

SAMPLE PAPER-2015
CLASS-XII
SUBJECT- MATHEMATICS

Time : 3 Hours

M.M. 100

Instructions

- i) All questions are compulsory, there are three sections A, B and C.
- ii) This question paper consists of **29** questions.
- iii) Questions from 1 to 10 are of 01 marks each, questions from 11 to 22 are of 04 marks each and questions from 23 to 29 are of 06 marks each.

SECTION – A

1. Find the positive value of x if $[1 \ x] \begin{bmatrix} -1 \\ x \end{bmatrix} = 0$.
2. If $A = \begin{bmatrix} \cos x & \sin x \\ -\sin x & \cos x \end{bmatrix}$, find $A^T A$.
3. A matrix A of order 3 and $|A| = 8$. Find the value of $\left| \frac{A}{2} \right|$.
4. If $x = b \sin t$, $y = a \cos t$, then find $\frac{d^2 y}{dx^2}$.
5. Evaluate: $\int_{-\pi}^{\pi} \cos x \sin^{19} x \, dx$
6. Evaluate: $\int \frac{\sin^3 x + \cos^3 x}{\sin^2 x \cos^2 x} \, dx$
7. Write the order and degree of the differential equation $\left(\frac{d^3 y}{dx^3}\right)^2 - 3\left(\frac{d^2 y}{dx^2}\right)^3 + 2 = 0$
8. If $\vec{a} = \hat{i} + \hat{j}$, $\vec{b} = \hat{j} + \hat{k}$ find a vector which is perpendicular to both \vec{a} and \vec{b} .
9. If f and g are function on R such that $f(x) = \sin x$ and $g(x) = x^2$, find of $\left(\frac{\pi}{2}\right)$
10. Find the value of $\sin^{-1}\left(\frac{\sin x + \cos x}{\sqrt{2}}\right)$

SECTION-B

11. Simplify: $\tan^{-1}\left(\frac{\cos x}{1 - \sin x}\right)$

12. If $A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$, then find $A^2 - 5A + 6I$

OR

Using properties of determinants, prove:

$$\begin{vmatrix} 1 + a^2 - b^2 & 2ab & -2b \\ 2ab & 1 + b^2 - a^2 & 2a \\ 2b & -2a & 1 - a^2 - b^2 \end{vmatrix} = (1 + a^2 + b^2)^3$$

13. Find the points on the curve $\frac{x^2}{9} + \frac{y^2}{16} = 1$ at which the tangents are parallel to x-axis.

14. Find the approximate value $\sqrt{25.8}$ by using differentiation.

15. If $y = \cot^{-1}\left(\frac{\sqrt{1+x} + \sqrt{1-x}}{\sqrt{1+x} - \sqrt{1-x}}\right)$, find $\frac{dy}{dx}$.

OR

$$\begin{cases} \frac{\lambda \cos x}{\pi - 2x} & \text{if } x \neq \frac{\pi}{2} \\ 3, & \text{if } x = \frac{\pi}{2} \end{cases}$$

Find the value of λ , so that the function $f(x) =$

is continuous at $x = \frac{\pi}{2}$.

16. Evaluate: $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx$

17. Evaluate: $\int \frac{e^x}{\sqrt{5 - 4e^x - e^{2x}}} dx$.

18. $\vec{a} = \lambda \hat{i} + 2 \hat{j} - 3 \hat{k}$ and $\vec{b} = 3 \hat{i} - \hat{j} + 2 \hat{k}$, find the value of λ if $\vec{a} + \vec{b}$ is perpendicular to $\vec{a} - \vec{b}$.

OR

Find the area of the triangle with position vectors of the vertices $\hat{i} + \hat{j}$, $\hat{i} + 2\hat{j} - 3\hat{k}$ and $4\hat{i} + 3\hat{j} + \hat{k}$.

19. Evaluate: Evaluate: $\int_0^{\pi} \frac{x \tan x}{\sec x + \tan x} dx$

20. Solve the differential equation: $(x + y) dy + (x - y) dx = 0$

OR

Solve the differential equation: $\cos x \frac{dy}{dx} + y = \sin x$

21. Check whether the relation R on R defined by $R = \{(a,b) : a \leq b^3\}$ is reflexive, symmetric or transitive.
22. Two dice are thrown simultaneously. Let x denote the number of sixes. Find the probability distribution of x. Also find the mean and variance of x.

SECTION – C

23. In a bulb factory, machines A, B and C manufacture 60%, 30% and 10% bulbs respectively. 1%, 2% and 3% of the bulbs produced respectively by A, B and C are found to be defective. A bulb is picked up at random from the total production and found to be defective. Find the probability that, this bulb was produced by the machine A.
24. A window has the shape of a rectangle surrounded by a semicircle. If the perimeter of the window is 10 unit, then find its dimension in order that the area may be maximum.

OR

Show that a closed right circular cylinder of given total surface area and maximum volume is such that its height is equal to diameter of its base.

25. If $A = \begin{bmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & 0 & 1 \\ 9 & 2 & -3 \\ 6 & 1 & -2 \end{bmatrix}$, find AB.

By using its product solve: $x - y + 2z = 1$, $2y - 3z = 1$, $3x - 2y + 4z = 2$

26. Using integration find the area lying above x-axis and included between the circle $x^2 + y^2 = 8x$ and $y = 4x^2$

OR

Find the value of $\int_1^3 (x^2 + x) dx$ by using limit sum

27. Find the equation of the plane passing through the point (-1, 3, 2) and perpendicular to the planes $x + 2y + 3z = 5$ and $3x + 3y + z = 0$
28. Find the shortest distance between the lines, $\vec{r} = (\hat{i} + \hat{j}) + \lambda (\hat{i} + 2\hat{j} - \hat{k})$ and $\vec{r} = (\hat{i} + \hat{j}) + \mu (-\hat{i} + \hat{j} - 2\hat{k})$.

OR Find the vector equation of a plane passing through the intersection of the planes

$\vec{r} \cdot (\hat{i} + \hat{j} + \hat{k}) = 6$ and $\vec{r} \cdot (2\hat{i} + 3\hat{j} + 4\hat{k}) = -5$ and the point (1, 1, 1)

29. A man has Rs.1500 for purchase of rice and wheat. A bag of rice costs Rs.180 and a bag of wheat costs Rs.120. He has storage capacity of 10 bags only. He earns a profit of Rs.11 and

Rs.9 per bag of rice and wheat, respectively. Formulate an L.P.P to maximize the profit and find the maximum profit.

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