## COMMON FIRST MID-TERM TEST - 2023

### Standard - 11

Reg. No. ☐☐☐☐☐☐

### MATHEMATICS

Time: 1.30 hours　　　　　　　　　　　　　　　　　　　　Marks: 50

### PART - I

**Choose the best answer:**　　　　　　　　　　　　　　　　$10 \times 1 = 10$

1) If $n(A) = 2$, $n(B \cup C) = 3$ then $n[(A \times B) \cup (A \times C)]$ is
   a) $2^3$　　　　　b) $3^2$　　　　　c) 6　　　　　d) 5

2) The range of the function $\dfrac{1}{1 - 2\sin x}$ is

   a) $(-\infty, -1) \cup \left(\dfrac{1}{3}, \infty\right)$　　　　　b) $\left(-1, +\dfrac{1}{3}\right)$

   c) $\left[-1, \dfrac{1}{3}\right]$　　　　　d) $(-\infty, -1) \cup \left(\dfrac{1}{3}, \infty\right)$

3) 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
   a) Reflexive　　　b) Symmetric　　　c) Transitive　　　d) Equivalence

4) Let $f : R \to R$ be defined by $f(x) = 1 - |x|$. Then the range of $f$ is
   a) $R$　　　　　b) $(1, \infty)$　　　　　c) $(-1, \infty)$　　　　　d) $(-\infty, 1]$

5) The solution set of the following inequality $|x-1| \geq |x-3|$
   a) $[0, 2]$　　　　　b) $(2, \infty)$　　　　　c) $(0, 2)$　　　　　d) $(-\infty, 2)$

6) The value of $\log_{\sqrt{2}} 512$ is
   a) 16　　　　　b) 18　　　　　c) 9　　　　　d) 12

7) If $\dfrac{1 - 2x}{3 + 2x - x^2} = \dfrac{A}{3 - x} + \dfrac{B}{x + 1}$ then the value of $A + B$ is

   a) $\dfrac{-1}{2}$　　　　　b) $\dfrac{-2}{3}$　　　　　c) $\dfrac{1}{2}$　　　　　d) $\dfrac{2}{3}$

8) Let $X = \{1, 2, 3, 4\}$, $Y = \{a, b, c, d\}$ and $f = \{(1, a), (4, b), (2, c), (3, d), (2, d)\}$, then $f$ is
   a) an one-to-one function　　　　　b) an onto function
   c) a function which is not one-to-one　　　　　d) not a function

9) The Quadratic equation which roots are 7 and $-3$ is
   a) $x^2 + 4x - 21 = 0$　　　　　b) $x^2 - 4x + 21 = 0$
   c) $x^2 - 4x - 21 = 0$　　　　　d) $x^2 + 4x + 21 = 0$

10) 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
    a) 10　　　　　b) $-8$　　　　　c) $-8, 8$　　　　　d) 6

### PART - II

**Answer ANY FOUR questions: Qn.No. 16 is compulsory.**　　　　　　$4 \times 2 = 8$

11) If $A = \{1, 2, 3, 4\}$ and $B = \{3, 4, 5, 6\}$, Find $n[(A \cup B) \times (A \cap B) \times (A \triangle B)]$.

12) Let $f$ and $g$ be the two functions from $R$ to $R$ defined by $f(x) = 3x - 4$ and $g(x) = x^2 + 3$, find $gof$.

13) Prove $\log a + \log a^2 + \log a^3 + \ldots\ldots + \log a^n = \dfrac{n(n+1)}{2} \log a$

14) Find the radius of the spherical tank whose volume is $\dfrac{32\pi}{3}$ cubic units.

15) Find the zeros of the polynomial function $f(x) = 4x^2 - 25$.

16) If P(A) denotes the power set of A, then find $n(P(P(P(\phi))))$

## PART - III

**Answer ANY FOUR questions: Qn.No. 22 is compulsory.**                **4×3=12**

17) If $n[P(A)] = 1024$, $n(A \cup B) = 15$ and $n[P(B)] = 32$ then find $n(A \cap B)$?

18) Find the range of the function $\dfrac{1}{2\cos x - 1}$.

19) Let A = {a, b, c}, what is the equivalence relation of smallest cardinality on A? What is the equivalence relation of largest cardinality on A?

20) Solve: $\dfrac{3(x-2)}{5} \le \dfrac{5(2-x)}{3}$

21) Resolve into partial fractions: $\dfrac{3x+1}{(x-2)(x+1)}$

22) Write $f(x) = x^2 + 5x + 4$ in completed square form.

## PART - IV

**Answer ALL the questions:**                                            **4×5=20**

23) Write the values of at $-3, 5, 2, -1, 0$ if $f(x) = \begin{cases} x^2 + x - 5 & ; & x \in (-\infty, 0) \\ x^2 + 3x - 2 & ; & x \in (3, \infty) \\ x^2 & ; & x \in (0, 2) \\ x^2 - 3 & ; & \text{Otherwise} \end{cases}$

**(OR)**

If $f : R \rightarrow R$ is defined by $f(x) = 2x - 3$. Prove that f in a bijection and find its inverge.

24) If $f, g : R \rightarrow R$ be defined by $f(x) = 2x - |x|$ and $g(x) = 2x + |x|$. Find fog.

**(OR)**

Resolve the following rational expressions into partial fractions: $\dfrac{x^2 + x + 1}{x^2 - 5x + 6}$

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

**(OR)**

Find all the values of x that satisfies the inequality $\dfrac{2x-3}{(x-2)(x-4)}$.

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

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