



- KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE
- DON'T WRITE ANYTHING ON THE QUESTION PAPER

Answer ALL Questions

(10 X 10 = 100 Marks)

1. Determine the values of a and b for which the system $x + 2y + 3z = 6$, $x + 3y + 5z = 9$, $2x + 5y + az = b$ has (i) unique solution (ii) no solution. [10]
2. If $f(x) = 2x^3 + 3x^2 - 36x$, find the intervals on which is increasing or decreasing, and find the local maxima and local minimum values of $f(x)$. [10]
3. Find the area of the region in the first quadrant bounded by $y = 2\sqrt{x}$ and the lines $y = 2$ and $x = 0$. If the enclosed region is revolved about the x -axis, compute the volume of the solid so generated. [10]
4. Find the solution of $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 2y = 0$, $y(0) = 0$, $y'(0) = 1$. [10]
5. Find the length of the perpendicular from the point $(1, 2, 3)$ to the line $\frac{x-6}{3} = \frac{y-7}{2} = \frac{z-7}{-2}$. [10]
6. Find the shortest distance between the lines L_1 and L_2 whose vector equations are $\vec{r} = \vec{i} + \vec{j} + \lambda(2\vec{i} - \vec{j} + \vec{k})$ and $\vec{r} = 2\vec{i} + \vec{j} - \vec{k} + \mu(3\vec{i} - 5\vec{j} + 2\vec{k})$. [10]
7. A lot contains 10 good articles, 4 with minor defects and 2 with major defects. 2 articles are chosen from the lot at random (without replacement). Find the probability that (i) both are good (ii) both have major defects (iii) at least one is good (iv) at most one is good (v) exactly one is good. [10]
8. Find the solution of $x \frac{dy}{dx} = x^2 + 3y$; $x > 0$. [10]
- 9.a) (i) Show that $A = \begin{bmatrix} 5 & 3 \\ -1 & -2 \end{bmatrix}$ satisfies the equation $A^2 - 3A - 7I = 0$ and hence find A^{-1} . [10]

(ii) Find the rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \\ 3 & 1 & 2 \end{bmatrix}$.

OR

9.b) (i) Find the slope of the curve at $x^3 + y^3 - 9xy = 0$ the point $(2, 4)$. [10]

(ii) Obtain the Taylor series expansion of $f(x) = \ln(1+x)$ at $x = 0$.

10.a) Use partial fractions to evaluate $\int \frac{x^2+1}{x^2-5x+6} dx$. [10]

OR

10.b) (i) Find the truth value of $\sim q \Rightarrow (\sim p \vee \sim F)$. [10]

(ii) Determine whether the statement $[(p \vee q) \wedge (\neg p \vee r)] \rightarrow (q \vee r)$ is tautology or contradiction.

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