

11183

B. Sc. (Pass Course) 1st Sem. (Regular/Re-appear/Improvement) (Mercy Chance)

Examination – December, 2023

MATHEMATICS (Solid Geometry)

Paper : 12BMS113

Time : Three hours]

[Maximum Marks : 40

Before answering the questions, candidates should ensure that they have been supplied the correct and-complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all, selecting *one* question from each Unit. Question No. 9 (Unit-V) is *compulsory*. Marks are indicated against each question.

UNIT – I

1. (a) Find the equation of tangent and normal to the conic $x^2 + 2xy - y^2 + 2x + 4y + 1 = 0$ at the point $(-2, 1)$. 3
- (b) Trace the conic : 4

$$8x^2 - 4xy + 5y^2 - 16x - 14y + 17 = 0$$
2. (a) Prove that the conics $x^2 + 3y^2 - 4x - 6y + 4 = 0$ and $x^2 - y^2 - 4x + 2y + 2 = 0$ are confocal. 3

- (b) Show that the locus of the point of intersection of two tangents to the parabola $\frac{l}{r} = 1 + \cos \theta$, which cut one another at a constant angle α is $\frac{l}{r} = \cos \alpha + \cos \theta$. 4

UNIT – II

3. (a) Find the locus of the centres of the sphere, which passes through a given point and intercept a fixed length on a given line. 3
- (b) Find the limiting points of the co-axial system of spheres $x^2 + y^2 + z^2 + 3x - 3y + 6 = 0$, $x^2 + y^2 + z^2 - 6y - 6z + 6 = 0$. 4
4. (a) Find the equation of cone which contains the three co-ordinate axes and the lines through the origin having direction cosines $l_1, m_1, n_1; l_2, m_2, n_2$. 3
- (b) Find the equation of the right circular cylinder whose axis is $x = 2y = -z$ and radius 4. 4

UNIT – III

5. (a) Find the condition that the plane $lx + my + nz = 1$ should touch the ellipsoid $\frac{x^2}{\alpha^2} + \frac{y^2}{\beta^2} + \frac{z^2}{\gamma^2} = 1$. 3

P. T. O.

(2)

- (b) Find the equation of polar plane of a point (x_1, y_1, z_1) w.r.t. the conicoid $ax^2 + by^2 + cz^2 = 1$.

4

6. (a) Prove that six normals can be drawn from a given point to the ellipsoid.

3

- (b) Find the centre of the conic given by the equations :

4

$$2x - 2y - 5z + 5 = 0, 3x^2 + 2y^2 - 15z^2 = 4$$

UNIT - IV

7. (a) Find the length of semi-axis of the sections of the paraboloid $2x^2 + y^2 - z = 0$ by the plane $x + 2y + z = 4$.

4

- (b) Find the locus of the point of intersection of perpendicular generators of a hyperboloid of one sheet.

3

8. (a) Reduce the equation to standard form :

4

$$9x^2 + 4y^2 + 4z^2 + 8yz + 12zx + 12xy + 4x + y + 10z + 1 = 0$$

and show that it represents a parabolic cylinder.

- (b) Show that two confocal paraboloids cut everywhere at right angles.

3

(3)

P. T. O.

UNIT - V

9. (a) Define pole and polar of a conic.

2

- (b) Prove that one conicoid confocal with a given conicoid, touches a plane.

2

- (c) Write the equation of conic through the intersection of two given conics.

2

- (d) Find the equation of a sphere whose centre is $(0, 0, 0)$ and radius r .

2

- (e) Define Ellipsoid of revolution.

2

- (f) Find the nature of the conic : $x^2 - 2xy + 2y^2 - 4x - 6y + 3 = 0$.

2

(4)