

# CLASS XII

## SAMPLE PAPER

### MATHS

**TIME: 3 HRS**

**MAX. MARKS: 100**

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#### **GENERAL INSTRUCTIONS:**

- 1 All questions are compulsory
  - 2 Section-A, each question carries 1 mark. (10×1=10)
  - 3 Section-B, each question carries 4 marks. (12×04=48)
  - 4 Section-C, each question carries 6 marks. (7×06=42)
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#### **SECTION A**

1. If  $f(x) = |x|$  and  $g(x) = |5x - 2|$ , then find  $f \circ g$ .
2. simplify  $\sin^{-1}(\sin 10)$ .
3. If A is a square matrix of order  $3 \times 3$  and  $|A| = 4$  find  $|\text{adj } A|$ .
4. If  $A = \begin{bmatrix} 2 & 3 \\ x & 6 \end{bmatrix}$  is a singular matrix. Find the value of  $x$ .
5. Evaluate  $\int e^x \left( \frac{1}{x} - \frac{1}{x^2} \right) dx$ .
6. If  $a * b = ab - 3$  then find  $3 * 4$ .
7. Find a vector in the direction of vector  $i-2j$  that has magnitude 7 units.
8. find the shortest distance between two lines  $\frac{x}{1} = \frac{y}{0} = \frac{z}{0}$  and  $\frac{x}{0} = \frac{y}{1} = \frac{z}{0}$ .

9. Write the degree and order of the differential equation

$$y = x \frac{dy}{dx} + 2 \left(1 + \frac{d^2y}{dx^2}\right)^{\frac{1}{2}}.$$

10. If a line makes angles

$90^\circ$ ,  $60^\circ$  and  $30^\circ$  with the positive direction of  $x$ ,  $y$  and  $z$  axis, find

Its Direction Cosine.

### SECTION B

11. Let  $A = N \times N$  and ' $*$ ' be a binary operation on  $A$  defined by  $(a, b) * (c, d) = (a + c, b + d)$  show that  $*$  is commutative and associative. find identity element for  $*$  on  $A$ , if any.

12. Prove that  $\tan^{-1} \left( \frac{\sqrt{1+x^2} + \sqrt{1-x^2}}{\sqrt{1+x^2} - \sqrt{1-x^2}} \right) = \frac{\pi}{4} + \frac{1}{2} \cos^{-1} x^2$ .

**Or**

Prove that

$$\tan^{-1} \left( \frac{1}{4} \right) + \tan^{-1} \left( \frac{2}{9} \right) = \frac{1}{2} \cos^{-1} \left( \frac{3}{5} \right)$$

13. Let  $T$  be the set of all triangles in a plane with  $R$  a relation in  $T$  given by

$R = \{(T_1, T_2) : T_1 \text{ is congruent to } T_2\}$ . Show that  $R$  is an equivalence relation.

14. For what value of **a** and **b**, the function  $f$  defined as:

$$f(x) = \begin{cases} 3a x + b, & \text{if } x < 1 \\ 11, & \text{if } x = 1 \\ 5a x - 2b, & \text{if } x > 1 \end{cases} \text{ is continuous at } x = 1.$$

15. Find  $\frac{dy}{dx}$  if  $x = a \left( \cos t + \log \tan \frac{t}{2} \right)$ ,  $y = a \sin t$ .

**Or**

If  $y = x^{\cos x} + \sin x^{\cos x}$  find  $\frac{dy}{dx}$ .

16. Evaluate  $\int \frac{2x+3}{2x^2-3x-2} dx$ .

**Or**

Evaluate  $\int_0^{\frac{\pi}{2}} \log \sin x dx$

17. find the intervals in which the following function is strictly increasing or strictly decreasing

$$F(x) = 20 - 9x + 6x^2 - x^3.$$

**Or.**

For the curve  $y = 4x^2 - 2x^5$ , find all the points which the tangent passes through the origin.

18. Form the differential equation of the family of circles having radii 3 units.

19. Solve

$$(x + y + 1) \frac{dy}{dx} = 1.$$

20. Find a unit vector perpendicular to each of the vector  $\vec{a} + \vec{b}$  and  $\vec{a} - \vec{b}$ , where  $\vec{a} = 3\hat{i} + 2\hat{j} + 2\hat{k}$  and  $\vec{b} = \hat{i} + 2\hat{j} - 2\hat{k}$ .

21. find the equation of line of the shortest distance between two lines  $\frac{x-8}{3} = \frac{y+9}{-16} = \frac{z-10}{9}$  and  $\frac{x-15}{3} = \frac{y-29}{8} = \frac{5-z}{5}$ .

22. Three balls are drawn one by one without replacement from a bag containing five white balls and four green balls. Find the probability distribution of no. of green balls drawn.

### SECTION-C

23. If  $A = \begin{bmatrix} 2 & 1 & 3 \\ 4 & -1 & 0 \\ -7 & 2 & 1 \end{bmatrix}$ , Find  $A^{-1}$  & hence solve the following system of equations.

$$2x + y + 3z = 3$$

$$4x - y = 3, \quad -7x + 2y + z = 2$$

**Or**

Using elementary transformations, find the inverse of the matrix.

$$\begin{bmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix}$$

24. If the length of three sides of a trapezium other than the base are equal to 10cm each then find the area of trapezium when it is maximum.

25. Find the area bounded by the curves  $x^2 + y^2 = 4$  &  $(x - 2)^2 + y^2 = 1$  by using integration.

26. Evaluate  $\int_1^2 (x^2 + x + 2) dx$  as a limit of sums.

**Or**

Evaluate  $\int_{-1}^3 |x \sin(\pi x)| dx$ .

27. Find the co-ordinates of the foot of the perpendicular and the perpendicular distance of the point (1,3,4) from the plane  $2x - y + z + 3 = 0$ . Also find the image of the point in the plane.

28. Two tailors A & B earns Rs. 150 & Rs. 200 per day respectively. 'A' can stitch 6 shirts and 4 pants per day, while B can stitch 10 shirts & 4 pants per day. How many days shall each of them work, if it is desired to produce at least 60 shirts & 32 pants at a minimum labor Cost? Solve the problem graphically.

29. In a factory which manufactures bolts machines A,B & C manufacture respectively 25%, 35% & 40% of the bolts. Of their outputs 5%, 4% & 2% are respectively defective bolts. A bolt is drawn at random from the product and it is found to be defective. A) What is the probability that it is manufactured by the machine B ? B) Find the probability that it is manufactured by either A or C .