

FMM

11 - Std

Time : 1.30 HR

# FIRST MID - TERM TEST - 2024

## MATHEMATICS

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MARKS: 45

## PART - I

Note : i) Choose the correct answer .

10 × 1 = 10

- If  $A = \{(x, y) : y = \sin x, x \in \mathbb{R}\}$  and  $B = \{(x, y) : y = \cos x, x \in \mathbb{R}\}$  then  $A \cap B$  contains
  - no element
  - infinitely many elements
  - only one element
  - cannot be determined
- The number of students who take both the subjects Mathematics and Chemistry is 70. This represents 10% of the enrollment in Mathematics and 14% of the enrollment in Chemistry. The number of students take atleast one of these two subjects, is
  - 1120
  - 1130
  - 1100
  - insufficient data
- For non-empty sets A and B, if  $A \subset B$  then  $(A \times B) \cap (B \times A)$  is equal to
  - $A \cap B$
  - $A \times A$
  - $B \times B$
  - none of these
- The function  $f: \mathbb{R} \rightarrow \mathbb{R}$  is defined by  $f(x) = \sin x + \cos x$  is
  - an odd function
  - neither an odd function nor an even function
  - an even function
  - both odd function and even function
- If the set  $A = \{1, 2, 3\}$  is defined on the function  $R = \{(1, 2), (2, 1)\}$ , then R is
  - reflexive
  - symmetric
  - transitive
  - equivalence
- Given that  $x, y$  and  $b$  are real numbers  $x < y, b > 0$ , then
  - $xb < yb$
  - $xb > yb$
  - $xb \leq yb$
  - $\frac{x}{b} \geq \frac{y}{b}$
- The value of  $\log_a b \log_b c \log_c a$  is
  - 2
  - 1
  - 3
  - 4
- If  $a$  and  $b$  are the roots of the equation  $x^2 - kx + 16 = 0$  and satisfy  $a^2 + b^2 = 32$ , then the value of  $k$  is
  - 10
  - 8
  - 8, 8
  - 6
- The number of roots of  $(x + 3)^4 + (x + 5)^4 = 16$  is
  - 4
  - 2
  - 3
  - 0
- The number of
  - a integers
  - rational numbers
  - irrational numbers
  - a prime number



d) one who plays bridge

## PART - II

Note : i) Answer any Three questions.

3 × 2 =

ii) Question number 15 is compulsory.

11. If  $A = \{1, 2, 3, 4\}$  and  $B = \{3, 4, 5, 6\}$ , find  $n((A \cup B) \times (A \cap B) \times (A \Delta B))$ .
12. If  $n(A \cap B) = 3$  and  $n(A \cup B) = 10$ , then find  $n(\rho(A \Delta B))$ .
13. Solve  $|2x - 17| = 3$  for  $x$ .
14. Rationalize the denominator of  $\frac{\sqrt{5}}{(\sqrt{5} + \sqrt{2})}$ .
15. Let  $f, g : \mathbb{R} \rightarrow \mathbb{R}$  be defined as  $f(x) = \sin x$  and  $g(x) = x^2$ . Find  $f \circ g$ .

## PART - III

Note : i) Answer any Three questions

3 × 3 =

ii) Question number 20 is compulsory.

16. Find the range of the function  $f(x) = \frac{1}{1 - 3\cos x}$ .
17. Check the relation  $R = \{(1,1), (2,2), (3,3), \dots, (n,n)\}$  defined on the set  $S = \{1, 2, 3, \dots, n\}$  for the three basic relations.
18. Solve the equation  $\sqrt{6 - 4x - x^2} = x + 4$ .
19. Find the number of solutions of  $x^2 + |x - 1| = 1$ .
20. Solve  $\frac{1}{|x| - 3} < \frac{1}{2}$ .

## PART-IV

Note : i) Answer all the questions.

4 × 5 =

21. a) In the set  $Z$  of integers, define  $mRn$  if  $m - n$  is a multiple of 1. Prove that  $R$  is an equivalence relation.

(OR) Resolve into partial fractions :  $\frac{x+1}{x^2(x-1)}$ .

22. a) If  $f: \mathbb{R} \rightarrow \mathbb{R}$  is defined by  $f(x) = 2x - 3$  prove that  $f$  is a bijection and find its inverse. (OR)

a) Solve  $\frac{x+1}{x+3} < 3$ .

23. a) Write the values of  $f$  at  $-3, 5, 2, -1, 0$  if

$$f(x) = \begin{cases} x^2 + x - 5, & \text{if } x \in (-\infty, 0) \\ x^2 + 3x - 2, & \text{if } x \in (3, \infty) \\ x^2, & \text{if } x \in (0, 2) \\ x^2 - 3, & \text{other wise} \end{cases}$$

(OR) b) If  $a^2 + b^2 = 7ab$ , show that  $\log \frac{a+b}{3} = \frac{1}{2} (\log a + \log b)$ .

24. a) Let  $f, g : \mathbb{R} \rightarrow \mathbb{R}$  be defined as  $f(x) = 2x - |x|$  and  $g(x) = 2x + |x|$ . Find  $f \circ g$ . (OR) b) If one root of  $k(x - 1)^2 = 5$  is double the other root, show that  $k = 2$  or  $k = -25$ .