm

16 K4 3



Q. No

M BTL CO

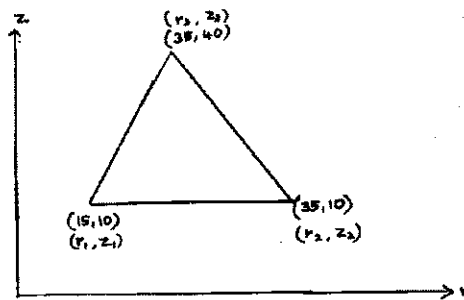
14. a) The nodal co-ordinates for an axisymmetric triangular element are given below

16 K4 4

$$r_1 = 15\text{mm}, z_1 = 10\text{mm}$$

$$r_2 = 35\text{mm}, z_2 = 10\text{mm}$$

$$r_3 = 35\text{mm}, z_3 = 40\text{mm}$$

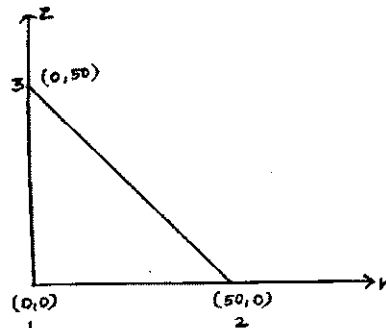


Evaluate strain displacement relationship matrix for that element

(OR)

- b) Evaluate the element stresses for the axisymmetric element shown in figure. The nodal displacements are:

16 K4 4



$$u_1 = 0.06\text{mm}; w_1 = 0.04\text{mm}$$

$$u_2 = 0.02\text{mm}; w_2 = 0.03\text{mm}$$

$$u_3 = 0.01\text{mm}; w_3 = 0.01\text{mm}$$

15. a) Derive the strain displacement matrix of two dimensional four noded isoparametric elements.

16 K2 5

(OR)

- b) Explain the solution technique to dynamic problems.

16 K2 5

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Government College of Engineering, Salem
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M.E. Degree Examinations – April/May 2025

Semester: II [Full Time]

Thermal Engineering

22THC21 – HYDROGEN AND FUEL CELL TECHNOLOGIES

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Define the term "water-gas shift reaction."	2	K1	1
2. Name half reactions involved in water electrolysis.	2	K1	1
3. Name two metal hydrides used for hydrogen storage.	2	K1	2
4. What are the key applications of hydrogen in the chemical industry?	2	K1	2
5. List the significance of a fuel cell.	2	K1	3
6. What is activation polarization in a fuel cell?	2	K1	3
7. List two advantages of using a PEMFC in vehicles.	2	K1	4
8. Name two types of fuel cells that can operate on hydrocarbons without external reforming.	2	K1	4
9. List two advantages of using hydrogen in vehicles.	2	K1	5
10. What is the main difference between centralized and decentralized power systems using fuel cells?	2	K1	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Why hydrogen is considered as a clean fuel, and what are the challenges associated with its adoption as a mainstream energy source? Explain in detail.	16	K2	1
(OR)			
b) Explain the role of catalysts in enhancing the efficiency of hydrogen production in thermochemical methods.	16	K2	1
12. a) What are the major technical challenges in storing hydrogen and how can they be overcome? Explain in detail.	16	K2	2
(OR)			
b) Explain how hydrogen safety regulations differ from conventional fuels and the implications for infrastructure development.	16	K2	2

Q. No		M	BTL	CO
13. a)	Compare and contrast the operational principles of fuel cells and batteries, highlighting their respective advantages and limitations.	16	K4	3
	(OR)			
b)	Analyze how the choice of electrolyte in a fuel cell affects its temperature range, efficiency and applications? Explain in detail.	16	K4	3
14. a)	Explain the important features of AFC. Also mention its applications.	16	K2	4
	(OR)			
b)	What are the basic components of a PEM fuel cell, and how does it produce electricity? Explain in detail.	16	K2	4
15. a)	How can fuel cells be integrated into residential power systems to improve energy efficiency and sustainability? Explain in detail.	16	K2	5
	(OR)			
b)	Demonstrate the environmental benefits and challenges of using hydrogen as a clean energy carrier.	16	K2	5

Registration Number :

Government College of Engineering, Salem
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M.E. Degree Examinations – April/May 2025

Semester: II [Full Time]

Welding Technology

22WTC21 – WELDING PROCESSES - II

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
1.	List the advantages and disadvantages of Hybrid welding process.	2	K1	1
2.	What are the laser sources for Laser Beam Welding?	2	K1	1
3.	What are the variants of Electroslag welding?	2	K2	2
4.	Mention the applications of Flash welding.	2	K2	2
5.	What are the advantages of Solid state welding processes over conventional welding processes?	2	K1	3
6.	List the process characteristics of Roll welding.	2	K1	3
7.	List the various joint design used in Friction welding.	2	K1	4
8.	What are the applications of friction stir processing?	2	K1	4
9.	Compare Soldering and Brazing processes.	2	K1	5
10.	Mention the applications of Under Water Welding.	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
11. a)	Describe the equipment details, different degrees of vacuum, advantages, disadvantages and applications of Electron Beam Welding.	16	K2	1
(OR)				
b)	Describe the principle of operation, advantages, limitations and applications of Laser Beam Welding.	16	K2	1
12. a)	Explain the principle of operation, process variables, nature of flux and applications of Electro Slag Welding.	16	K2	2
(OR)				
b)	Explain the principle of operation and applications of Seam welding, Projection welding, Upset welding and High frequency welding processes.	16	K2	2

Q. No		M	BTL	CO
13. a)	Describe the principle of operation, equipment, advantages, limitations and applications of Cold Pressure Welding and Explosive Welding processes.	16	K2	3
	(OR)			
b)	Describe the principle of operation, equipment, advantages, limitations and applications of Diffusion welding and Ultrasonic welding processes.	16	K2	3
14. a)	Explain the process characteristics, equipment, welding variables, weld properties and applications of Friction Welding.	16	K2	4
	(OR)			
b)	Explain the principle of operation, tool design, advantages, limitations and applications of Friction Stir Welding.	16	K2	4
15. a)	Illustrate the various types of Brazing processes with neat sketches.	16	K3	5
	(OR)			
b)	Illustrate the Oxy fuel cutting, Arc cutting and Thermal cutting processes with neat sketches.	16	K3	5

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: V [Full Time]

Computer Science and Engineering

22CS501 – DATABASE MANAGEMENT SYSTEMS

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Predict the purpose of a Database System.	2	K4	1
2. What is Dynamic SQL? How does it differ from Static SQL?	2	K2	1
3. What is a Relationship in an E-R model?	2	K2	2
4. Define Multi-valued Dependency.	2	K1	2
5. Mention the need for concurrency control.	2	K3	2
6. List out the main principles of ARIES.	2	K1	2
7. Define indexing and why it is used.	2	K4	3
8. How is B+ Tree different from B-Tree?	2	K4	3
9. Write down the Key Features of the Object-Relational Model.	2	K4	3
10. Define the term data mining.	2	K1	3

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Describe the basic architecture of a database with the help of a block diagram.	16	K1	1
(OR)			
b) Explain the different types of keys in the Relational Model (Primary key, Foreign key, Candidate key, and Super key) with examples.	16	K1	1
12. a) Elucidate the components of an E-R diagram with suitable examples.	16	K4	2
(OR)			
b) Explain the concept of Normalization and describe the process of achieving 1NF, 2NF, and 3NF with an example.	16	K4	2

Q. No	M	BTL	CO
13. a) Consider transaction T_1 Read (A) $A:=A-50$ Write (A) Read (B) $B:=B+50$ Write (B) Read (A) Read (B) Display (A+B) Commit Write lock and unlock instruction to T_1 for implementing : 1) Two phase locking protocol 2) Rigorous two phase locking protocol.	16	K3	2
(OR)			
b) Apply database recovery techniques considering a suitable example.	16	K3	2
14. a) Explain in detail about RAID and different levels with their advantages and disadvantages.	16	K4	3
(OR)			
b) Illustrate the static hashing and dynamic hashing with an example.	16	K4	3
15. a) Explain the architecture of distributed databases with a neat diagram.	16	K2	3
(OR)			
b) Write short notes on following, i) XML Databases ii) Data warehouse and its components.	16	K2	3

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B.E. Degree Examinations – April/May 2025

Semester: V [Full Time] / III [Part Time]

Electrical and Electronics Engineering

22EE501/23PTEE301 – CONTROL SYSTEMS

(Regulations 2022/2023)

(Use of regular XY graph, semilog graph and polar graph is permitted)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Compare the open loop and closed loop control system.	2	K2	1
2. Write the analogous electrical, mechanical elements in force voltage analogy.	2	K1	1
3. State the various standard test inputs used in control systems.	2	K1	2
4. What is the effect of PD controller on the performance of the system?	2	K2	2
5. The damping ratio and natural frequency of oscillation of a second order system is 0.5 and 8 rad/sec respectively. Calculate the resonant peak and resonant frequency.	2	K3	3
6. What are the advantages of Nichols chart?	2	K2	3
7. Determine the stability of the following system using Routh's criterion $G(s)H(s) = \frac{1}{(s+2)(s+4)}$	2	K3	4
8. Define Nyquist stability criterion.	2	K1	4
9. When lag-lead compensation is employed?	2	K2	5
10. What are the limitations of Ziegler-Nichols method?	2	K2	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) The signal flow graph for a feedback control system is shown in Fig.1. Determine the transfer function.	16	K3	1

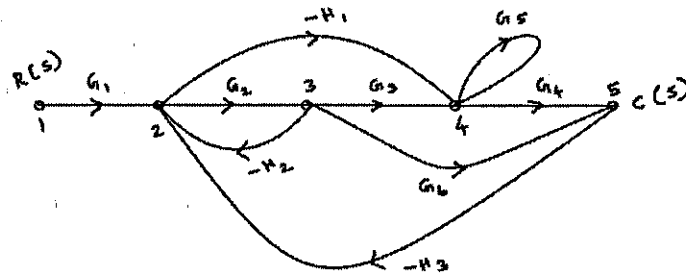


Fig.1

(OR)

- b) Using block diagram reduction technique, Find the transfer function of the system is shown in Fig.2. 16 K3 1

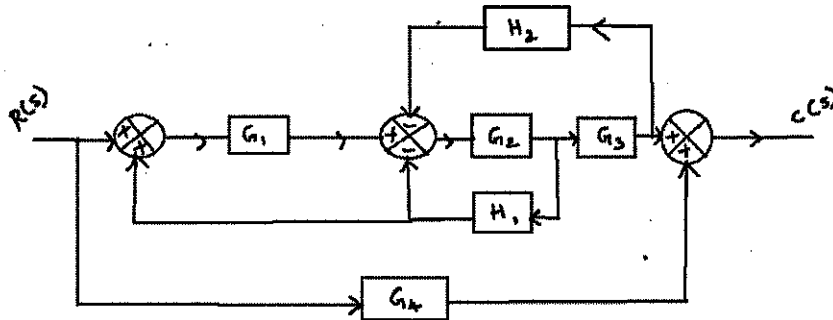


Fig.2

12. a) The unity feedback system is characterized by an open loop transfer function $G(s) = \frac{K}{s(s+10)}$. Determine the gain K so that the system will have a damping ratio of 0.5. For this value of K, determine the settling time, peak overshoot and time to peak overshoot for a unit step input. 16 K3 2

(OR)

- b) For a unity feedback control system, the open loop transfer function is given by $G(s) = \frac{10(s+2)}{s^2(s+1)}$. Find the position, velocity and acceleration error coefficients and also find the steady state error when the input is $R(s) = \frac{3}{s} - \frac{2}{s^2} + \frac{1}{3s^3}$? 16 K3 2

13. a) Consider a unity feedback system having an open loop transfer function $G(s) = \frac{K}{s(1+0.5s)(1+4s)}$. Sketch the polar plot and determine the value K so that i) gain margin is 20dB ii) phase margin is 30° . 16 K3 3

(OR)

- b) Sketch the bode plot and hence find the gain cross over frequency, phase cross over frequency, gain margin and phase margin for the function $G(s) = \frac{10(s+3)}{s(s+2)(s^2+4s+100)}$. 16

Q. No		M	BTL	CO
14. a)	Sketch the root locus of the system whose open loop transfer function is $G(s) = \frac{K}{s(s+2)(s+4)}$. Comment about its stability.	16	K3	4
	(OR)			
b)	Draw the Nyquist plot for the system whose open loop transfer function $G(s)H(s) = \frac{K}{s(s+2)(s+10)}$. Determine the range of K for which closed loop system is stable.	16	K3	4
15. a)	i) Draw the circuit diagram of a lag compensator and obtain its transfer function.	8	K2	5
	ii) Discuss in detail about the step by step procedure to design a lag compensator using root locus.	8	K2	5
	(OR)			
b)	i) Draw the circuit diagram of a lead compensator and obtain its transfer function.	8	K2	5
	ii) Discuss in detail the procedure to design a lead compensator using bode plot.	8	K2	5

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B.E. Degree Examinations – April/May 2025

Semester: V & VII [Full Time]

Mechanical Engineering

22ME501/18ME603 – DESIGN OF MACHINE ELEMENTS

(Regulations 2022/2018/2018A)

(Design data book to be Permitted)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. What is meant by Preferred number?	2	K1	1
2. Give the different failure theories and the type of materials for which these theories are applicable.	2	K1	1
3. What is critical speed of shafts?	2	K1	2
4. What is the difference between a key and cotter joint?	2	K2	2
5. Why V-thread is preferred in fasteners?	2	K2	3
6. Where do we use riveting?	2	K2	3
7. Distinguish between close coiled and open coiled springs.	2	K2	4
8. What types of stresses are induced in a Crank shaft?	2	K1	4
9. What is bearing stress?	2	K1	5
10. Write any two types of lever.	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) Determine the wall thickness of a cylinder vessel closed at both ends, according to a) Maximum shear stress theory, b) Maximum distortion energy theory, and c) Maximum strain theory. The data are: Internal pressure = 20 N/mm ² , Internal diameter of the vessel = 250mm, Allowable tensile stress = 100 N/mm ² , Poisson's ratio = 0.3.	16	K2	1

(OR)

Q. No		M	BTL	CO
b)	A leaf spring in an automobile is subjected to cyclic stresses. The mean stress is 150 MPa and amplitude stress is 5 MPa. Estimate under what factor of safety the spring is working by goodman's and soderberg considerations? $\sigma_u = 300$ MPa, $\sigma_y = 200$ MPa and $\sigma_{-1} = 150$ MPa.	16	K2	1
12. a)	A solid shaft is required to be replaced by a hollow shaft to save 75% of the weight. If the diameter of the solid shaft is 'd' and the hollow shaft are 'd _o ' and 'd _i '. Find the relation between the diameters so as to have the same torsional strength.	16	K3	2
	(OR)			
b)	It is required to design a bushed pin type flexible coupling to connect the output shaft of the electric motor to the shaft of the centrifugal pump. The motor delivers 20 kW power at 700 rpm. The starting torque of the motor can be assumed to be 150% of the radial torque. Determine the coupling and specify the dimensions of its components.	16	K3	2
13. a)	In an air cylinder assembly 8 bolts are used to hold the tube and covers. Gaskets are used between the tube and covers. A preload of 15 kN is given to the gasket to prevent air leakage. The maximum force developed by the cylinder is 20 kN. Material of the bolt is C45. Assuming stiffness of the connected parts to be equal to two times the stiffness of bolt, determine the size of the bolt.	16	K3	3
	(OR)			
b)	A welded connection, as shown in Fig. 1 is subjected to an eccentric force of 7.5 kN. Determine the size of welds if the permissible shear stress for the weld is 100 N/mm ² . Assume static conditions.	16	K3	3

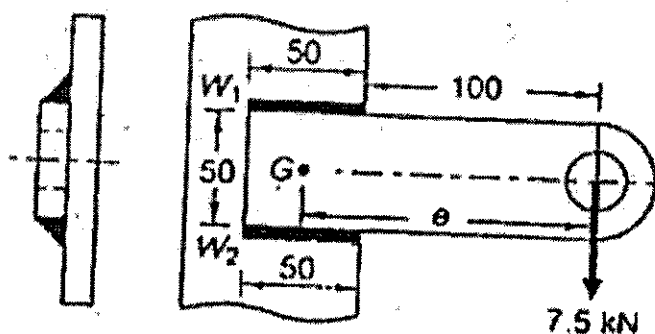


Fig. 1

Q. No	M	BTL	CO
14. a) The turning moment diagram for a petrol engine is drawn to the following scale: Along x-axis crank angle is taken with a scale as $1 \text{ mm} = 1^\circ$ and along y-axis, turning moment is taken with a scale $1 \text{ mm} = 10 \text{ Nm}$. The areas above and below the mean turning moment line, taken in order, are -400, +800, -340, +900, and -650 mm^2 . The nominal speed of the engine is 300 rad/s. Determine a) the mass of the flywheel, b) dimension of rim if width is twice of the thickness. Assume diameter of flywheel rim is 300 mm, density of wheel rim material = 7000 kg/m^3 , $C_s = 0.3 \%$.	16	K3	4
(OR)			
b) Design a cast-iron piston for a single acting four stroke I.C. engine for the following specifications: Cylinder bore = 100 mm, stroke length = 120 mm, maximum gas pressure = 6 MPa, brake mean effective pressure = 0.7 MPa, fuel consumption = 0.24 kg/kW/hr, speed = 2200 rpm.	16	K3	4
15. a) A single-row deep-groove ball bearing is subjected to a radial force of 8 kN and a thrust force of 3 kN. The shaft rotates at 1200 rpm. The expected life L_{10}^{th} of the bearing is 20000 hr. The minimum acceptable diameter of the shaft is 75 mm. Select a suitable ball bearing for the application.	16	K3	5
(OR)			
b) A hand lever for a brake is 0.8 m long from the center of gravity of the spindle to the point of application of the pull of 300 N. The effective overhang from the nearest bearing is 100 mm. If the permissible stress in tension, shear and crushing is not to exceed 66 N/mm^2 , design the spindle, key and lever. Assume the arm of the lever to be rectangular having width twice of its thickness.	16	K3	5

Registration Number :

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B.E. Degree Examinations – April/May 2025

Semester: III [Part Time]

Common to **Civil/Mechanical** Engineering

22PTMA301 / 23PTMA301 / 16PTMA301

- NUMERICAL METHODS

(Regulations 2022/2023/2016/2016 A)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO								
1. If $g(x)$ is continuous in $[a, b]$ then under what condition the iterative method $x = g(x)$ has unique solution in $[a, b]$.	2	K1	1								
2. Solve by Gauss Elimination method $x + y = 2$ and $2x + 3y = 5$.	2	K2	1								
3. Prove that $\Delta f(x)g(x) = g(x+h)\Delta f(x) - f(x+h)\Delta g(x)$.	2	K2	2								
4. Write the second divided differences with arguments a, b, c , if $f(x) = \frac{1}{x}$.	2	K2	2								
5. State the formula for Gaussian 2-point quadrature.	2	K1	3								
6. Find $\frac{dy}{dx}$ at $x = 50$ from the table:	2	K2	3								
<table border="1"><tr><td>x</td><td>50</td><td>51</td><td>52</td></tr><tr><td>y</td><td>3.684</td><td>3.7084</td><td>3.7325</td></tr></table>				x	50	51	52	y	3.684	3.7084	3.7325
x	50	51	52								
y	3.684	3.7084	3.7325								
7. Using Taylor series method, find y at $x = 0.1$ if $\frac{dy}{dx} = x^2y - 1, y(0) = 1$.	2	K3	4								
8. Using Euler's method find the solution of the initial value problem $\frac{dy}{dx} = x + y, y(0) = 1$ at $x = 0.2$ taking $h = 0.2$.	2	K3	4								
9. Write down the explicit formula to solve the one-dimensional heat equation.	2	K1	5								
10. State the finite difference scheme for solving the Poisson's equation.	2	K1	5								

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) i) Using Newton-Raphson method, find the iterative formula for the square root of N and hence find the value of $\sqrt{15}$.	8	K3	1
ii) Solve by Gauss -Elimination method: $3x + 4y + 5z = 18, 2x - y + 8z = 13$ & $5x - 2y + 7z = 20$.	8	K2	1

(OR)

Q. No		M	BTL	CO												
b) i)	Find the real root of $x^3 - 2x^2 - 4 = 0$ correct to three decimal places by iterative method.	8	K3	1												
ii)	Find the inverse of the matrix $\begin{pmatrix} 1 & 2 & 1 \\ 2 & 3 & -1 \\ 2 & -1 & 3 \end{pmatrix}$ by Gauss-Jordan method.	8	K2	1												
12. a) i)	Use Newton's divided difference formula, to find the value of $y(4)$:	8	K3	2												
	<table><tr><td>x</td><td>-1</td><td>0</td><td>3</td><td>6</td><td>7</td></tr><tr><td>y</td><td>3</td><td>-6</td><td>39</td><td>822</td><td>1611</td></tr></table>	x	-1	0	3	6	7	y	3	-6	39	822	1611			
x	-1	0	3	6	7											
y	3	-6	39	822	1611											
ii)	Using Newton's Forward interpolation formula, find $f(1.5)$ from the following data:	8	K3	2												
	<table><tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>$f(x)$</td><td>858.3</td><td>869.6</td><td>880.9</td><td>892.3</td><td>903.6</td></tr></table>	x	0	1	2	3	4	$f(x)$	858.3	869.6	880.9	892.3	903.6			
x	0	1	2	3	4											
$f(x)$	858.3	869.6	880.9	892.3	903.6											
	(OR)															
b) i)	Using Lagrange's interpolation formula, find the value of 'y' corresponding to $x = 10$ from the following data.	8	K3	2												
	<table><tr><td>x</td><td>5</td><td>6</td><td>9</td><td>11</td></tr><tr><td>y</td><td>12</td><td>13</td><td>14</td><td>16</td></tr></table>	x	5	6	9	11	y	12	13	14	16					
x	5	6	9	11												
y	12	13	14	16												
ii)	Using Newton's backward interpolation formula, find 'y' when $x = 27$ from the following data:	8	K3	2												
	<table><tr><td>x</td><td>10</td><td>15</td><td>20</td><td>25</td><td>30</td></tr><tr><td>y</td><td>35.4</td><td>32.2</td><td>29.1</td><td>26.0</td><td>23.1</td></tr></table>	x	10	15	20	25	30	y	35.4	32.2	29.1	26.0	23.1			
x	10	15	20	25	30											
y	35.4	32.2	29.1	26.0	23.1											
13. a) i)	Find the first derivative of 'y' at $x = 54$ from the following data:	8	K4	3												
	<table><tr><td>x</td><td>50</td><td>51</td><td>52</td><td>53</td><td>54</td></tr><tr><td>y</td><td>3.6840</td><td>3.7084</td><td>3.7325</td><td>3.7563</td><td>3.7798</td></tr></table>	x	50	51	52	53	54	y	3.6840	3.7084	3.7325	3.7563	3.7798			
x	50	51	52	53	54											
y	3.6840	3.7084	3.7325	3.7563	3.7798											
ii)	Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by using Simpson's 1/3 rule and 3/8 rule by dividing the range into six equal part.	8	K4	3												
	(OR)															
b) i)	Evaluate $\int_0^\pi \sin x \, dx$ by dividing the interval into 8 equal strips using Trapezoidal rule and compare the result with actual value of integral.	8	K4	3												
ii)	Evaluate $\int_{-1}^1 \frac{dx}{1+x^2}$ by Gaussian two-point and three-point formula.	8	K4	3												

Q. No		M	BTL	CO
14. a)	i) Solve $y' = y^2 + x, y(0) = 1$ using Taylor series method to find $y(0.1)$ & $y(0.2)$ correct to four decimal places.	8	K2	4
	ii) Using Milne's method, find $y(0.8)$, given $\frac{dy}{dx} = 1 + y^2, y(0) = 1, y(0.2) = 0.2027, y(0.4) = 0.4228$ and $y(0.6) = 0.6841$.	8	K3	4
	(OR)			
b) i)	Find $y(0.1)$ using Runge-Kutta method of order four, given $\frac{dy}{dx} = y - x, y(0) = 1$.	8	K2	4
	ii) Given $y' = y - x^2, y(0) = 1, y(0.2) = 1.2186, y(0.4) = 1.4682$ & $y(0.6) = 1.7379$, find $y(0.8)$ by Adam's - Bashforth method.	8	K3	4
15. a)	i) Solve the boundary value problem, $y'' - y = 0$ with $y(0) = 0$ and $y(2) = 4$ by taking $h = 0.5$.	8	K2	5
	ii) Solve the Poisson equation $\nabla^2 u = -10(x^2 + y^2 + 10)$ over the square mesh with sides $x = 0, y = 0, x = 3, y = 3$ and $u = 0$ on the boundary. Assume mesh length $h = 1$ unit.	8	K3	5
	(OR)			
b) i)	Solve by Bender-Schmidt formula, $u_{xx} = 2u_t$ when $u(0, t) = 0, u(4, t) = 0$ and with initial condition $u(x, 0) = x(4 - x)$ upto $t = 5$ sec, taking $h = 1$.	8	K2	5
	ii) Solve by Crank-Nicholson's scheme: $16u_t = u_{xx}, 0 < x < 1, t > 0$ with $u(x, 0) = 0, u(0, t) = 0, u(1, t) = 100t$. Compute u for one-step, taking $h = \frac{1}{4}$.	8	K3	5

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

M.E. Degree Examinations – April/May 2025

Semester: III [Full Time]

Computer Aided Design

22CDE74 – NANO MATERIAL TECHNOLOGY

(Regulations 2022)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
1. Compare bottom up and top up approach.	2	K2	1
2. What are the challenges in nanotechnology?	2	K2	1
3. How do surfactants stabilize nanoparticles during synthesis?	2	K3	2
4. What are some successful examples of nanomaterials synthesized at an industrial scale?	2	K3	2
5. Why is the characterization of nanomaterials more challenging compared to bulk materials?	2	K3	3
6. What are the applications of masking?	2	K3	3
7. What factors influence the detection limit of nano-sensors?	2	K2	4
8. What are the key fabrication techniques for nano tweezers?	2	K3	4
9. Define nanofluids.	2	K2	5
10. How to avoid agglomeration in the nanofluid?	2	K3	5

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No	M	BTL	CO
11. a) How does reducing the dimensionality of nanomaterials enhance the Seebeck coefficient and thermoelectric efficiency?	16	K3	1
(OR)			
b) How do temperature variations impact the electronic behavior of nanomaterials compared to bulk materials?	16	K3	1
12. a) How do parameters such as temperature, solvent, and precursor concentration influence the growth of nanostructures in techniques like chemical vapor deposition (CVD) or sol-gel synthesis?	16	K4	2
(OR)			
b) How does the compatibility of different materials impact the synthesis of composite nanomaterials?	16	K4	2

Q. No		M	BTL	CO
13. a)	How do Transmission Electron Microscopy (TEM) and Scanning Electron Microscopy (SEM) differ in their ability to resolve nanostructures?	16	K4	3
	(OR)			
b)	How is X-ray Diffraction (XRD) used to determine the crystallinity and lattice parameters of nanomaterials?	16	K4	3
14. a)	What are the key challenges in integrating MEMS and NEMS devices into electronic circuits?	16	K3	4
	(OR)			
b)	What are the differences between short-wave infrared (SWIR), mid-wave infrared (MWIR), and long-wave infrared (LWIR) in night vision applications?	16	K3	4
15. a)	Describe in detail about thermos-physical properties of aluminum oxide water nanofluid.	16	K2	5
	(OR)			
b)	Explain any three models used for the measurement of thermal conductivity of nanomaterials.	16	K2	5

Registration Number:

Government College of Engineering :: Salem
(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: III [Part Time]

Electrical and Electronics Engineering

09MA301 – MATHEMATICS - III

(Regulations 2009)

Time : 3 Hours

Maximum Marks : 100

(10 x 2 = 20 Marks)

Part A

Answer ALL Questions

1. Form a partial differential equation by eliminating the arbitrary constant from the equation $z = ax^2 + by^2$.
2. Solve: $(D^2 + 3DD' + 2D'^2)z = 0$.
3. State the sufficient condition for existence of Fourier series.
4. If $f(x) = x + x^3$ in $(-\pi, \pi)$, find the Euler's coefficients a_0, a_n .
5. The ends A and B of a rod of length 20cm long have their temperature at 30°C and 90°C. Find the steady state temperature distribution on the rod.
6. Write down the possible solutions of the Laplace equation.
7. If $F\{f(x)\} = F(s)$, then prove that $F\{e^{iax} f(x)\} = F(s + a)$.
8. State Parseval's identity on Fourier transforms.
9. Form the difference equation by elimination arbitrary constant 'A' from $y_n = A \cdot 2^n$
10. Find the Z- transform of a^n .

Part B

(5 x 16 = 80 Marks)

Answer any FIVE Questions

11. i) Solve: $x(y - z)p + y(z - x)q = z(x - y)$. (8)
ii) Solve: $(D^2 + 4DD' - 5D'^2)z = 3e^{2x-y} + \sin(x - 2y)$. (8)
12. i) Obtain the half range cosine series of $f(x) = x$, $(0, \pi)$. (8)
ii) Find the Fourier series up to the second harmonic representing the function $y = f(x)$ given by (8)

x	0	$\pi/3$	$2\pi/3$	π	$4\pi/3$	$5\pi/3$	2π
y	1.8	0.3	0.5	2.16	1.3	1.76	1.8

13. A string is stretched and fastened to two points $x = 0$ and $x = l$ apart. (16)
If it is set vibrating giving each point a velocity $\lambda x(l - x)$, find the displacement at any subsequent time.

14. Find the Fourier transform of the function (16)

$$f(x) = \begin{cases} a^2 - x^2, & |x| < a \\ 0, & |x| > a \end{cases} \text{ And show that}$$

i) $\int_0^\infty \frac{\sin t - t \cos t}{t^3} dt = \frac{\pi}{4}$. Also prove that $\int_0^\infty \left(\frac{\sin t - t \cos t}{t^3} \right)^2 dt = \frac{\pi}{15}$.

15. i) Using convolution theorem, find $Z^{-1} \left[\frac{z^2}{(z-4)(z-3)} \right]$. (8)

- ii) Solve: $y_{n+2} - 2y_{n+1} + y_n = 2^n$ given that $y_0 = 2$ and $y_1 = 1$ by using Z-transform method. (8)

16. Find the Fourier transform of $f(x) = \begin{cases} a - |x|, & |x| \leq a \\ 0, & |x| > a \end{cases}$. Hence prove that (16)

$$\int_0^\infty \left(\frac{\sin t}{t} \right)^4 dt = \frac{\pi}{3}$$

17. A rod of length cm has its ends A and B kept at $0^\circ C$ and $100^\circ C$ (16)
respectively until steady state condition prevails. If the temperature at B is suddenly reduced to $0^\circ C$ and kept so, while that of A is maintained. Find the temperature distribution $u(x, t)$.

18. Expand $f(x) = x^2$, when $-\pi < x < \pi$, in a Fourier series of periodicity (16)
 2π . Hence deduce that

i) $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \dots = \frac{\pi^2}{6}$

ii) $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \dots = \frac{\pi^2}{12}$

iii) $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{8}$

Registration Number :

Government College of Engineering, Salem
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B.E. Degree Examinations – April/May 2025

Semester: VI [Part Time]

Civil Engineering

12CE603- STEEL STRUCTURE (LIMIT STATE DESIGN)

(Regulations 2012)

(Use of IS 800-2007, IS 6533-1971 IS 875 part 1,2,3 IS 805 : 1968 and Steel Tables are Permitted)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

1. List the types of connections.
2. Define stiffened seated connection.
3. Why HSFG bolts are needed.
4. Illustrate self-supporting type chimney.
5. Define dome of a tank.
6. Mention the demerits of rectangular water tanks.
7. When gantry girder is used?
8. Write the parts of plate girder.
9. Write the types of roof trusses.
10. Recall the term purlin.

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q.No

M

11. a) Design a stiffened seat connection for an ISMB 350@514 N/m (16)
transmitting an end reaction of 320 kN (due to factored loads) to a
column section ISHB 300@576.8 N/Am. Use steel of grade 410 and bolts
of grade 4.6.

(OR)

- b) Explain the procedure for stiffened seated connection. (16)
- i) Bolted connection
 - ii) Welded connection

12. a) Design a self supporting chimney at the outskirts of sale. The height of (16)
the chimney is 80 m and its diameter is 3m.

(OR)

- b) In detail discuss the design of foundation for chimney with sketches. (16)

13. a) Design a circular steel water tank with a flexible base for a capacity of 5,00,000 litres. (16)

(OR)

- b) Discuss the design procedure for staging and foundation for steel circular water tank. (16)

14. a) Write down the step by step procedure of design of gantry girder in detail. (16)

(OR)

- b) A plate girder is used for a span of 22 m. It is subjected a UDL of 42KN/m Assuming 2500 mm x 8 mm web plate pairs of ISA 150 x 150 x 15 mm angles and 400 mm x 20 mm flange plates, design the bearing stiffener at the support. (16)

15. a) Design an angle section purlin for a trussed roof for the following data (16)

Span of the truss : 10 m
Spacing of truss : 4 m c/c
Spacing of purlin along the slope of truss : 2 m c/c
Wind load on purlin normal to roof : 10 N/m²
Vertical load from roof covering : 0.2 KN/m²
Slope of the truss is 1 Vertical and 2 horizontal.

(OR)

- b) Discuss briefly the following with neat sketches. (16)

i) Bracing system in roof truss ii) Connection of purlin to rafter
iii) Anchorages of truss with concrete column.

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: I [Full Time]

Mechanical Engineering

12MA101 – MATHEMATICS - I

(Regulations 2012)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

1. State Cayley-Hamilton theorem.
2. Find the Eigen value of the matrix $A = \begin{pmatrix} 2 & -5 & 7 \\ 0 & 3 & 4 \\ 0 & 0 & 6 \end{pmatrix}$.
3. If α, β, γ are the roots of $x^3 - 2x^2 - 4x + 6 = 0$, find the value of $\Sigma \alpha$ and $\alpha\beta\gamma$.
4. Form an equation whose roots are two times those of the equation $x^3 + 2x^2 - 3x + 4 = 0$.
5. Define radius of curvature of a curve.
6. Define evolute of a curve.
7. Find $\frac{dy}{dx}$ if $x^2 + y^2 + 2xy = 0$
8. If $x = r \cos \theta$, $y = r \sin \theta$, find $\frac{\partial(x,y)}{\partial(r,\theta)}$.
9. Find the area bounded by the lines $x = 0, y = 2$ and $y = 3x$.
10. Find the value of $\int_1^3 \int_2^4 \int_1^2 xyz \, dz \, dy \, dx$.

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q.No

M

11. a) i) Find the Eigen values and Eigen vectors for the matrix $\begin{pmatrix} 3 & -4 & 4 \\ 1 & -2 & 4 \\ 1 & -1 & 3 \end{pmatrix}$. (8)

- ii) Using Cayley-Hamilton theorem, find A^{-1} for the matrix (8)

$$A = \begin{pmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{pmatrix}$$

(OR)

- b) Reduce the quadratic form into the canonical by using orthogonal transformation $x^2 + 5y^2 + z^2 + 2xy + 2yz + 6xz$ and hence find rank, index, signature, nature. (16)

Q.No**M**

12. a) i) Solve $x^3 - 3x^2 - 16x + 48 = 0$, given that sum of two roots is zero. (8)
- ii) Find the equation whose roots are less by 2, than the roots of the equation $x^4 - x^3 - 10x^2 + 4x + 24 = 0$. (8)
- (OR)**
- b) i) Solve $x^4 + 3x^3 - 3x - 1 = 0$. (8)
- ii) Discuss the nature of roots of the equation $x^5 - 6x^2 - 4x + 5 = 0$. (8)
13. a) i) Find the radius of curvature at $(a, 0)$ on the curve $y^2 = 4ax$. (8)
- ii) Find the equation of the envelope for the family of the lines $y = mx + \frac{1}{m}$. (8)
- (OR)**
- b) i) Find the circle of curvature of the curve $xy = c^2$ at a point (c, c) . (8)
- ii) Find the evolute of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$. (8)
14. a) i) If $u = \sin^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$ then show that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \frac{1}{2} \tan u$. (8)
- ii) Find the Maximum and Minimum of $f(x, y) = x^3 + 3x^2 - 15x^2 + 72x$. (8)
- (OR)**
- b) i) Expand $f(x, y) = e^x \cos y$ at $(0, 0)$ upto 3rd term using Taylor's series. (8)
- ii) Find the dimension of the rectangular box without a top of maximum capacity, whose surface area is 108 sq. cm. (8)
15. a) i) By changing the order of integration, evaluate $\int_0^1 \int_y^{2-y} xy \, dx \, dy$. (8)
- ii) Using double integral, find the area of the Ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$. (8)
- (OR)**
- b) i) Find the volume of the tetrahedron bounded by the coordinate planes and $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$. (8)
- ii) By changing in to polar Co - ordinates, evaluate $\int_0^a \int_y^a \frac{x}{x^2+y^2} \, dx \, dy$. (8)

Registration Number :

Government College of Engineering, Salem
(An Autonomous Institution, Affiliated to Anna University, Chennai)

M.E. Degree Examinations – April/May 2025

Semester: I [Full Time]

Welding Technology

18WTC11 - ADVANCED MATHEMATICS AND STATISTICS

(Regulations 2018/2018 A)

(Tables for Standard Normal Distribution, t-distribution, F-distribution and Chi-square distribution are allowed)

Time : 3 Hours

Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

1. Write the principle of Least Square.
2. Compare Gauss elimination with Gauss seidel method.
3. Evaluate: $\int_0^t J_0(u)J_0(t-u)du$.
4. Find : $L^{-1}\{\log\left(\frac{p+2}{p+3}\right)\}$.
5. Show that $\int_0^\infty \frac{\lambda \sin \lambda x}{\lambda^2+1} d\lambda = \frac{\pi}{2} e^{-x}, x \geq 0$.
6. Find the Fourier cosine transform of $x e^{-ax}$.
7. Find the mean of the Uniform distribution.
8. Write the uses of ψ^2 - test.
9. State the Mathematical model used in analysis of variance in a two-way classification.
10. What is meant by main advantage of LSD over RBD?

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No

M

11. a) i) Fit a second degree parabola to the following data taking x as the independent variable:

(8)

x:	0	1	2	3	4
y:	1	1.8	1.3	2.5	6.3

Find the difference between the actual value of y and the value of y obtained from the fitted curve when $x = 2$.

- ii) Find the root of the equation $3x + \sin x = e^x$ by Newton's method.

(8)

(OR)

Q. No

M

- b) i) Apply Gauss-Seidel method to solve the following system of equations. (8)
 $20x + y - 2z = 17, 3x + 20y - z = -18, 2x - 3y + 20z = 25$
- ii) Solve the equations by Gauss Elimination method (8)
 $10x + y + z = 12; 2x + 10y + z = 13; 2x + 2y + 10z = 14$
12. a) i) Find the Laplace transform of the following $e^{2t} \int_0^t \frac{\sin 3t}{t} dt$. (8)
- ii) Solve the equation $\frac{\partial y}{\partial x} - \frac{\partial y}{\partial t} = 1 - e^{-t}, 0 < x < 1, t > 0$ given that $y(x, 0) = x$ by Laplace transform techniques. (8)
- (OR)
- b) i) Using the Laplace transform method, solve the equation (8)
 $u_{xx} - u_{tt} = xt, 0 \leq x < \infty, 0 \leq t < \infty,$
 subject to $u_t(x, 0) = 0, u(x, 0) = 0$
- ii) Solve: $\frac{\partial y}{\partial t} = 3 \frac{\partial^2 y}{\partial x^2}$ if $y(\pi/2, t) = 0, y(x, 0) = 30 \cos 5x, (\frac{\partial y}{\partial x})_{x=0} = 0$. by (8)
 Laplace transform techniques.
13. a) i) Find the Fourier transform of $f(x) = e^{-a^2 x^2}$. (8)
- ii) Solve the heat conduction equation $\frac{\partial u}{\partial t} = k \frac{\partial^2 u}{\partial x^2}, -\infty < x < \infty, t > 0$ (8)
 subject to $u(x, t)$ and $u_t(x, t)$ both $\rightarrow 0$ as $|x| \rightarrow \infty$
 and $u(x, 0) = f(x), -\infty < x < \infty$
- (OR)
- b) i) Find the Fourier sine transform of e^{-x} and hence find the Fourier sine (8)
 transform of $f(x) = \frac{x}{x^2 + 1^2}$
- ii) Obtain the solution of free vibrations of a semi-infinite string governed (8)
 by $u_{tt} = c^2 u_{xx}, 0 < x < \infty, t > 0$, subject to $u(x, 0) = f(x), u_t(x, 0) = g(x)$.
14. a) Messages arrive at a switchboard in a Poisson manner at an average rate (16)
 of six per hour. Find the probability for each of the following events:
- (a) Exactly two messages arrive within one hour.
- (b) No message arrives within one hour.
- (c) At least three messages arrive within one hour.

(OR)

Q. No

M

- b) i) If $X \sim N(3; 9)$, which means that X is a normal random variable with mean = 3 and variance = 9. Find the probability that X lies between 2 and 5. (8)

- ii) The following table gives the number of aircraft accidents that occur during the various days of a week. Find whether the accidents are uniformly distributed over the week. (8)

Days	Sun	Mon	Tue	Wed	Thu	Fri	Sat
No. of Accidents	14	16	8	12	11	9	14

15. a) The varieties A, B, C, D, E, F, G of wheat were sown in 5 plots each and the following yields in quintals per acre were obtained (16)

A	13	11	10	16	12
B	15	11	13	18	12
C	14	10	12	13	11
D	14	10	15	17	10
E	17	15	14	19	12
F	15	9	13	14	10
G	16	12	13	15	11

Do the data indicate a significant difference in the yields of varieties?

(OR)

- b) A variable trial was conducted on wheat with 4 varieties in a Latin Square Design. The plan of the experiment and the per plot yield are given below: (16)

C	25	B	23	A	20	D	20
A	19	D	19	C	21	B	18
B	19	A	14	D	17	C	20
D	17	C	20	B	21	A	15

Analyses data and interpret the result.

Registration Number :

Government College of Engineering :: Salem
(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: VIII [Full Time]

Civil Engineering

18CEPE01 – TRAFFIC ENGINEERING

(Regulations 2018/2018A)

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer **ALL** Questions

1. Define Skid Resistance.
2. What is meant by field of vision?
3. What are the various types of volume counts?
4. State the causes of accidents related to Traffic Engineering.
5. List the advantages of Vehicle Actuated Signals.
6. Mention the Mandatory signs.
7. What is an Intersection?
8. Write the difference between Flyover and Grade Separator.
9. What is the purpose of One way Streets? What are its disadvantages?
10. List out the various methods of Traffic Calming.

Part B

(5 x 16 = 80 Marks)

Answer **ALL** Questions

11. a) i) Discuss briefly about the scope and importance of Traffic Engineering. (8)
ii) Explain briefly about Vehicle characteristics and its applications. (8)
(OR)
b) Discuss in detail the various factors which affect the Road user characteristics and their effect on Traffic performance. (16)
12. a) i) What are the various methods of carrying out Speed and delay surveys? Explain. (8)
ii) Discuss briefly about the details to be collected while conducting Parking Inventory Survey with a neat sketch. (8)
(OR)
b) i) Explain in detail about causes of Accidents and Accident Studies. (8)
ii) Discuss briefly about Safety measures of Accidents. (8)

13. a) Explain the various types of Traffic Signals and their functions. How are the Signal Timings decided? (16)

(OR)

- b) i) What are the various types of Traffic Signs? Explain. (8)
ii) Explain in detail about Street Lighting and its importance. (8)

14. a) i) Explain about the classification of Intersections in detail. (8)
ii) What is the concept of Grade Separator? Explain. (8)

(OR)

- b) Explain in detail about Channelization of Intersection and its purposes with neat sketches. (16)

15. a) What are the various Traffic System Management (TSM) measures that may be adopted? Explain. (16)

(OR)

- b) What are the applications of Intelligent Transport System? Explain in detail. (16)