[This question paper contains 2 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 6548 **L**

Unique Paper Code : 2354001201

Name of the Paper : ANALYTIC GEOMETRY

Name of the Course : **COMMON PROG GROUP (GE)**

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. Attempt **all** question by selecting any **two** parts from each question.
3. **All** questions carry equal marks.
4. No calculator allowed.

1(a) Sketch the parabola $x^2 = -8y$, and label the focus, vertex, and directrix.

1(b) Write the definition of ellipse. Find the equation of ellipse whose ends of major axis are at $(\pm 3,0)$ and ends of minor axis are at $(0, \pm 2)$.

1(c) Sketch the hyperbola $\frac{x^2}{16} - \frac{y^2}{9} = 1$, and label the vertices, foci, and asymptotes.

2(a) Describe the graph of the equation $4x^2 + 8y^2 + 16x + 16y + 20 = 0$.

2(b) Find the new coordinates of the point $(-2, 6)$ if the coordinate axes are rotated through an angle of $\theta = 60°$.

2(c) Find an equation of the parabola traced by a point that moves so that its distance from $(2,4)$is the same as its distance to the x-axis.

3(a) (i) Find the vector that has length 2 and oppositely directed to $\vec{v} = -3i + 4j + k$.
(ii) Determine whether vectors $\vec{u}$ and $\vec{v}$ make an acute angle, an obtuse angle or are orthogonal where $\vec{u} = 6i + j + 3k, \vec{v} = 4i - 6k$.

3(b) Find the volume of the parallelepiped with adjacent edges

$$\vec{u} = (2, -6, 2), \quad \vec{v} = (0, 4, -2), \quad \vec{w} = (2, 2, -4).$$

P.T.O.

3 (c) Let L_1 and L_2 be the lines

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

$$L_2 : x = 2 + t, y = 3 + 4t, z = 4 + 2t,$$

show that the lines L_1 and L_2 intersect, and find their point of intersection.

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

4(b) Find an equation for the line L of intersection of the planes

$2x - 4y + 4z = 6$ and $6x + 2y - 3z = 4$.

4(c) Find an equation of the plane through $(-1,4,-3)$that is perpendicular to the line

$$x - 2 = t, y + 3 = 2t, z = -t.$$

5 (a) Find the equation of the sphere passing through the points $(1,0,0)$, $(0,2,0)$, $(0,0,3)$ and $(1,1,1)$.

5 (b) Find the equation of the circle of intersection of the sphere $x^2 + y^2 + z^2 = 16$ and the plane $x + z = 4$.

5 (c) Find the equation of the sphere through the circle $x^2 + y^2 + z^2 = 25$, $x + z = 5$ and passing through the point $(1,2,3)$.

6 (a) Find the equation of a cone with vertex $(1, -2, 3)$ and base, the circle $x^2 + y^2 = 4$ in the plane $z = 0$.

6 (b) Find the equation of the right circular cone which contains the three coordinate axes as generators.

6 (c) Find the equation of the cylinder whose generators are parallel to $(2,1,-2)$ and which passes through the circle $x^2 + z^2 = 9, y = 0$.