

Thiruvallur District

FIRST MID TERM TEST - JULY 2019

STANDARD - XI

MATHEMATICS

TIME: 1.15 hours

MARKS - 45

PART - A

I. CHOOSE THE CORRECT ANSWER:

10 × 1 = 10

- If $n[(A \times B) \cap (A \times C)] = 8$ and $n(B \cap C) = 2$, then $n(A)$ is
(a) 6 (b) 4 (c) 8 (d) 16
- The range of the function $\frac{1}{1 - 2 \sin x}$ is
(a) $(-\infty, -1) \cup (\frac{1}{3}, \infty)$ (b) $(-1, \frac{1}{3})$
(c) $[-1, \frac{1}{3}]$ (d) $(-\infty, -1) \cup (\frac{1}{3}, \infty)$
- The solution of $5x - 1 < 24$ and $5x + 1 > -24$ is
(a) (4, 5) (b) (-5, -4) (c) (-5, 5) (d) (-5, 4)
- The equation whose roots are numerically equal but opposite in sign to the roots of $3x^2 - 5x - 7 = 0$ is
(a) $3x^2 - 5x - 7 = 0$ (b) $3x^2 + 5x - 7 = 0$ (c) $3x^2 - 5x + 7 = 0$ (d) $3x^2 + x - 7 = 0$
- $\frac{1}{\cos 80^\circ} - \frac{\sqrt{3}}{\sin 80^\circ} =$
(a) $\sqrt{2}$ (b) $\sqrt{3}$ (c) 2 (d) 4
- Which of the following is not true?
(a) $\sin \theta = -\frac{3}{4}$ (b) $\cos \theta = -1$ (c) $\tan \theta = 25$ (d) $\sec \theta = \frac{1}{4}$
- If $f(\theta) = |\sin \theta| + |\cos \theta|$, $\theta \in \mathbb{R}$ then $f(\theta)$ is in the interval
(a) $[0, 2]$ (b) $[1, \sqrt{2}]$ (c) $[1, 2]$ (d) $[0, 1]$
- In an examination there are three multiple choice questions and each question has 5 choices. Number of ways in which a student can fail to get all answer correct is
(a) 125 (b) 124 (c) 64 (d) 63
- The number of 5 digit numbers all digits of which are odd is
(a) 25 (b) 5^5 (c) 5^6 (d) 625
- In a plane there are 10 points out of which 4 points are collinear, then the number of triangles formed is
(a) 110 (b) $10C_3$ (c) 200 (d) 116

PART - B

II. Answer FOUR questions. Qn.No. 16 is compulsory:

4 × 2 = 8

11. Let $A = \{a, b, c\}$. What is the equivalence relation of smallest and largest cardinality on A?
12. Find the values of p for which the difference between the roots of the equation $x^2 + px + 8 = 0$ is 2.
13. Solve: $\log_{5-x}(x^2 - 6x + 65) = 2$.
14. Find $\sin[x - y]$, given that $\sin x = \frac{8}{17}$, $0 < x < \frac{\pi}{2}$ and $\cos y = \frac{-24}{25}$, with $\theta \pi < y < \frac{3\pi}{2}$.
15. Find the number of ways arranging the letters of the word BANANA.
16. Solve: $3\cos^2\theta = \sin^2\theta$.

PART - C

III. Any FOUR questions. Q.No.22 is compulsory:

4 × 3 = 12

17. Solve: $\frac{x+1}{x+3} < 3$.
18. Find the number of solutions of $x^2 + |x - 1| = 1$.
19. In a ΔABC , if $\cos C = \frac{\sin A}{2 \sin B}$, show that the triangle is isosceles.
20. If the letter of the word GARDEN are permuted in all possible ways and the strings thus formed are arranged in the dictionary order, then find the rank of the word DANGER.
21. A box of one dozen apple contains a rotten apple. If we are choosing 3 apples simultaneously, in how many ways, one can get only good apples.
22. Show that the relation $xy = -2$ is a function for a suitable domain. Find the domain and the range of the function.

PART - D

IV. Answer ALL the questions:

3 × 5 = 15

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

(OR)

Using the mathematical induction, show that for any natural number n

$$\frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + \dots + \frac{1}{n.(n+1)} = \frac{n}{n+1}$$

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

(OR)

Find the square root of $7 - 4\sqrt{3}$.

25. If $A + B + C = \pi$, prove that

$$\cos A + \cos B + \cos C = 1 + 4 \sin\left(\frac{A}{2}\right) \cdot \sin\left(\frac{B}{2}\right) \cdot \sin\left(\frac{C}{2}\right)$$

(OR)

Prove that
$$\frac{\cot[180 + \theta] \cdot \sin(90 - \theta) \cdot \cos(-\theta)}{\sin(270 + \theta) \cdot \tan(-\theta) \cdot \operatorname{cosec}(360 + \theta)} = \cos^2 \theta \cdot \cot \theta$$

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