



S.NO	VSA(1Mark Each)
	Choose and write the correct option in the following questions:-
1	Let R be a relation on the set L of lines defined by $l_1 R l_2$ if l_1 is perpendicular to l_2 , then relation R is (a) reflexive and symmetric (b) symmetric and transitive (c) equivalence relation (d) symmetric
2	Which of the following corresponds to the principal value branch of $\tan^{-1}x$? (a) $(-\frac{\pi}{2}, \frac{\pi}{2})$ (b) $(-\frac{\pi}{2}, \frac{\pi}{2}) - \{0\}$ (c) $(0, \pi)$ (d) $[-\frac{\pi}{2}, \frac{\pi}{2}]$
3	If A is a square matrix such that $A^2 = I$, then $(A - I)^3 + (A + I)^3 - 7A$ is equal to (a) A (b) I - A (c) I + A (d) 3A
4	If $\begin{vmatrix} 2x & -1 \\ 4 & 2 \end{vmatrix} = \begin{vmatrix} 3 & 0 \\ 2 & 1 \end{vmatrix}$, then the value of x is (a) 3 (b) $\frac{2}{3}$ (c) $\frac{3}{2}$ (d) $-\frac{1}{4}$
5	The function $f(x) = [x]$, where $[x]$ denotes the greatest integer function, is continuous at (a) 4 (b) -2 (c) 1 (d) 1.5
6	The total revenue in rupees received from the sale of x units of an article is given by $R(x) = 3x^2 + 36x + 5$. The marginal revenue in rupees when $x = 15$ is (a) 126 (b) 116 (c) 96 (d) 90
7	The absolute maximum value of $y = x^3 - 3x + 2$ in $0 \leq x \leq 2$ is (a) 4 (b) 6 (c) 0 (d) 2
8	$\int_0^{\frac{\pi}{2}} \frac{dx}{1 + \sin x}$ is equal to (a) 0 (b) $\frac{1}{2}$ (c) $\frac{3}{2}$ (d) 1
9	The order of the differential equation of all the circles of given radius 4 is (a) 1 (b) 3 (c) 4 (d) 2
10	The area of the parallelogram whose one diagonal is $2\hat{i} + \hat{j} - 2\hat{k}$ and one side is $3\hat{i} + \hat{j} - \hat{k}$ is (a) $\hat{i} - 4\hat{j} - \hat{k}$ sq.units (b) $3\sqrt{2}$ sq.units (c) $6\sqrt{2}$ sq.units (d) 6 sq.units
	Solve the following questions:-
11	Find the position vector of the midpoint of the vector joining the points P(2, 3, 4) and Q(4, 1, -2).
12	A bag contains 5 red and 3 blue balls. If 3 balls are drawn at random without replacement, find the probability of getting exactly one red ball.
13	Differentiate $y = \log(\sec x + \tan x)$ w.r.t.x
14	If the line has direction ratios 2, -1, -2 determine its direction Cosines.
15	Verify that the function is a solution of the corresponding diff. equation. $y = x^2 + 2x + c$, $y^1 - 2x - 2 = 0$
16	If $f(a + b - x) = f(x)$, then, $\int_a^b f(x) dx = ?$
17	Find $\int \frac{\sqrt{\tan x}}{\sin x \cdot \cos x} dx$
18	If area of a triangle is 35 sq. units with vertices (2, -6), (5, 4) and (k, 4). Then find the value of k.

19	If the matrix A is both symmetric and skew symmetric, then what can you say about the matrix A?
20	Find :- $\sin(\tan^{-1}x)$
SA –SHORT ANSWER TYPE QUESTIONS (2 Marks Each)	
21	Prove that the relation R in R defined by $R = \{(a, b) : a \leq b^3\}$ is neither reflexive nor symmetric nor transitive.
22	What is the range of the function $f(x) = \frac{ x-1 }{(x-1)}$
23	Solve for x:- $2 \tan^{-1}(\cos x) = \tan^{-1}(2\operatorname{cosec}x)$
24	Find the values of x and y from the following equation: $2 \begin{bmatrix} x & 5 \\ 7 & y-3 \end{bmatrix} + \begin{bmatrix} 3 & -4 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 7 & 6 \\ 15 & 14 \end{bmatrix}$
25	Show that using properties of determinant $\begin{vmatrix} x & x^2 & yz \\ y & y^2 & zx \\ z & z^2 & xy \end{vmatrix} = (x-y)(y-z)(z-x)(xy+yz+zx)$
26	Find all points of discontinuity of f, where f is defined by $f(x) = \begin{cases} 2x+3, & \text{if } x \leq 2 \\ 2x-3, & \text{if } x > 2 \end{cases}$
27	Differentiate $\sin(\tan^{-1}e^{-x})$ with respect to x.
28	Show that the points A $(-2\hat{i} + 3\hat{j} + 5\hat{k})$, B $(\hat{i} + 2\hat{j} + 3\hat{k})$, C $(7\hat{i} - \hat{k})$ are collinear.
29	If $e^y(x+1) = 1$, show that $\frac{d^2y}{dx^2} = \left(\frac{dy}{dx}\right)^2$
30	Bag I contains 3 red and 4 black balls while another Bag II contains 5 red and 6 black balls. One ball is drawn at random from one of the bags and it is found to be red. Find the probability that it was drawn from Bag II.
LA-I LONG ANSWER TYPE QUESTIONS (4 Marks Each)	
31	Let $A = \mathbb{R} - \{3\}$ and $B = \mathbb{R} - \{1\}$. Consider the function $f: A \rightarrow B$ defined by $f(x) = \frac{(x-2)}{(x-3)}$. Show that f is one one onto and hence find f^{-1} .
32	Let * be a binary operation. Find the binary operation $a * b = a - b + ab$ is (a) Commutative (b) Associative
33	Prove that :- $\tan^{-1}\frac{1}{3} + \tan^{-1}\frac{1}{5} + \tan^{-1}\frac{1}{7} + \tan^{-1}\frac{1}{8} = \frac{\pi}{4}$
34	If $f(x) = \begin{bmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix}$, then show that $f(x).f(y) = f(x+y)$
35	Using cofactors of elements of third column, evaluate $\Delta = \begin{vmatrix} 1 & x & yz \\ 1 & y & zx \\ 1 & z & xy \end{vmatrix}$
36	If $x\sqrt{1+y} + y\sqrt{1+x} = 0$, prove that $\frac{dy}{dx} = -\frac{1}{(1+x)^2}$
37	Let $f: \mathbb{N} \rightarrow \mathbb{N}$ be defined by $f(n) = \begin{cases} \frac{n+1}{2}, & \text{if } n \text{ is odd} \\ \frac{n}{2}, & \text{if } n \text{ is even} \end{cases}$ for all $n \in \mathbb{N}$. Find whether the function f is bijective.
38	The volume of a cube is increasing at a rate of $9\text{cm}^3/\text{s}$. How fast is the surface area increasing when the length of an edge is 10cm ?
39	Evaluating the following:- $\int \frac{\sin^8 x - \cos^8 x}{1 - 2\sin^2 x \cos^2 x} dx$

40	Show that the lines $\frac{x-5}{7} = \frac{y+2}{-5} = \frac{z}{1}$ and $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$ are perpendicular to each other.
LA-II LONG ANSWER TYPE QUESTIONS (6 Marks Each)	
41	Using integration find the area bounded by the curves $(x-1)^2 + y^2 = 1$ and $x^2 + y^2 = 1$.
42	Find the particular solution of differential equation $(1+x^2)dy + 2xy dx = \cot x dx$
43	Find the equation of the line through the points A(3,4,1) and B (5, 1, 6) crosses the XY plane.
44	An aeroplane can carry a maximum of 200 passengers. A profit of Rs 1000 is made on each executive class ticket and a profit of Rs 600 is made on each economy class ticket. The airline reserves at least 20 seats for executive class. However, at least 4 times as many passengers prefer to travel by economy class than by the executive class. Determine how many tickets of each type must be sold in order to maximise the profit for the airline. What is the maximum profit?
45	In a factory which manufactures bolts. Machines A, B and C manufacture respectively 25%, 35% and 40% of the bolts. Of their output 5, 4 and 2 percent are respectively defective bolts. A bolt is drawn at random from the product and is found to be defective. What is the probability that it is manufactured by the machine B.
46	The cost of 4kg onion, 3kg wheat and 2kg rice is Rs. 60. The cost of 2kg onion, 4kg wheat and 6kg rice is Rs. 90. The cost of 6kg onion 2kg wheat and 3kg rice is Rs. 70. Find the cost of each item per kg by matrix method.
47	Find the intervals in which the function f given by $f(x) = \sin x + \cos x$, $0 \leq x \leq 2\pi$ is strictly increasing or decreasing.
48	If $\cos^{-1} \frac{x}{a} + \cos^{-1} \frac{y}{b} = \alpha$, prove that $\frac{x^2}{a^2} - \frac{2xy}{ab} \cos \alpha + \frac{y^2}{b^2} = \sin^2 \alpha$
49	Evaluate $\int_0^{\frac{\pi}{2}} \log \sin x dx$
50	Find the coordinates of the foot of the perpendicular and the perpendicular distance of the point P (3, 2, 1) from the plane $2x - y + z + 1 = 0$. Find also, the image of the point in the plane.