

# CLASS XII SAMPLE PAPER MATHEMATICS

**Time : 3 Hours**

**Max. Marks : 100**

**SECTION – A**

**10x1=10**

1. Find the domain of the function  $e^{3\log x}$ .
2. Find a branch of the function  $\cos^{-1}$  other than the principal value branch.
3. If A is a 3x3 matrix such that  $|A|=5$  then what is  $|\text{adj}A|$  ?
4. What is the minimum value of  $|\sin 4x + 3|$  ?
5. Write square matrices A and B of order 2 such that  $AB=0$ ,  $A \neq 0$  and  $B \neq 0$ .
6. If  $\vec{a}$  and  $\vec{b}$  are any two vectors such that  $|\vec{a} \cdot \vec{b}| = |\vec{a} \times \vec{b}|$  then what is the angle between  $\vec{a}$  and  $\vec{b}$ ?
7. If the lines  $\frac{x-1}{3} = \frac{y}{3k} = \frac{z+2}{1}$  and  $\frac{x+1}{2k} = \frac{y+5}{1} = \frac{z-2}{-3}$  are perpendicular then find the value of k.
8. Write the value of  $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin^{25} x \, dx$
9. If  $\vec{a}$  and  $\vec{b}$  are unit vectors such that  $|\vec{a} + \vec{b}| = 1$  then what is  $|\vec{a} - \vec{b}|$ ?
10. If A is a square matrix of order 3 such that  $|A| = 4$  then find  $A(\text{adj}A)$ .

**Section B**

**12x4=48**

11. Prove that the function  $f: \mathbb{R} \rightarrow \mathbb{R}$  defined as  $f(x) = 2x-3$  is invertible

12. Show that  $\sin^{-1} \frac{12}{13} + \cos^{-1} \frac{4}{5} + \tan^{-1} \frac{63}{16} = \pi$

13. Using the properties of determinant show that

$$\begin{vmatrix} x+y+2z & x & y \\ z & y+z+2x & y \\ z & x & z+x+2y \end{vmatrix} = 2(x+y+z)^3$$

Q.14. Differentiate  $x^{\sin x} + \sin x^{\cos x}$

OR

If  $x = \sqrt{a} \sin^{-1} t$ ,  $y = \sqrt{a} \cos^{-1} t$  show that  $dy/dx = -y/x$

15. Find the intervals in which the function  $f$  given by  $f(x) = \sin x + \cos x$ ,  $0 \leq x \leq 2\pi$

16. Show that the lines  $x+3/-3 = y-1/1 = z-5/5$  and  $x+1/-1 = y-2/2 = z-5/5$  are Coplanar

OR

Find the angle between the line  $x+1/2 = y/3 = z-3/6$  and the plane  $10x+2y-11z=3$

17. Find the  $\int \frac{x+2}{2x^2+6x+5} dx$  OR

$$\text{Find } \int (3 \sin \theta - 2) \cos \theta / (5 - \cos^2 \theta - 4 \sin \theta) d\theta$$

18. Evaluate  $\int (x^2 + 1) e^x / (x+1)^2 dx$

Q.19. Two cards are drawn simultaneously without replacement from a well shuffled pack of 52 cards. Find the mean, variance, and standard deviation of the number of kings.

Q.20. Obtain the inverses of the following matrix using elementary operations

$$A = \begin{pmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{pmatrix}$$

21. Find the general solution of the differential equation  $y dx - (x+2y^2) dy = 0$

22. Find the particular solution of the differential equation  $dy/dx = -4xy^2$  Given that  $y=1$  when  $x=0$ .

OR

Find the particular solution of the differential equation  $x^2 dy + (xy + y^2) dx = 0$  Given that  $y=1$  when  $x=1$

**SECTION-C**

**7x6=42**

23. Find  $A^{-1}$  where  $A = \begin{bmatrix} 2 & 3 & 10 \\ 4 & -6 & 5 \\ 6 & 9 & -20 \end{bmatrix}$

Using  $A^{-1}$ , solve the following system of equations

$$\frac{4}{x} - \frac{6}{y} + 5z = 1$$

$$\frac{2}{x} + \frac{3}{y} + 10z = 4$$

$$\frac{6}{x} + \frac{9}{y} - 20z = 2$$

24. Find the local maxima and local minima of  $\sin^4 x + \cos^4 x$ ,  $0 < x < \pi/2$ .

OR

Show that the semi vertical angle of right circular cone of given surface area and maximum

volume is  $\sin^{-1} \frac{1}{3}$ .

25. Solve the initial value problem :

$$(x + y)dy + (x - y)dx = 0, y = 1 \text{ when } x = 1.$$

26. Sketch the graph of the region

$$\{(x,y) : 0 \leq y \leq x^2 + 3; 0 \leq y \leq 2x + 3; 0 \leq x \leq 3\}$$

Also find the area of the region using integration.

27. Let the number of times a candidate applies for a job be  $X$  and  $P(X=x)$  denotes the probability that he will be selected  $x$  times. Given that

$$P(X=x) = \begin{cases} (k+1)x, & \text{if } x = 0 \\ 2kx, & \text{if } x=1 \text{ or } 2 \\ k(6-x), & \text{if } x = 3 \text{ or } 4 \text{ or } 5 \\ - & \end{cases}$$

where  $k$  is a +ve real number.

- Find the value of  $k$ .
- What is the probability that he will be selected exactly three times.
- What is the probability that he will be selected atleast once.
- Find the mean and variance of the probability distribution of  $X$ .

OR

In a hostel 60% of the students read Hindi newspaper, 10% read English newspaper and 20% read both. A student is selected at random..

- Find the probability that she reads neither Hindi nor English newspapers.
- If she reads Hindi newspaper, find the probability that she reads English newspaper.
- If she reads English newspaper, find the probability that she reads Hindi newspaper.

28. Find the vector equation of the line passing through the point  $(1,2,-4)$  and perpendicular to the two lines

$$\frac{x-8}{3} = \frac{y+19}{-16} = \frac{z-10}{7} \text{ and}$$

$$\frac{x-15}{3} = \frac{y-29}{8} = \frac{z-5}{-5}.$$

29. A diet for a sick person must contain atleast 4000 units of vitamins, 50 units of minerals and 1400 units of calories. Two foods A and B are available at a cost of Rs4 and Rs3 per unit, respectively. If one unit of A contains 200 units of vitamin, 1 unit of mineral and 40 units of calories, one unit of B contains 100 units of vitamin, 2 units of minerals and 40 units of calories, find what combination of foods should be used to have the least cost?

M.A.CHAUHAN(MUSA SIR)

Mob.7500943454