13. (a) Find the equation to the right circular cylinder whose guiding circle is $x^2 + y^2 + z^2 = 9,\ x - y + z = 3$.

Or

(b) Find the equation of the enveloping cylinder of the conicoid $ax^2 + by^2 + cz^2 = 1$, whose generators are parallel to $x = y = z$.

(MAT2S) R7 (3) **(1110–2)**

B.Sc. DEGREE EXAMINATION,
MARCH/APRIL 2019.

(Regular)

First Year — Second Semester

Part II — Mathematics

Paper II — SOLID GEOMETRY

Time : Three hours Maximum : 75 marks

SECTION A — ($5 \times 5 = 25$ marks)

Answer any FIVE of the following.

1. Find the angles between the planes $x + 2y + 3z = 5,\ 3x + 3y + z = 9$.

2. Find the equation of the plane through (2, 3, 4) and parallel to $5x - 6y + 7z - 3 = 0$.

3. Find the image of the point (2, –1, 3) in the plane $3x - 2y + z = 9$.

4. Show that the line $\frac{x-2}{1} = \frac{y+3}{-2} = \frac{z+4}{5}$ is parallel to $3x + 4y + z = 4$.

5. Find the centre and radius of the sphere $x^2 + y^2 + z^2 - 6x + 8y - 10z + 1 = 0$.

6. Find the equation of the tangent plane to the sphere $x^2 + y^2 + z^2 - 2x - 4y + 2z - 3 = 0$ at $(-1, 4, -2)$.

7. Find the equation of the cone whose vertex is $(1, 2, 3)$ and base $y^2 = 4ax, z = 0$.

8. Find the equation of the cylinder whose generators are parallel to $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$ and which passes through the curve $x^2 + y^2 = 16, z = 0$.

SECTION B — ($5 \times 10 = 50$ marks)

Answer ALL of the following questions.

9. (a) Find the equation to the plane containing the points $A = (3, 2, -5)$, $B = (-3, 8, -5)$, $C = (-3, 2, 1)$. Show that the point $(-1, 4, -3)$ is the circumcentre of the ΔABC. Also find its centroid.

Or

(b) Prove that the equation $2x^2 - 6y^2 - 12z^2 + 18yz + 2zx + xy = 0$ represents a pair of planes, and find the angle between them.

10. (a) A variable plane makes intercepts on the axes, the sum of whose squares is K^2 (a constant). Show that the locus of the foot of the perpendicular from origin to the plane is $(x^{-2} + y^{-2} + z^{-2})(x^2 + y^2 + z^2)^2 = K^2$.

Or

(b) Find the S.D. between the lines $\frac{x-3}{3} = \frac{y-8}{-1} = \frac{z-3}{1}$, $\frac{x+3}{-3} = \frac{y+7}{2} = \frac{z-6}{4}$. Find also the equations and the points in which the S.D. meets the given lines.

11. (a) Find the pole of the plane $x - y - z + 9 = 0$ w.r.t. the sphere $x^2 + y^2 + z^2 - 2x + 4y - 6z + 5 = 0$.

Or

(b) Find the equation of the sphere which touches the plane $3x + 2y - z + 2 = 0$ at $(1, -2, 1)$ and cuts orthogonally to the sphere $x^2 + y^2 + z^2 - 4x + 6y + 4 = 0$.

12. (a) Find the angle between the lines of intersection of the plane $x - 3y + z = 0$ and the cone $x^2 - 5y^2 + z^2 = 0$.

Or

(b) Find the equation of the cone whose vertex is $(1, 1, 0)$ and whose guiding curve is $y = 0$, $x^2 + z^2 = 4$.