

## FIRST MIDTERM TEST AUGUST 2024

11 TH STANDARD  
MATHEMATICS

Reg.No

Marks : 45

ME : 1.30 Hrs

## I. Choose the best answer

10x1=10

1. If  $A = \{(x, y) : y = e^x, x \in \mathbb{R}\}$  and  $B = \{(x, y) : y = e^{-x}, x \in \mathbb{R}\}$  then  $n(A \cap B)$  is  
(1) Infinity (2) 0 (3) 1 (4) 2
2. The range of the function  $f(x) = ||x| - x|, x \in \mathbb{R}$  is  
(1)  $[0, 1]$  (2)  $[0, \infty)$  (3)  $[0, 1)$  (4)  $(0, 1)$
3. If the function  $f: [-3, 3] \rightarrow S$  defined by  $f(x) = x^2$  is onto, then  $S$  is  
(1)  $[-9, 9]$  (2)  $\mathbb{R}$  (3)  $[-3, 3]$  (4)  $[0, 9]$
4. If  $n((A \times B) \cap (A \times C)) = 8$  and  $n(B \cap C) = 2$ , then  $n(A)$  is  
(1) 6 (2) 4 (3) 8 (4) 16
5. Let  $f: \mathbb{R} \rightarrow \mathbb{R}$  be defined by  $f(x) = 1 - |x|$ . Then the range of  $f$  is  
(1)  $\mathbb{R}$  (2)  $(1, \infty)$  (3)  $(-1, \infty)$  (4)  $(-\infty, 1]$
6. Let  $X = \{1, 2, 3, 4\}$  and  $R = \{(1, 1), (1, 2), (1, 3), (2, 2), (3, 3), (2, 1), (3, 1), (1, 4), (4, 1)\}$ . Then  $R$  is  
(1) reflexive (2) symmetric (3) transitive (4) equivalence
7. If  $|x + 2| \leq 9$ , then  $x$  belongs to  
(1)  $(-\infty, -7)$  (2)  $[-11, 7]$  (3)  $(-\infty, -7) \cup [11, \infty)$  (4)  $(-11, 7)$
8. The solution set of the following inequality  $|x - 1| \geq |x - 3|$  is  
(1)  $[0, 2]$  (2)  $[2, \infty)$  (3)  $(0, 2)$  (4)  $(-\infty, 2)$
9. If  $\frac{1-2x}{3+2x-x^2} = \frac{A}{3-x} + \frac{B}{x+1}$ , then the value of  $A + B$  is  
(1)  $\frac{-1}{2}$  (2)  $\frac{-2}{3}$  (3)  $\frac{1}{2}$  (4)  $\frac{2}{3}$
10. The number of roots of  $(x + 3)^4 + (x + 5)^4 = 16$  is  
(1) 4 (2) 2 (3) 3 (4) 0

3x2=6

## II. Answer any 3 of the following. Q.No 15 compulsory

11. If  $n(A \cap B) = 3$  and  $n(A \cup B) = 10$ , then find  $n(\phi(A \Delta B))$ .
12. If  $A = \{1, 2, 3, 4\}$  and  $B = \{3, 4, 5, 6\}$ , find  $n((A \cup B) \times (A \cap B) \times (A \Delta B))$ .
13. If  $A \times A$  has 16 elements,  $S = \{(a, b) \in A \times A : a < b\}$ ;  $(-1, 2)$  and  $(0, 1)$  are two elements of  $S$ , then, find the remaining elements of  $S$ .
14. Construct a quadratic equation with roots 7 and  $-3$ .
15. Find a positive number smaller than  $\frac{1}{2^{1000}}$ . Justify.

3x3=9

## III. Answer any 3 of the following. Q.No 20 compulsory

16. Let  $A = \{a, b, c\}$  and  $R = \{(a, a), (b, b), (a, c)\}$ . Write down the minimum number of ordered pairs to be included to  $R$  to make it  
(i) reflexive (ii) symmetric (iii) transitive (iv) equivalence

17. Find the Domain of the function  $f(x) = \frac{1}{1-2\sin x}$
18. Draw graph of (i)  $y = |x|$  (ii)  $y = |x + 1|$  (iii)  $y = |x + 2| - 3$
19. Simplify by rationalizing the denominator  $\frac{7+\sqrt{6}}{3-\sqrt{2}}$ .
20. If  $\frac{\log x}{y-z} = \frac{\log y}{z-x} = \frac{\log z}{x-y}$ , then prove that  $xyz = 1$ .

4x5=20

#### IV. Answer the following

21. Write the values of  $f$  at  $-4, 1, -2, 7, 0$  if

$$f(x) = \begin{cases} -x + 4 & \text{if } -\infty < x \leq -3 \\ x + 4 & \text{if } -3 < x < -2 \\ x^2 - x & \text{if } -2 \leq x < 1 \\ x - x^2 & \text{if } 1 \leq x < 7 \\ 0 & \text{otherwise} \end{cases}$$

If one root of  $k(x-1)^2 = 5x - 7$  is double the other root, show that  $k = 2$  or  $-25$ .

22. In a survey of 5000 persons in a town, it was found that 45% of the persons know Language A, 25% know Language B, 10% know Language C, 5% know Languages A and B, 4% know Languages B and C and 4% know Languages A and C. If 3% of the persons know all the three Languages, find the number of persons who knows only Language A. (OR) Solve the equation

$$\sqrt{6-4x-x^2} = x+4.$$

23. In the set  $Z$  of integers, define  $mRn$  if  $m-n$  is divisible by 7. Prove that  $R$  is an equivalence relation.

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

24. If  $f, g: \mathbb{R} \rightarrow \mathbb{R}$  are defined by  $f(x) = |x| + x$  and  $g(x) = |x| - x$ , find  $g \circ f$  and  $f \circ g$ .

(OR) Prove that  $\log 2 + 16 \log \frac{16}{15} + 12 \log \frac{25}{24} + 7 \log \frac{81}{80} = 1$ .

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