[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1473 **F**

Unique Paper Code : 2352201202

Name of the Paper : DSC : Analytic Geometry

Name of the Course : **Bachelor of Arts**

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 any **two** parts from each section.
4. **All** questions carry equal marks.

1. (a) Sketch the parabola and label the focus, vertex, and directrix of the following

$$y^2 - 10y - 12x + 61 = 0.$$

P.T.O.

(b) State the reflection property of the hyperbola. Sketch the graph of the hyperbola $25y^2 - 9x^2 = 225$, and label the vertices, foci, and asymptotes.

(c) Find an equation for the ellipse satisfying the given conditions: the ends of the major axis are $(0, \pm 6)$; passes through $(-3, 2)$.

2. (a) Find the equation for the parabola that has its vertex at $(5, -3)$, axis parallel to they-axis and which passes through the point $(10, 2)$.

(b) Identify and sketch the curve $xy = 1$.

(c) Find the angle that the vector $\vec{v} = -\sqrt{3}\hat{i} + \hat{j}$ makes with the positive x-axis.

3. (a) Find the vector component of $\vec{v}$ along $\vec{b}$ and the vector component of $\vec{v}$ orthogonal to $\vec{b}$ where $\vec{v} = 2\hat{i} - \hat{j} + 3\hat{k}$, $\vec{b} = \hat{i} + 2\hat{j} + 2\hat{k}$.

(b) Find the area of the triangle with vertices P(1, 5, –2), Q(0,0,0) and R(7,2,0).

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

4. (a) Find the parametric equation of the line that passes through the point P(–1, 2, 4) and is parallel to the vector $\vec{v} = 3\hat{i} - 4\hat{j} + \hat{k}$.

(b) Find the direction cosines of a line which is perpendicular to the lines whose direction ratios are 1,2,3; –1,3,5.

(c) Show that the line $x = -1 + t$, $y = 3 + 2t$, $z = -t$ and the plane $2x - 2y - 2z + 3 = 0$ are parallel and find the distance between them.

5. (a) Find the equation of the sphere described on the join of the points A(2, –3, 4) and B(–5, 6, –7) as diameter.

(b) Prove that the tangent planes to the cone $lyz + mzx + nxy = 0$ are at right angles to the generators of the cone

$$l^2x^2 + m^2y^2 + n^2z^2 - 2mnyz - 2nlzx - 2lmxy = 0.$$

P.T.O.

(c) Find the equation of the right circular cylinder of radius 2 whose axis is the line $\frac{x-1}{2}=\frac{y-2}{2}=\frac{z-2}{2}$.

6. (a) Find the equations of the sphere through the circle $x^2 + y^2 + z^2 = 1$, $2x + 4y + 5z = 6$ and touching the plane $z = 0$.

(b) Find the equation of the cone whose vertex is (α, β, γ) and base

$$ax^2 + by^2 = 1,\ z = 0.$$

(c) Find the enveloping cylinder of the sphere $x^2 + y^2 + z^2 - 2x + 4y = 1$ having its generators parallel to the line $x = y = z$.