

SAMPLE PAPER-2015
Subject: MATHEMATICS
Class-XII

Time Allowed: 3 Hours **Maximum Marks: 100**

Topic Covered: Complete Syllabus PAPER CODE:

CS-A

General Instructions:

- (i) All the questions are compulsory.
- (ii) This question paper consists of **29** questions divided into three sections **A, B** and **C**.
- (iii) Section **A** comprises of **10** questions of **one mark** each.
- (iv) Section **B** comprises of **12** questions of **four marks** each.
- (v) Section **C** comprises of **7** questions of **six marks** each.

SECTION-A

1. If $\sin\left(\sin^{-1}\frac{1}{5} + \cos^{-1}x\right) = 1$, then find x .
2. Evaluate the principle value of $\sin^{-1}\left(-\frac{1}{2}\right)$.
3. For what value of x , the matrix $\begin{bmatrix} 6-x & 4 \\ 3-x & 1 \end{bmatrix}$ is singular?
4. If $\begin{bmatrix} x & x-6 \\ 2x+y & 7 \end{bmatrix} = \begin{bmatrix} 3 & 1 \\ 8 & 7 \end{bmatrix}$, then find value of y .
5. A matrix of order 3×3 is such that $|A|=4$, find the value of $|2A|$.
6. Differentiate: $\sin x^\circ$ with respect to x .
7. Write the order and degree of the differential equations: $xy \frac{d^2y}{dx^2} + x \left(\frac{dy}{dx}\right)^2 - y \frac{dy}{dx} = 0$.
8. If A, B, C are vertices of triangle ABC, what is the value of $\vec{AB} + \vec{BC} + \vec{CA}$.
9. Find a unit vector in the direction of $\vec{a} = 2\hat{i} - 3\hat{j} + 6\hat{k}$.
10. If the equation of line AB are $\frac{3-x}{1} = \frac{y+2}{-2} = \frac{z-5}{4}$. Write the direction ratio of line parallel to AB.

SECTION-B

11. If $f: \mathbb{R} \rightarrow \mathbb{R}$ be a function defined by $f(x) = 4x^3 + 7$, show that 'f' is bijective.
12. Prove that $2\tan^{-1}\frac{3}{4} - \tan^{-1}\frac{17}{31} = \frac{\pi}{4}$.

OR

Solve for x : $\tan^{-1}\left(\frac{2x}{1-x^2}\right) + \cot^{-1}\left(\frac{1-x^2}{2x}\right) = \frac{\pi}{3}$.

13. Using properties of determinants, prove the following :

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

14. Discuss the continuity of the function $f(x)$ at $x = \frac{1}{2}$, when $f(x)$ is defined as follow:

$$f(x) = \begin{cases} \frac{1}{2} + x, & 0 \leq x < \frac{1}{2} \\ 1, & x = \frac{1}{2} \\ \frac{3}{2} + x, & \frac{1}{2} < x \leq 1 \end{cases}$$

15. If $x\sqrt{1+y} + y\sqrt{1+x} = 0$ then prove that $\frac{dy}{dx} = -\frac{1}{(1+x)^2}$.

OR

If $x = a(\cos t + \log \tan t/2)$ and $y = a \sin t$, find $\frac{dy}{dx}$.

16. Find $\frac{d}{dx} \left(\cot^{-1} \left[\frac{\sqrt{1+\sin x} + \sqrt{1-\sin x}}{\sqrt{1+\sin x} - \sqrt{1-\sin x}} \right] \right)$.

17. Evaluate $\int \frac{\sin x - \cos x}{\sqrt{\sin 2x}} dx$. **OR** Evaluate $\int_0^\pi \frac{x \sin x}{1 + \cos^2 x} dx$.

18. Find $\int \frac{1}{\sqrt{\sin^3 x \sin(x+\alpha)}} dx$.

19. Show that $\int_0^a f(x)g(x)dx = 2 \int_0^a f(x)dx$, if f and g are defined as $f(x) = f(a-x)$ and $g(x) + g(a-x) = 4$.

20. If $\vec{a}, \vec{b}, \vec{c}$ are three mutually perpendicular vector of equal magnitude, show that $\vec{a} + \vec{b} + \vec{c}$ is equally inclined to $\vec{a}, \vec{b}, \vec{c}$. Also find the angle.

21. Find the perpendicular distance of the point $(1,0,0)$ from the line $\frac{x-1}{2} = \frac{y+1}{-3} = \frac{z+10}{8}$. Also find the co-ordinates of the foot of the perpendicular and the equation of the perpendicular.

22. Two cards are drawn successively with replacement from well shuffled deck of 52 cards. Find the probability distribution of the number of aces.

SECTION-C

23. If $A = \begin{bmatrix} 3 & -4 & 2 \\ 2 & 3 & 5 \\ 1 & 0 & 1 \end{bmatrix}$, find A^{-1} and hence solve the following system of equations $3x - 4y + 2z = -1$, $2x + 3y + 5z = 7$ and $x + z = 2$.

24. Show that right circular cylinder of given volume, open at the top has minimum total surface area if its height is equal to the radius of base.

25. Find the area of region given by $\{(x, y): x^2 \leq y \leq |x|\}$.

OR

Using integration, find the area of triangle whose vertices are $A(2,5)$, $B(4,7)$ and $C(6,2)$.

26. In a bank, principal increases continuously at the rate of 5% per year. An amount of Rs 1000 is deposited with this bank, how much will it worth after 10 years ($e^{0.5} = 1.648$).

27. Find the equation of plane passing through the point $(1,2,1)$ and perpendicular to the line joining points $(1,4,2)$ and $(2,3,5)$. Also find the co-ordinates of foot of perpendicular of the point $(4,0,3)$ from the above found plane.

28. A dietician wishes to mix two types of foods in such a way that the vitamin contents of mixture contains at least 8 units of vitamin A and 10 units of units of vitamin C. Food I contains 2 units per k.g. of vitamin A and one unit of per k.g of vitamin C. Food II contains 1 unit per k.g. of vitamin A and two unit per k.g. of vitamin C. It costs Rs 50 per k.g. to purchase food I and Rs 70 per k.g. to

purchase food II .Formulate the problem as L.P.P to minimize the cost of such mixture and find the minimum cost graphically.

29. Of the students in college, it is known that 60% resides in hostel and 40% are day scholars. Previous year result report that 30% of student residing in the hostel attain A grade and 20% of day scholars attain A grade in the examination at the end of the year , one student is chosen at random in the college and he has an A grade. What is the probability that selected is a hostler.

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