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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 the y-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 $x = y = z$.