[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 6276 G

Unique Paper Code : 62354343

Name of the Paper : Analytic Geometry and Applied Algebra

Name of the Course : **B.A. (Prog.) Mathematics (CBCS)**

Semester : III

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. This question paper has six questions in all.
3. Attempt any two parts from each question.
4. All questions are compulsory.

P.T.O.

1. (a) Identify and sketch the curve (6.5)

$$(y - 3)^2 = 6(x - 2).$$

(b) Describe the graph of the equation (6.5)

$$9x^2 + 4y^2 + 18x - 24y + 9 = 0.$$

(c) Sketch the curve represented by the equation

$$(y + 3)^2 - 9(x + 2)^2 = 36,$$

and label the vertices, foci and asymptotes. (6.5)

2. (a) Find an equation of the parabola whose axis is $y = 0$ and passes through the points $(3, 2)$ and $(2, -3)$. (6)

(b) Find an equation of the ellipse with foci $(\pm 1, 0)$ and $b = \sqrt{2}$. Also sketch the graph. (6)

(c) Find an equation of the hyperbola with vertices $(0, \pm 3)$ and asymptotes $y = \pm x$. (6)

3. (a) Let $x'y'$-coordinate system be obtained by rotating xy-coordinate system through an angle $\theta = 45°$. Find the equation of curve $x^2 - xy + y^2 - 6 = 0$ in $x'y'$-coordinate system. (6.5)

(b) Find the distance from the point $(-5, 2, -3)$ to the x-axis. (6.5)

(c) Describe the surface whose equation is given by (6.5)

$$x^2 + y^2 + z^2 - 3x + 4y - 8z + 25 = 0.$$

4. (a) Find the orthogonal projection of $\vec{v} = \hat{i} + \hat{j} + \hat{k}$ on $\vec{b} = 2\hat{i} + 2\hat{j}$ and find the vector component of $\vec{v}$ orthogonal to $\vec{b}$. (6)

(b) Find the area of the triangle with vertices P(2, 2, 0), Q(–1, 0, 2) and R(0, 4, 3). (6)

(c) Use a scalar triple product to determine whether the vectors $\vec{u} = 4\hat{i} - 8\hat{j} + \hat{k}$, $\vec{v} = 2\hat{i} + \hat{j} - 2\hat{k}$ and $\vec{w} = 3\hat{i} - 4\hat{j} + 12\hat{k}$ lie in the same plane. (6)

5. (a) Find the parametric equation of the line that is perpendicular to the lines

L_1: $x = 4t$, $y = 1 - 2t$, $z = 2 + 2t$;

L_2: $x = 1 + t$, $y = 1 - t$, $z = -1 + 4t$,

and passes through their point of intersection. (6.5)

(b) Show that the line L: $x = 3 + 8t$, $y = 4 + 5t$, $z = -3 + t$, and the plane $x - 3y + 7z = 12$ are parallel. (6.5)

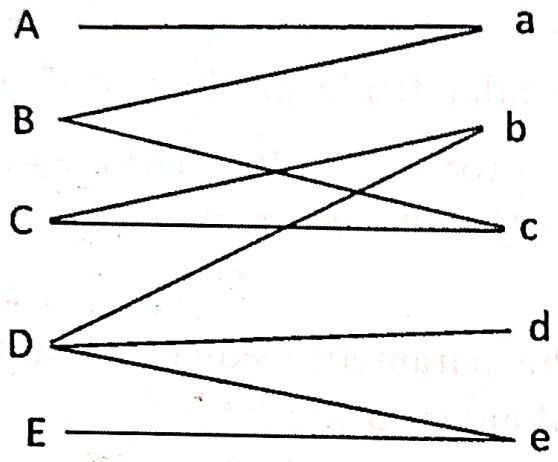
(c) Find the coordinates of the point where the line

$$L: x = 2 + t,\ y = 1 - 2t,\ z = -8t,$$

intersects the plane $3x + y + z = 6$. (6.5)

6. (a) Define a Latin square. Give an example of a Latin square of order 4. (6)

(b) Find a matching or explain why none exists for the following graph (6)



(c) Three pitchers of sizes 10 litres, 4 litres and 7 litres are given. If initially 10 litres pitcher is full and the other two empty, find a minimal sequence of pouring so as to have exactly 3 litres of water in two pitchers. (6)