[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 6339 **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)

$$x = y^2 - 4y + 2.$$

(b) Sketch the curve represented by the equation

$$4x^2 + 9y^2 = 36,$$

and also label the foci, vertices and the ends of minor axis. (6.5)

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

$$x^2 - 4y^2 + 2x + 8y - 7 = 0.$$

2. (a) Find an equation for the parabola whose vertex is at (1, 1) and directrix $y = -2$. Also sketch the graph. (6)

(b) Find an equation for the ellipse with foci $(0, \pm 2)$ and major axis with end points $(0, \pm 4)$. Also state the reflection property of the ellipse. (6)

(c) Find an equation of the hyperbola with vertices $(\pm 2, 0)$ and foci $(\pm 3, 0)$. (6)

3. (a) Rotate the coordinate axis to remove the xy-term of the curve

$$x^2 + 2\sqrt{3xy} + 3y^2 + 2\sqrt{3}x - 2y = 0.$$

Then name the conic. (6.5)

(b) Find the distance from the point (-5, 2, -3) to the yz-plane. (6.5)

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

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

4. (a) Express the vector $\vec{v}$ as the sum of a vector parallel to $\vec{b}$ and a vector orthogonal to $\vec{b}$ where

$\vec{v} = -2\hat{i} + \hat{j} + 6\hat{k}$, $\vec{b} = -2\hat{j} + \hat{k}$. (6)

(b) Find two, unit vectors that are orthogonal to both

$\vec{u} = -7\hat{i} + 3\hat{j} + \hat{k}$ and $\vec{v} = 2\hat{i} + 4\hat{k}$. (6)

(c) Use a scalar triple product to determine whether the vectors $\vec{u} = \hat{i} - 2\hat{j} + \hat{k}$, $\vec{v} = 3\hat{i} - 2\hat{k}$ and $\vec{w} = 5\hat{i} - 4\hat{j}$ lie in the same plane. (6)

5. (a) Find the parametric equation of the line L passing through the points (2, 4, –1), and (5, 0, 7). Where does the line intersect the xy-plane? (6.5)

(b) Find the distance between the point (2, 3, 6) and the plane 2x + y + z = 1. (6.5)

P.T.O.

(c) Show that the lines

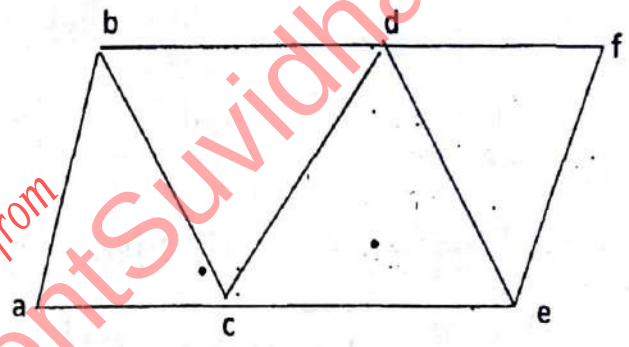
L_1: $x = 1 + 7t$, $y = 3 + t$, $z = 5 - 3t$;

L_2: $x = 4 - t$, $y = 6$, $z = 7 + 2t$,

are skew. Also find the distance between them. (6.5)

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

(b) Find a minimal edge cover for the following graph. Give a detailed logical analysis. (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 2 litres of water in either the 7 litres or the 4 litres pitcher. (6)