(b) Show that the equation of a right circular cone whose vertex is the origin, axis is the z-axis, and semi vertical angle is α is $x^2 + y^2 = z^2 \tan^2 \alpha$.

(c) Find the equation of the right cylinder whose guiding circle is

$$x^2 + y^2 + z^2 = 9, \quad x - y + z = 3.$$

6. (a) Show that the plane $2x - 2y + z + 12 = 0$ touches the sphere

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

(b) Find the equation of the circular cone which passes through the point (1,1,2) and has its vertex at the origin and the axis lies on the line $\frac{x}{2} = \frac{y}{-4} = \frac{z}{3}$.

(c) Find the equation of the right cylinder whose axis is $\frac{x}{2} = \frac{y}{3} = \frac{z}{6}$ and radius is 4.

[This question paper contains 4 printed pages.]

Your Roll No..............

Sr. No. of Question Paper : 5613 **H**

Unique Paper Code	:	2352201202
Name of the Paper	:	DSC : Analytic Geometry
Name of the Course	:	**B.A. (Programme) with Mathematics as Major**
Semester	:	II

Duration : 3 Hours Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. **All** questions are compulsory.
3. Attempt **two** parts from each question.
4. Each question carries equal marks.
5. Use of Calculator not allowed.

1. (a) Sketch the graph of the parabola : $y = 4x^2 + 8x + 5$, showing its vertex, focus and directrix.

(b) Identity and sketch the curve

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

(c) Find the equation of the ellipse that satisfies the given conditions: foci (2,1) and (2, –3); major axis of length 6.

2. (a) Find an equation of the hyperbola that passes through the origin and has asymptotes.

$$y = x - 2, \quad y = -x + 4.$$

(b) Sketch the following ellipse and label its foci, vertices, and ends of minor axis $9x^2 + y^2 = 9$.

(c) State reflection property of the parabola. Find an equation of the parabola that satisfies the given conditions: focus (1,1) and directories $y = -2$.

3. (a) Find the equation of the plane that passes through the points A(–2,1,4), B(1,0,3) and is perpendicular to the plane $4x - y + 3z - 2 = 0$.

(b) In each part, find two-unit vectors in 2-space that satisfy the stated conditions.

(i) Perpendicular to the vector from the point A(–3, 2) to the point B(1, –1).

(ii) Parallel to the vector from the point A(–3, 2) to the point B(1, –1).

(c) Show that the lines L_1 and L_2 are parallel and find the shortest distance between them.

L_1: $x = 3 - 2t$, $y = 4 + t$, $z = 6 - t$

L_2: $x = 5 - 4t$, $y = -2 + 2t$, $z = 7 - 2t$

4. (a) Let $u = 2i + 3j$, $v = i + j$, and $w = -i + j$. Find the scalar components of u along v and w and the vector components of u along v and w.

(b) Determine whether the vectors $u = i - 2j + k$, $v = 3i - 2k$, and $w = 5i - 4j$ lie in the same plane. Also find the area of parallelogram determined by v and w.

(c) Find the equation of plane passing through origin and parallel to the plane $4x - 2y + 7z + 12 = 0$. Also find the distance between them.

5. (a) If the radius of $x^2 + y^2 + z^2 - 4x - 4y + 2z + k = 0$ is 5 units, find k.