







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  $\alpha, \beta, \gamma$  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

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

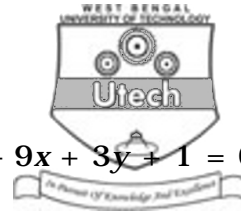
- b) Solve the following system of linear equations by Cramer's rule

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

$$x + y + z = 2$$

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

- 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  $\alpha, \beta, \gamma$  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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