

1473

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(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  $(\alpha, \beta, \gamma)$  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  $x = y = z$ .

(700)

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[This question paper contains 4 printed pages.]

24 JUL 2023

Your Roll No.....



Sr. No. of Question Paper : 1473

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

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

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