

CLASS XII SAMPLE PAPER MATHS

THE VELAMMAL INTERNATIONAL SCHOOL

SECTION – A (10 X 1 = 10 MARKS)

1. Let $A = \{1, 2, 3\}$. Then write the number of equivalence relations containing $(1, 2)$.
2. Find the value of $\sin\left(\frac{\pi}{3} - \sin^{-1}\left(-\frac{1}{2}\right)\right)$
3. If A is a square matrix of order 4 such that $|\text{adj}A| = 256$. Find $|A^T|$.
4. Find the values of k so that $\begin{pmatrix} 5 & 3 \\ x & 2 \end{pmatrix}$ is not singular.
5. If A is of order 3×4 and BA is of order 2×4 , then find the order of B .
6. Evaluate $\int_{-\pi}^{\pi} \sin^7 x \, dx$
7. $\int \sin^3 x \, dx$
8. Find the angle between the vectors $3\vec{i} - 2\vec{j} + 6\vec{k}$ and $4\vec{i} - \vec{j} + 8\vec{k}$.
9. \vec{a} and \vec{b} are two unit vectors and θ is the angle between them, then find the condition for $\vec{a} + \vec{b}$ to be a unit vector.
10. If a line makes $45^\circ, 60^\circ$, with positive direction of x -axis x, y then find the angle made by it with the z axis.

SECTION – B (12 X 4 = 48 MARKS)

11. Show that the relation R defined by $(a,b) R (c,d) \Rightarrow a+d = b+c$ on the set $N \times N$ is an equivalence relation.
12. Prove that $\tan^{-1}\frac{1}{5} + \tan^{-1}\frac{1}{7} + \tan^{-1}\frac{1}{3} + \tan^{-1}\frac{1}{8} = \frac{\pi}{4}$,
13. If $A = \begin{pmatrix} 0 & 6 & 7 \\ -6 & 0 & 8 \\ 7 & -8 & 0 \end{pmatrix}$, $B = \begin{pmatrix} 0 & 1 & 1 \\ 1 & 0 & 2 \\ 1 & 2 & 0 \end{pmatrix}$, $C = \begin{pmatrix} 2 \\ -2 \\ 3 \end{pmatrix}$ Calculate AC, BC and $(A+B)C$. Also verify that $(A+B)C = AC + BC$

14. Find a and b so that $f(x) = \begin{cases} x + a\sqrt{2} \sin x, & \text{if } 0 \leq x < \frac{\pi}{4} \\ 2x \cot x + b, & \text{if } \frac{\pi}{4} \leq x < \frac{\pi}{2} \\ a \cos 2x - b \sin x, & \text{if } \frac{\pi}{2} \leq x < \pi \end{cases}$ is continuous on $[0, \pi]$

15. If $x = a(\cos \theta + \theta \sin \theta)$, $y = a(\sin \theta - \theta \cos \theta)$, find $\frac{d^2y}{dx^2}$ (OR)

If $x = \sin t$, $y = \sin pt$. Show that $(1 - x^2) \frac{d^2y}{dx^2} - x \frac{dy}{dx} + p^2 y = 0$

16. Show that the curves $4x = y^2$ and $4xy = k$ cut at right angles if $k^2 = 512$.

17. Evaluate $\int_0^{\pi/2} [2 \log(\sin x) - \log(\sin 2x)] dx$ (OR) $\int \left(\frac{2 + \sin 2x}{1 + \cos 2x} \right) e^x dx$

18. Evaluate $\int_0^{\pi/2} \frac{\sin x - \cos x}{1 + \sin x \cos x} dx$ (OR) $\int \frac{(x^2 + 1)(x^2 + 2)}{(x^2 + 3)(x^2 + 4)} dx$

19. Solve $\frac{dy}{dx} + \frac{y}{(1-x^2)^{3/2}} = \frac{x + \sqrt{1+x^2}}{(1-x^2)^2}$

20. If \vec{a} is a unit vector and $(\vec{x} - \vec{a}) \cdot (\vec{x} + \vec{a}) = 8$, then find $|\vec{x}|$.

21. Find the vector and Cartesian equation of the plane passing through the points A(0,0,0) and B(3,-1,2) and is parallel to the line $\frac{x-4}{1} = \frac{y+3}{-4} = \frac{z+1}{7}$.

22. Three white balls and five black balls are placed in a bag, and three men draw a ball in succession (without replacement) until a white ball is drawn. Show that their respective chances are 27:18:11.

SECTION – C (7 X 6 = 42 MARKS)

23. $A = \begin{bmatrix} 2 & 3 & 1 \\ -3 & 2 & 1 \\ 5 & -4 & -2 \end{bmatrix}$. Verify that $A^3 - 6A^2 + 9A - 4I = O$. Hence find A^{-1} .

24. A water tank has the shape of an inverted right circular cone with its axis vertical and vertex lowermost. Its radius is 14m and height is 7m. Water is discharged at a rate of 5 cubic metre per hour. Find the rate at which the level of the water is falling at the instant when the depth of water in the tank is 4 m.

25. Find the area of the region in the first quadrant enclosed by the x-axis, the line $y = x$ and the circle $x^2 + y^2 = 32$

26. Solve $\frac{xdx + ydy}{xdy - ydx} = \sqrt{\frac{a^2 - x^2 - y^2}{x^2 + y^2}}$
27. Find the equation of a line passing through (2,-1,3) and perpendicular to the line $\vec{r} = (\vec{i} + \vec{j} - \vec{k}) + \lambda(2\vec{i} - 2\vec{j} + \vec{k})$ and also perpendicular to the line joining the points (2,-1,-3) and (3,1,-1)
28. Ten eggs are drawn successively, with replacement, from a lot containing 10% defective eggs. Find the probability that there is at least one defective egg.
29. If a young man rides his motorcycle at 25km/hr, he had to spend Rs.2 per km on petrol. If he rides at a faster speed of 40km/hr, the petrol cost increases at 5 per km. He has Rs.100 to spend on petrol and wishes to find what is the maximum distance, he can travel in one hour. Express this as an LPP and solve it graphically.

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