

"Section - B"

Marks: 50

Q-2. Attempt any ten (10) parts each part carries equal marks:-



- (i) Separate into real and imaginary parts $\left(\frac{4-5i}{2-3i}\right)^2$.
- (ii) Find the product of $2 - 3i$ and $7 + 5i$.
- (iii) Prove that $\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$.
- (iv) If $A = \begin{pmatrix} 0 & 2 & 2 \\ -1 & 3 & 2 \\ 1 & 0 & 5 \end{pmatrix}$, find A^{-1} .
- (v) Find the angle between the vectors \vec{OP} and \vec{OQ} where $\vec{OP} = 2i + j$ and $\vec{OQ} = -3i + 2j$.
- (vi) Find the volume of the parallelepiped whose edges are represented by $a = 3i + j - k, b = 2i - 3j + k, c = i - 3j - 4k$.
- (vii) Find the sum of the first 200 positive odd integers.
- (viii) Convert $0.\overline{123}$ to a common fraction.
- (ix) Find the sum to $2n$ terms of the series whose n th term is $4n^2 + 5n + 1$.
- (x) Find n and r if $a_n = 840$ and $n_1 = 35$.
- (xi) Find domain and range of the function $f(x) = \frac{x-4}{x-3}$.
- (xii) Maximize $Z = 4x + 3y$ subject to the constraints
- $$\begin{array}{rcl} 3x & + & 4y \leq 24 \\ 8x & + & 6y \leq 48 \\ x \leq 5, & y \leq 6, & x, y \geq 0 \end{array}$$
- (xiii) Solve the equation $\tan \theta = \frac{-\sqrt{3}}{3}$.

"Section - C"

Marks: 30

Note: Attempt any three (3) questions. Each question carries equal marks:-

- Q-3. (a) Prove that $\sin 2\theta = \frac{2 \tan \theta}{1 + \tan^2 \theta}$.
- (b) Find the middle term in the expansion of $(2x^3 + 3y)^8$.
- Q-4. (a) Solve the triangle with dimensions $\alpha = 100^\circ, C = 345, \gamma = 56.4^\circ$.
- (b) Prove that $\sin 20^\circ \sin 60^\circ \sin 40^\circ \sin 80^\circ = \frac{3}{16}$.
- Q-5. (a) Three unbiased coins are tossed. What is the probability of obtaining at least one head?
- (b) Without graphing, find vertex, all intercepts and axis of the graph of the function $f(x) = -x^2 + 6x + 5$.
- Q-6. (a) Prove that $\cos(\tan^{-1} x) = \frac{1}{\sqrt{1+x^2}}, x \geq 0$.
- (b) Find the unit vector perpendicular to both $i - 2j + 3k$ and $2i + j - k$.