



vii) The equation $x^4 + 2x^2 - 7x - 5 = 0$ has

- a) one real roots and three complex roots
- b) one complex roots and three real roots
- c) two real roots and two complex roots
- d) four real roots.

viii) Cardan's method is used for solving equation of degree

- a) 2
- b) 3
- c) 4
- d) none of these.

ix) If α, β, γ be the roots of $x^3 - 3x^2 + 6x - 2 = 0$, then

$\sum \alpha\beta$ is

- a) 3
- b) 6
- c) 2
- d) none of these.

x) $f(x, y) = \sqrt{x} + \sqrt{y}$ is a function of degree

- a) $\frac{1}{2}$
- b) $\frac{1}{3}$
- c) 0
- d) $\frac{1}{4}$.



xi) The equation $r = 3 \sin \theta + 4 \cos \theta$ represents

- a) a parabola b) an ellipse
 c) a straight line d) a circle.

xii) The inverse of the matrix $\begin{bmatrix} 2 & 3 \\ 4 & 6 \end{bmatrix}$ is

- a) $\begin{bmatrix} 2 & -3 \\ 4 & 6 \end{bmatrix}$ b) $\begin{bmatrix} 1 & 2 \\ -\frac{3}{2} & 3 \end{bmatrix}$
 c) $\begin{bmatrix} -2 & 4 \\ -3 & 6 \end{bmatrix}$ d) does not exist.

GROUP - B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Prove that the set of real numbers of the form $a + b \sqrt{2}$ where a and b are rational numbers, forms a field under addition and multiplication.
3. Solve the equation $x^3 - 9x^2 + 14x + 24 = 0$, two of whose roots are in the ratio 3 : 2.
4. Prove that, any square matrix can be expressed assume of a symmetric matrix and a skew-symmetric matrix.



5. If $u = \tan^{-1} \left(\frac{x+y}{\sqrt{x} + \sqrt{y}} \right)$, then show that

$$x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \frac{1}{4} \sin 2u.$$

6. A function $f(x)$ is defined as follows

$$\begin{aligned} f(x) &= 1 + x \text{ when } x \leq 2, \\ &= 5 - x \text{ when } x > 2. \end{aligned}$$

Show that $f(x)$ is continuous at $x = 2$ but $f'(2)$ does not exist.

GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) State Descart's rule of sign. Using this rule find the nature of the roots of the equation

$$x^4 - 7x^3 + 21x^2 - 9x + 21 = 0.$$

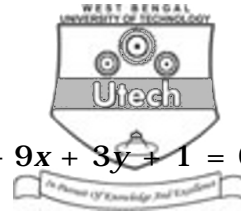
b) Solve the following system of linear equations by Cramer's rule

$$x - y + 2z = 1$$

$$x + y + z = 2$$

$$2x - y + z = 5.$$

c) If by a transformation of one rectangular axis to another with same origin the expression $ax + by$ changes to $a'x' + b'y'$, Prove that $a^2 + b^2 = a'^2 + b'^2$.



8. a) Show that the equation $20x^2 + 15xy + 9x + 3y + 1 = 0$ represents a pair of intersecting straight lines which are equidistant from the origin.

b) Show that $\cos x > 1 - \frac{x^2}{2}$ if $0 < x < \frac{\pi}{2}$.

c) If α, β, γ be the roots of the equation

$$x^3 - px^2 + qx - r = 0, \text{ then find the value of } \sum \frac{1}{\alpha}.$$

9. a) If $A = \{a, b, c, d, e\}$, $B = \{c, a, e, g\}$ and $C = \{b, e, f, g\}$,

then show that $(A \cup B) \cap C = (A \cap C) \cup (B \cap C)$.

b) Reduce the following equation to the canonical form and determine the nature of the conic represented by it

$$x^2 - 4xy + 4y^2 - 12x - 6y - 39 = 0.$$

c) Evaluate $\lim_{x \rightarrow 1} \left(\frac{x}{x-1} - \frac{1}{\log x} \right)$.



10. a) Evaluate $\int \frac{dx}{(1+x)\sqrt{1-x^2}}$.

b) If PSQ be a focal chord of a conic with focus S and semi-latus rectum l , then prove that $\frac{1}{SP} + \frac{1}{SQ} = \frac{2}{l}$.

c) If $A - 2B = \begin{bmatrix} 0 & 6 & 26 \\ 6 & -9 & 12 \\ 2 & 9 & -10 \end{bmatrix}$ and

$2A + B = \begin{bmatrix} 10 & -3 & 4 \\ 12 & -3 & 4 \\ 4 & 3 & 0 \end{bmatrix}$, find A and B .

11. a) If G be a group such that $(ab)^2 = a^2b^2 \forall a, b \in G$, show that the group G is abelian.

b) Show that $\int_0^1 \frac{\log(1+x)}{1+x^2} dx = \frac{\pi}{8} \log 2$.

c) If $y = e^{-x} \sin x$, then show that $y_4 + 4y = 0$.

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