

Topics : Complex Number, Sequence & Progression, Permutation & Combination, Fundamentals of Mathematics, Quadratic Equation

Type of Questions	M.M., Min.
Single choice Objective (no negative marking) Q. 1, 2, 3, 4 (3 marks, 3 min.)	[12, 12]
Short Subjective Questions (no negative marking) Q. 5, 6, 7 (3 marks, 3 min.)	[9, 9]
Match the Following (no negative marking) Q.8 (8 marks, 8 min.)	[8, 8]

- If z_1, z_2, z_3 are the vertices of the $\triangle ABC$ on the complex plane and are also the roots of the equation $z^3 - 3\alpha z^2 + 3\beta z + \gamma = 0$ then the condition for the $\triangle ABC$ to be equilateral triangle is :
(A) $\alpha^2 = \beta$ (B) $\alpha = \beta^2$ (C) $\alpha^2 = 3\beta$ (D) $\alpha = 3\beta^2$
- The sum of first 100 terms common to the series 17, 21, 25,.... & 16, 21, 26.... is
(A) 101100 (B) 111000 (C) 110010 (D) 100101
- How many seven digit number is to be formed using the digits 1 to 9 (without repetition) which is divisible by 9
(A) $4 \cdot 7!$ (B) 9P_7 (C) $7!$ (D) 9^6
- The complete solution set of the equation $x^8 - x^5 + x^2 - x + 1 > 0$ is given by
(A) $0 < x < 1$ (B) $-1 < x < 1$ (C) $x > 1$ (D) $x \in \mathbb{R}$.
- If the inequality $\sin^2 x + a \cos x + a^2 \geq 1 + \cos x$ holds for any $x \in \mathbb{R}$, find the range of values of a .
- If α, β are the roots of the equation $ax^2 + bx + c = 0$. Find the quadratic equation whose roots are $(a\alpha + b)^{-2}, (a\beta + b)^{-2}$.
- Find the solution of the equation, $2\log_9 \left(2\left(\frac{1}{2}\right)^x - 1 \right) = \log_{27} \left(\left(\frac{1}{4}\right)^x - 4 \right)^3$. Also state whether the solution is rational or irrational.

8. Match the column

Column – I

(A) The number of integral solutions of the inequality

$$\frac{(e^x - 1)(x - 2)(x - 1)^7}{(\ln x + 1)(x - 3)(x - 5)} \leq 0$$

(C) Number of solution of $\operatorname{sgn}(\operatorname{sgn} \sin x) = 0$
in $x \in [-2\pi, 2\pi]$

(D) Number of solution of $x = \tan x$ in $x \in (-\pi, \pi)$

Column – II

(p) 4

(r) 3

(s) 1

(t) 0

Answers Key

1. (A) 2. (A) 3. (A) 4. (D)
5. $(-\infty, -2] \cup [1, \infty)$ 6. $a^2c^2x^2 - (b^2 - 2ac)x + 1 = 0$
7. $-\log_2 3$, Irrational
8. $(A \rightarrow r), (B \rightarrow r), (C \rightarrow q), (D \rightarrow s)$