

3rd semester  
Home assignment  
Paper - 3036  
Marks - 50

Answers any five

- (1) (a) show that if the origin is transferred to  $(0,1)$  and the axes are rotated through  $45^\circ$ , the equation  $5x^2 - 2xy + 5y^2 + 2x - 10y - 7 = 0$  referred to new axes becomes

$$\frac{x'^2}{3} + \frac{y'^2}{2} = 1$$

- (b) show that the distance between the points  $(x_1, y_1)$  and  $(x_2, y_2)$  is unaltered by  
(i) translation of axes (ii) rotation of axes.

2. Find the condition that the general equation of the second degree

$$ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$$

may represent a pair of straight lines. Also find the point of contact between the lines.

3. (a) Reduce the equation

$$9x^2 - 29xy + 16y^2 - 18x - 10y + 19 = 0$$
 to the standard form.

- (b) show that  $2x^2 + 3xy - 2y^2 + 7x - y + 3 = 0$  represents a pair of perpendicular lines.

(4) Find the equation of the asymptotes of the hyperbola  $2x^2 - 5xy - 3y^2 - 5x - 3y - 21 = 0$ . Hence find the centre and principal axes of the hyperbola and also the equation of the conjugate hyperbola.

(5)(a) Find the equation of the line through the point  $(1, 2, 4)$  and perpendicular to the line  $3x + 2y - z - 4 = 0 = x - 2y - 2z - 5$

(b) Prove that  $\frac{x}{1} = \frac{y-2}{2} = \frac{z+3}{3}$ , and  $\frac{x-3}{2} = \frac{y-6}{3} = \frac{z-3}{4}$  are coplanar

(6)(a) Find the equation of sphere passing through points  $(1, 1, 1)$ ,  $(-2, 1, 2)$ ,  $(3, -3, 1)$  and  $(-1, 2, -1)$

(b) Find the equation of the right circular cylinder of radius 5, whose axis passes through  $(1, 2, 3)$  and is parallel to

$$\frac{x-4}{2} = \frac{y-3}{-1} = \frac{z-2}{2}$$

(7) Find the condition that the plane  $lx + my + nz = p$  is a tangent plane to the central conicoid  $ax^2 + by^2 + cz^2 = 1$