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R22



CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

Examination : B.Tech I Semester Supplementary Examinations December-2025
 Course Name : Matrices and Calculus
 Course Code : A400001
 Branch : CE/ EEE/ ME/ ECE/ CSE/ IT/ CSC/ CSM/ CSD/ AIM
 Date & Session : 29-12-2025 AN Duration: 3 hours Max. Marks: 60

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions

Each question carries ONE mark.

10x1=10M

1. Define rank of the matrix. 1 M
2. Find the value of K such that the rank of $\begin{bmatrix} 1 & 2 & 3 \\ 2 & k & 7 \\ 3 & 6 & 10 \end{bmatrix}$ is 2 1 M
3. State the Cayley - Hamilton theorem. 1 M
4. Define the following terms: a) Index b) Negative definite 1 M
5. State Lagrange's mean value theorem. 1 M
6. Expand $\sin x$ in powers of x . 1 M
7. State Euler's theorem on Homogeneous function. 1 M
8. If $x = r \cos \theta, y = r \sin \theta$, find $\frac{\partial(r, \theta)}{\partial(x, y)}$ 1 M
9. Evaluate $\int_0^5 \int_0^{x^2} x \, dy \, dx$ 1 M
10. Write the spherical polar coordinates for triple integrals. 1 M

PART-B

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). Find the rank of the matrix $A = \begin{bmatrix} 1 & 3 & 2 & 0 \\ 2 & 0 & 1 & 1 \\ 1 & 2 & 3 & 0 \\ 3 & -1 & 0 & 1 \end{bmatrix}$ by reducing to the Normal form. 10M

OR

11. B). Solve the following equation by using Gauss-Seidel method $10x+y+z = 12,$ 10M
 $2x+10y+z = 13, 2x+2y+10z = 14.$

12. A). Find the inverse of the matrix $\begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$ by using Cayley-Hamilton theorem. 10M

OR

12. B). Reduce the quadratic form $3x^2 + 5y^2 + 3z^2 - 2yz + 2zx - 2xy$ to the canonical form by orthogonalization and hence find its i) rank ii) index iii) signature iv) nature. 10M

(P.T.O..)

13. A). i) State Cauchy's mean value theorem. 2M
ii) Verify Rolle's theorem for the function $f(x) = x^3 - 6x^2 + 11x - 6$ in $[1,3]$ 8M

OR

13. B). Prove that $B(m, n) = \int_0^{\infty} \frac{x^{m-1}}{(1+x)^{m+n}} dx = \int_0^{\infty} \frac{x^{n-1}}{(1+x)^{m+n}} dx$ 10M

14. A). Verify if $u=2x-y+3z$, $v=2x-y-z$, $w=2x-y+z$ are functionally dependent and if so, find the relation between them. 10M

OR

14. B). Find the maximum and minimum values of the function. 10M
 $f(x, y) = x^3 + 3xy^2 - 3x^2 - 3y^2 + 4.$

15. A). Evaluate $\iiint_V (xy + yz + zx) dx dy dz$ where V is the region of space bounded by the planes $x = 0, x = 1, y = 0, y = 2, z = 0, z = 3.$ 10M

OR

15. B). Evaluate $\iint xy dx dy$ where R is the region bounded by x -axis, ordinate $x=2a$ and the curve $x^2=4ay.$ 10M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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Examination : B.Tech I Semester Supplementary Examinations December-2025
Course Name : Applied Physics
Course Code : A400008
Branch : CE/ ME/ CSC/ CSM/ CSD/ AIM
Date & Session : 31-12-2025 AN **Duration: 3 hours** **Max. Marks: 60**

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions
Each question carries ONE mark.

10x1=10M

1. State Wein's Law. 1 M
2. Give any two differences between conductors and insulators. 1 M
3. What is meant by Extrinsic Semiconductor? 1 M
4. What are the types of materials used for the constructions of Solar cell? 1 M
5. Name any two applications on LASER. 1 M
6. Refractive index Profile classifies the optical fibers into two categories. Name those two. 1 M
7. Define Polarization in dielectrics. 1 M
8. Define Magnetic Susceptibility. 1 M
9. Define Nano materials. 1 M
10. List out any two applications of Nano materials. 1 M

PART-B

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). i) Analyze how the outcome of Davisson and Germer experiment supported the wave nature of electrons. 7M
ii) Outline the interpretation on physical significance of wave function. 3M
- OR**
11. B). i) Comprehensively outline the Classical Free electron theory proposed by Drude and Lorentz. 6M
ii) Write a note on Effective mass (m^*) of an Electron. 4M
12. A). Describe the behavior of P-N junction diode under Forward Biasing and Reverse Biasing 10M
- OR**
12. B). i) Distinguish between Direct and Indirect Band Gap Semiconductors. 5M
ii) Write a short note on PIN diode. 5M
13. A). Define the terms Stimulated emission, Population Inversion. Analyze the working mechanism of RUBY LASER with the necessary sketches. 10M
- OR**
13. B). i) Neatly illustrate different layers in optical fibers and summarize the significance of each layer. 3M
ii) List out any three applications of Optical fibers and analyze the application in optical fiber communication with necessary block diagram. 7M

(P.T.O..)

14. A). Define the terms Polarization and Dielectric Constant. Derive Clasius-Mossoti relation in Dielectrics. 10M

OR

14. B). Examine the Hysteresis behavior of Ferro Magnetic materials with the relevant sketch. 10M

15. A). Nano materials can be synthesized using Physical vapour deposition method and Combustion method. Illustrate these two processes and outline the two processes. 10M

OR

15. B). Survey the principle, construction and working of Transmission Electron Microscope (TEM) with the relevant sketches. Identify its limitations. 10M



CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

Examination	: B.Tech I Semester Supplementary Examinations December-2025		
Course Name	: Engineering Chemistry		
Course Code	: A400009		
Branch	: EEE/ ECE/ CSE/ IT		
Date & Session	: 31-12-2025 AN	Duration: 3 hours	Max. Marks: 60

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions

Each question carries ONE mark.

10x1=10M

- | | | |
|-----|--|-----|
| 1. | What is the role of salt bridge in Galvanic Cells? | 1 M |
| 2. | Mention any two applications of Solar Cells. | 1 M |
| 3. | Write about the monomers of Nylon 6,6. | 1 M |
| 4. | Justify why thermoset articles cannot be shaped by application of heat and pressure. | 1 M |
| 5. | Distinguish between Gross and Net Calorific value of fuel. | 1 M |
| 6. | Mention the composition and uses of LPG. | 1 M |
| 7. | Distinguish between carbonate and non-carbonate hardness of water with example. | 1 M |
| 8. | Why is Calgon conditioning better than phosphate conditioning? | 1 M |
| 9. | Why is borosilicate glass preferred in chemical laboratory? | 1 M |
| 10. | What are the constituents of Portland Cement? | 1 M |

PART-B

Answer the following. Each question carries TEN Marks.

5x10=50M

- | | | |
|-----------|---|-----|
| 11.A). | Explain the following electrodes with their electrode reaction, potential with well labeled diagram. i) Calomel electrode ii) Glass electrode. | 10M |
| OR | | |
| 11.B). | Describe the construction of Lead Acid battery with reactions occurring during discharging and charging. | 10M |
| 12.A). | Write the preparation, properties and uses of i) PVC ii) Bakelite. | 10M |
| OR | | |
| 12.B). | What are Conducting Polymers? Illustrate the mechanism of conduction in polyacetylene. | 10M |
| 13.A). | Explain ultimate analysis of Coal. What is its significance. | 10M |
| OR | | |
| 13.B). | Describe the manufacture of gasoline by Fischer-Tropsch method. | 10M |
| 14.A). | i) Describe the estimation of hardness of water sample by EDTA Method. | 6M |
| | ii) 60 ml of standard hardness containing 1 mg of pure CaCO ₃ per ml consumed 22 ml of EDTA. 40 ml of water sample consumed 20 ml of EDTA solution using EBT indicator. 40 ml of water sample after boiling, filtering consumed 15 ml of EDTA. Calculate the temporary and permanent hardness of water sample. | 4M |
| OR | | |
| 14.B). | What are the specifications of potable water? Give an account of treatment plant for raw water for domestic use. | 10M |
| 15.A). | Explain the mechanism of setting and hardening of cement. | 10M |
| OR | | |
| 15.B). | i) Discuss the mechanism of extreme pressure lubrication. | 6M |
| | ii) Explain the terms cloud and pour points and give their significance. | 4M |



CMR COLLEGE OF ENGINEERING & TECHNOLOGY (UGC AUTONOMOUS)

Examination	: B.Tech I Semester Supplementary Examinations January-2026	
Course Name	: Electrical Circuit Analysis-I	
Course Code	: A402202	
Branch	: Electrical & Electronics Engineering	
Date & Session	: 02-01-2026 AN	Duration: 3 hours
		Max. Marks: 60

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions

Each question carries ONE mark.

10x1=10M

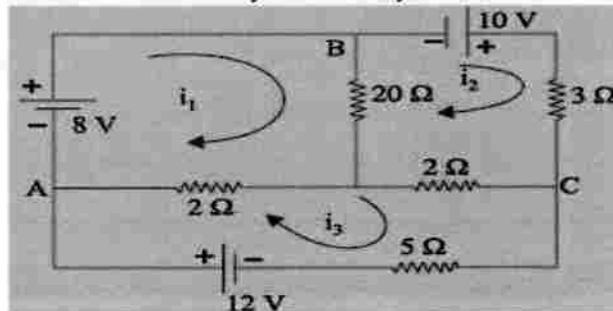
1. State Ohm's Law. 1 M
2. An Electric iron is rated 1000W, 240V. Find the current drawn of the heating element. 1 M
3. Define Impedance. 1 M
4. What is a Resonant frequency? 1 M
5. What is the difference between AC Network theorems and DC Network theorems? 1 M
6. State Norton's theorem 1 M
7. Give some method available for measuring three-phase power. 1 M
8. Write the relationship between line voltage & phase voltage and line current & phase current of a 3 phase star connected system. 1 M
9. Two coupled coils with self inductances of 1H and 2H are connected in series aiding. The resulting inductance L_{eq} is 4H. Find the coefficient of coupling between them. 1 M
10. Define: node and tree. 1 M

PART-B

Answer the following. Each question carries TEN Marks.

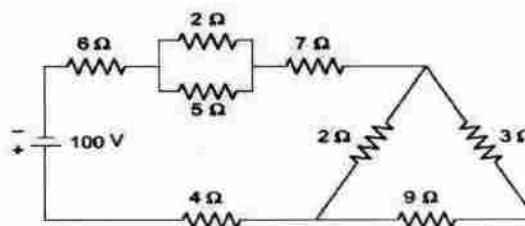
5x10=50M

- 11.A). i) What are the sources of the circuit? Explain briefly. 4M
 ii) Determine current in 5ohm resistor by mesh analysis method. 6M



OR

11. B). i) Classify the circuit elements. 4M
 ii) Find the equivalent resistance and total current of the circuit shown. 6M



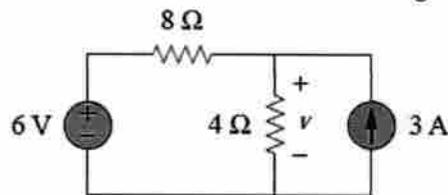
(P.T.O..)

12. A). i) What is meant by complex power? 4M
 ii) A series circuit consisting of a $10\ \Omega$ resistor, a $100\ \mu\text{F}$ capacitance and a 10mH inductance is driven by a $50\ \text{Hz}$ AC voltage source of maximum value $100\ \text{V}$. Calculate the equivalent impedance, current in the circuit, the power factor and power dissipated in the circuit. 6M

OR

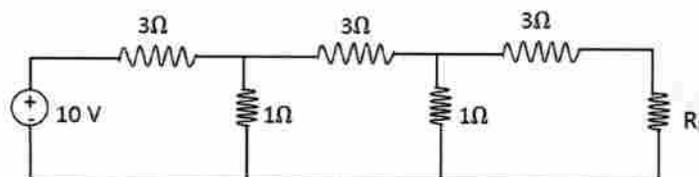
12. B). i) Explain about single phase RL circuit with relevant diagrams. 4M
 ii) An alternating voltage is given by $V=230\sin 314t$. Calculate a) frequency, b) maximum value, c) average value, d) RMS value. 6M

13. A). i) What are the applications of electrical network theorems? 4M
 ii) Use the superposition theorem to find v in the circuit in fig. 6M



OR

13. B). i) State and explain Maximum power transfer theorem. 4M
 ii) Determine R_L in the following network and calculate maximum power is delivered to it. 6M



14. A). i) Explain about the phase sequence with neat phases. 4M
 ii) Derive the expressions for wattmeter readings in two wattmeter method with balanced star connected load connected load. 6M

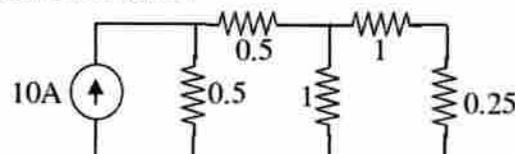
OR

14. B). Explain about Star and Delta connected three phase balanced circuits with neat diagrams. 10M

15. A). i) Mention comparison between electric circuit and magnetic circuit. 4M
 ii) Coil 1 of a pair of coupled coils has a continuous current of $5\ \text{A}$ and the corresponding fluxes ϕ_{11} and ϕ_{12} are 0.2 and $0.4\ \text{mWb}$ respectively. If the turns are $N_1 = 500$ and $N_2 = 1500$, find L_1 , L_2 , M and k . 6M

OR

15. B). i) What are the properties of tie-set matrix? 4M
 ii) Write the cut-set matrix of the graph and determine the loop currents. All the values of resistances in the circuit are in ohms. 6M



13. A). i) Draw equivalent circuit of single-phase transformer and explain. 5M
ii) A 50Hz single phase transformer has 6600V/400V. Having emf per turn is 10V and the maximum flux density in the core is 1.6 Tesla. Find: i) Suitable number of primary and secondary turns ii) Cross sectional area of the core. 5M

OR

13. B). i) Explain the operation of Auto transformer. 5M
ii) Draw the connection diagrams of Y-Y, Y- Δ three-phase transformer connections. 5M

14. A). i) Name the different parts of a dc machine and state the function of each part. 5M
ii) Explain the operation of 3-phase induction motor. 5M

OR

14. B). i) Explain how rotating magnetic field is generated. 5M
ii) Describe briefly torque-slip characteristics of induction motor. 5M

15. A). i) Write the important characteristics of Batteries. 5M
ii) Explain construction and operation of MCB. 5M

OR

15. B). i) Explain different types of wiring system. 5M
ii) Discuss the elementary calculations for energy consumption. 5M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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Examination : B.Tech I Semester Supplementary Examinations January-2026
 Course Name : Engineering Mechanics
 Course Code : A403201
 Branch : CE/ ME
 Date & Session : 05-01-2026 AN Duration: 3 hours Max. Marks: 60

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions

Each question carries ONE mark.

10x1=10M

- | | |
|---|-----|
| 1. State polygon law of forces. | 1 M |
| 2. Define non-coplanar concurrent forces. | 1 M |
| 3. Define angle of repose. | 1 M |
| 4. What is the principle used in the working of a screw jack? | 1 M |
| 5. Define centroid. | 1 M |
| 6. List out the various methods of finding out the centre of gravity of a body. | 1 M |
| 7. What is the radius of gyration of circle of diameter d about its diameter? | 1 M |
| 8. State perpendicular axis theorem. | 1 M |
| 9. What is the fundamental work-energy equation is for fixed – axis rotation? | 1 M |
| 10. Write the impulse-momentum equation and mention its applications. | 1 M |

PART-B

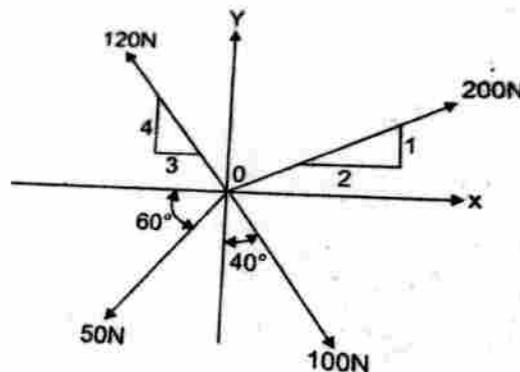
Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). State and prove Lami's theorem. 10M

OR

11. B). A system of four forces acting on a body is as shown in below figure. Determine Resultant. 10M

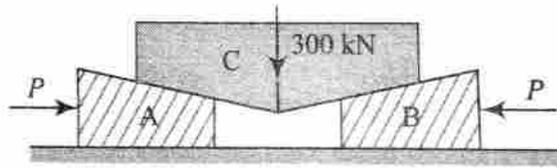


12. A). Derive the expression for efficiency of screw jack for 10M
 i) Raising the load
 ii) Lowering the load.

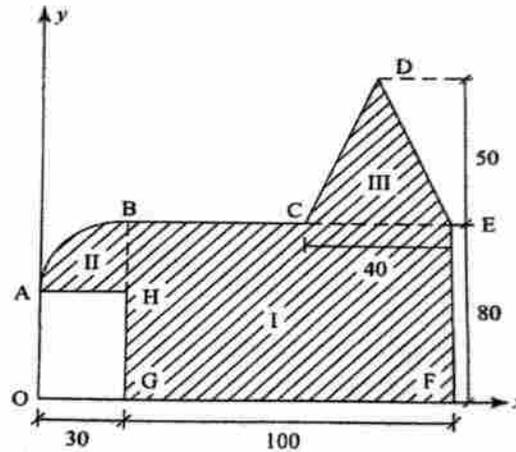
(P.T.O.)

OR

12. B). Block C weighing 300 kN is to be Raised by means of two wedges A and B having wedge angle 18° as shown in below figure. If the coefficient of friction for all the contiguous surfaces is 0.20, determine the force P necessary for impending the motion of C upwards. 10M



13. A). Determine the Centroid of the plane uniform lamina as shown in below figure. Consider all dimensions are in mm. 10M

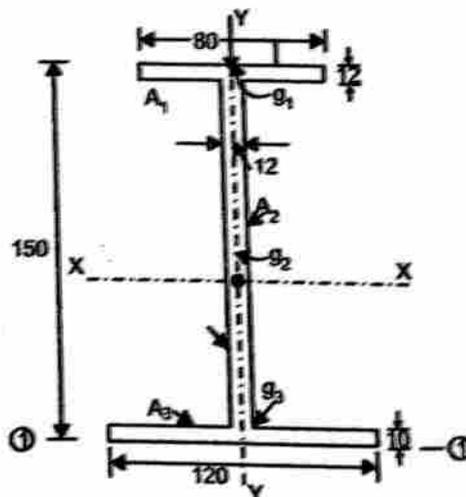


OR

13. B). A body consists of a right circular solid cone of height 40 mm and radius is 30 mm placed on a solid hemisphere of radius 30 mm of the same material. Find the position of centre of gravity of the body. 10M
14. A). Derive an equation for moment of inertia of the following sections about centroidal axis: 10M
 i) A rectangular section ii) A triangular section from its base.

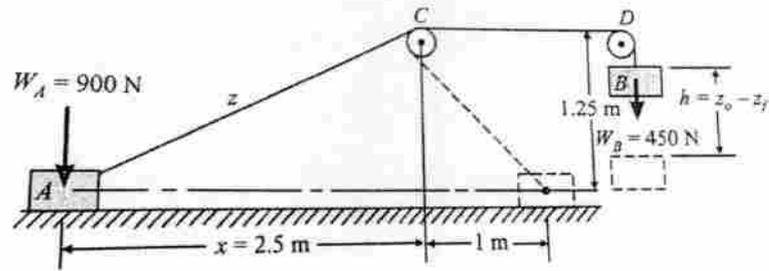
OR

14. B). Determine the polar moment of inertia of the I – Section as shown in the below figure. Also, determine the radii of Gyration with respect to X - X Axis and Y - Y axis. Consider all dimensions are in mm. 10M



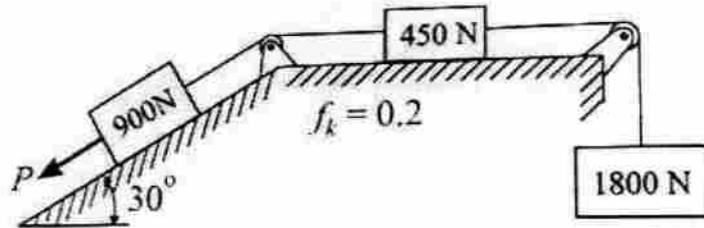
(P.T.O..)

15. A). Body A is pulled along the frictionless level surface in below shown figure by a flexible, inextensible cord passing over smooth fixed pegs at C and D to the weight B. If A starts from rest at the given position, determine its velocity when it is in the dashed position. 10M



OR

15. B). The system shown below figure has a rightward velocity of 3 m/s. Determine the constant value of P that will give it a leftward velocity of 6 m/s in a time interval of 20 sec. 10M



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R22



CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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Examination : B.Tech I Semester Supplementary Examinations January-2026
Course Name : C Programming and Data Structures
Course Code : A405202
Branch : EEE/ ECE
Date & Session : 05-01-2026 AN **Duration: 3 hours** **Max. Marks: 60**

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions
Each question carries ONE mark.

10x1=10M

1. Define Constant. 1 M
2. What are basic data types available in "C"? 1 M
3. List out different decision statements or conditional statements in C. 1 M
4. Give any two array applications. 1 M
5. What is the function? Write the types of functions. 1 M
6. How do you create a "pointer to pointer" in C? 1 M
7. Name the different types of linked lists. 1 M
8. What are queue operations? 1 M
9. What is sorting? What is searching? 1 M
10. Define Binary search. 1 M

PART-B

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). What are primitive data types? Explain about each data type in detail with examples. 10M
- OR**
11. B). What is bitwise operator? Explain each bitwise operator with example and write a C program to illustrate use of bitwise operators. 10M
12. A). Write a C program to perform an arithmetic operation using switch statement. (read the operator and operands from console). 10M
- OR**
12. B). Explain creating, accessing elements and multidimensional arrays in C. 10M
13. A). List and explain string manipulation functions with examples. 10M
- OR**
13. B). What is Recursion? write a C code to find Factorial of a given number using recursion. 10M
14. A). What is a stack? Show array and linked representation of stack. What are the applications of stacks? 10M
- OR**
14. B). Explain insert and delete operation in single linked list. 10M
15. A). Write a program to implement the binary search. 10M
- OR**
15. B). Simulate bubble sort on following data and write a C program for it. 3,6,8,9,1,2,22,11,5. 10M

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R22



**CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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Examination : B.Tech I Semester Supplementary Examinations January-2026
Course Name : Programming for Problem Solving
Course Code : A405201
Branch : CSE/ IT/ CSC/ CSM/ CSD/ AIM
Date & Session : 05-01-2026 AN **Duration:** 3 hours **Max. Marks:** 60

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions

Each question carries ONE mark.

10x1=10M

1. What is a Flowchart? 1 M
2. Compare a character and a string. 1 M
3. Write the syntax of do-while loop 1 M
4. Why do we use continue statement? 1 M
5. Define formal arguments. 1 M
6. List the basic string functions available in C. 1 M
7. What are enumerated data types? 1 M
8. What is the difference between ifdef and undef? 1 M
9. List any two differences between text and binary files. 1 M
10. Write the time complexity of Bubble sort. 1 M

PART-B

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). Write an algorithm and flowchart to find the largest of 3 numbers. 10M
- OR**
11. B). List and explain different types of operators are used in C. 10M
12. A). Explain different Iterative statements in C with syntax, flowchart and example each. 10M
- OR**
12. B). Write a C program to implement matrix multiplication using Arrays. 10M
13. A). What is meant by the scope of variables and explain the types of storage class in C? 10M
- OR**
13. B). Discuss call by value and call by reference with example programs. 10M
14. A). What is a pointer? Explain declaration, initialization and accessing of a pointer variable with an example. 10M
- OR**
14. B). Discuss about the various preprocessor commands used in C. 10M
15. A). i) Differentiate between text and binary files. 5M
ii) Write a C program to read and print the contents of a file. 5M
- OR**
15. B). Explain binary search method. Illustrate binary search on {2, 11, 15, 17, 19, 21, 25} and search for elements 24 and 17. 10M
