

LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034



B.Sc. DEGREE EXAMINATION – COMPUTER SCIENCE

FOURTH SEMESTER – APRIL 2023

UMT 4406 – MATHEMATICS FOR COMPUTER SCIENCE

Date: 04-05-2023

Dept. No.

Max. : 100 Marks

Time: 09:00 AM - 12:00 NOON

PART – A

Answer ALL the questions:

(10 × 2 = 20)

1. Define a column matrix.
2. Find determinant of $A = \begin{pmatrix} 1 & 2 \\ 2 & 3 \end{pmatrix}$.
3. What is a limit of a function?
4. Evaluate $\int (x^2 + 1)dx$.
5. Define solenoidal vector.
6. Determine the directional derivative of $\Phi = x + xy^2 + yz^3$ in the direction of the vector $2\vec{i} + 2\vec{j} - \vec{k}$ at $(0,1,1)$.
7. What is an ordinary differential equation?
8. Give the order and degree of the differential equation $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = 0$.
9. Define complete integral.
10. Solve $z = px + qy + pq$.

PART – B

Answer any FIVE of the following:

(5 × 8 = 40)

11. Find the eigen vectors of the matrix $A = \begin{pmatrix} 2 & -2 & 3 \\ 1 & 1 & 1 \\ 1 & 3 & 1 \end{pmatrix}$.
12. Verify Cayley Hamilton theorem for $A = \begin{pmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{pmatrix}$.
13. Evaluate $\int x^3 e^{-2x} dx$ using Bernoulli's formula.
14. Determine $\int_0^5 \int_0^1 (x + y) dx dy$ and $\int_0^a \int_0^b (x^2 + y^2) dx dy$.
15. Verify Green's theorem for $\int_C (x - 2y) dx + x dy$ where C is the circle $x^2 + y^2 = 1$.
16. Solve the equation $(D^2 - 5D + 6)y = e^{4x}$.
17. Find the solution of the equation $(D^2 + 4D + 5)y = x^3$.
18. Solve $p(1 + q^2) = q(z - 1)$.

PART - C

Answer any TWO of the following:

(2 × 20 = 40)

19. Diagonalize the matrix $A = \begin{pmatrix} 2 & -2 & 3 \\ 1 & 1 & 1 \\ 1 & 3 & 1 \end{pmatrix}$. (20)

20. a) Show that the matrix $A = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$ satisfies the equation $A^2 = -I$. Hence calculate the 16th power of $B = \begin{pmatrix} 1 & -1 \\ 1 & 1 \end{pmatrix}$.

b) Find the maxima and minima of the function $y = 2x^3 - 3x^2 - 36x + 10$. (12+8)

21. Given a vector-valued function $\vec{F} = (x^3 - yz)\vec{i} - 2x^2y\vec{j} + 2\vec{k}$, verify Gauss Divergence theorem for \vec{F} over the cube bounded by $x = 0, y = 0, z = 0, x = a, y = a, z = a$. (20)

22. a) Solve $x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} + y = \log x$.

b) Find the general solution of $x^2p + y^2q = (x + y)z$. (10+10)

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