(FOR THE CANDIDATES ADMITTED DURING THE ACADEMIC YEAR 2025-2026 ONLY)

SUB CODE 25UMS204

REG.NO.:

N.G.M. COLLEGE (AUTONOMOUS): POLLACHI
END-OF-SEMESTER EXAMINATIONS: MAY-2026
B.Sc.- MATHEMATICS **MAXIMUM MARKS: 75**
SEMESTER: II **TIME: 3 HOURS**

PART-III
ANALYTICAL GEOMETRY

SECTION – A (10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS. (K1)

1) The pole of the line $Ax + By + C = 0$ with respect to the parabola $y^2 = 4ax$ is _____.
   (A) $\frac{C}{A}, -\frac{2aB}{A}$ (B) $\frac{C}{A}, \frac{2aB}{A}$ (C) $-\frac{C}{A}, -\frac{2aB}{A}$ (D) $-\frac{C}{A}, \frac{2aB}{A}$
2) Distance between the points (r_1, θ_1) and (r_2, θ_2) is $PQ^2 =$ _____.
   (A) ${r_1}^2 + {r_2}^2$ (B)${r_1}^2 + {r_2}^2 - 2r_1 r_2 \cos(\theta_2 - \theta_1)$
   (C)${r_1}^2 - {r_2}^2$ (D)${r_1}^2 + {r_2}^2 + 2r_1 r_2 \cos(\theta_2 - \theta_1)$
3) The radius of the sphere which has its centre at the point (6, -1, 2) and touches the plane $2x - y + 2z - 2 = 0$ is
   (A) $\sqrt{41}$ (B) 3 (C) 5 (D) 15
4) The equation $x^2 + y^2 + z^2 + 2ux + 2vy + 2wz + d = 0$ represents a cone if
   (A) $\Delta > 0$ (B) $\Delta < 0$ (C) $\Delta = 0$ (D) $\Delta \neq 0$
5) Consider the equation $Ax^2 + By^2 + Cz^2 = 1$. If A, B, C are all real, then the equation represents _____.
   (A) an ellipses (B)a straight line (C)a hyperbola (D) planes

ANSWER THE FOLLOWING IN ONE OR TWO SENTENCES.

6) Obtain the equation of the chord of tangents drawn from (x_1, y_1), to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.
7) Find the Polar equation of a conic.
8) Find the equation of the sphere with centre (-1, 2, -3) and radius 3 units.
9) Define Right circular cone.
10) Define Enveloping Cylinder.

SECTION – B (5 X 5 = 25 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. (K3)

11) (a) If the chord of contact of tangents drawn from P to the circle $x^2 + y^2 = a^2$ subtends a right angle at the centre, find the locus of P.

(OR)

(b) Obtain the equation of the asymptotes of the hyperbola.

12) (a) Find the locus of the foot of the perpendiculars drawn from the pole to the tangents to the circle $r = 2a\cos\theta$.

(OR)

(b) If the tangents at P and Q on a conic intersect at T, then prove that $ST^2 = SP \cdot SQ$, if the conic is a parabola.

13 (a) Find the equation of the sphere having the circle $x^2 + y^2 + z^2 - 2x + 4y - 6z + 7 = 0$, $2x - y + 2z = 5$ for a great circle.

(OR)

(b) Obtain the equation of the tangent plane to the sphere $x^2 + y^2 + z^2 + 2ux + 2vy + 2wz + d = 0$ at point (x_1, y_1, z_1).

14 (a) Find the equation of the cone with vertex O and base curve, the conic in which the surface $ax^2 + bx^2 + cz^2 = 1$ is cut by the plane $l_1x + m_1y + n_1z = p$.

(OR)

(b) Derive the equation of the intersection of a straight line and a quadric cone.

15) (a) Find the equation of the cylinder whose generators are parallel to the line $\frac{x}{l} = \frac{y}{m} = \frac{z}{n}$ and whose guiding curve is $f(x, y, z) = 0,\ ax + by + cz = 0$.

(OR)

(b) Find the equation of the enveloping cylinder of the surface $ax^2 + bx^2 + cz^2 = 1$ having the generator parallel to $\frac{x}{l} = \frac{y}{m} = \frac{z}{n}$.

SECTION – C (5 X 8 = 40 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. (K4 (Or) K5)

16) (a) Derive the equation of the pair of tangents to the parabola $y^2 = 4ax$ from the point (x_1, y_1).

(OR)

(b) A pair of tangents to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ intercept on the x-axis a constant length c. Prove that the locus of the point of intersection is the curve.

17) (a) Tracing the conic $\frac{l}{r} = 1 + e\cos\theta$.

(OR)

(b) If the normal at L, one of the extremities of the latus rectum of the conic $\frac{l}{r} = 1 + e\cos\theta$, meets the curve again in Q, show that $SQ = l \cdot \frac{1+3e^2+e^4}{1+e^2-e^4}$.

18) a) A plane passes through a fixed point (a, b, c) and cuts the axes in A, B, C. Show that the locus of the centre of the sphere OABC is $\frac{a}{x} + \frac{b}{y} + \frac{c}{z} = 2$.

(OR)

(b) Show that the plane $2x - y - 2z = 16$ touches the sphere $x^2 + y^2 + z^2 - 4x + 2y + 2z - 3 = 0$ and find the point of contact.

19) a) Find the equations of the tangent planes to the cone $9x^2 - 4y^2 + 16z^2 = 0$ which contain the line $\frac{x}{32} = \frac{y}{72} = \frac{z}{72}$.

(OR)

(b) Find the equation to the cone through the coordinate axes and the line in which the planes $lx + my + nz = 0$ cuts the cone$x^2 + y^2 + z^2 + 2fyz + 2gzx + 2hxy = 0$.

20) (a) Find the equation of a right circular cylinder of radius 3 with axis $\frac{x+2}{3} = \frac{y-4}{6} = \frac{z-1}{2}$.

(OR)

(b) Find the equation of the tangent planes to $x^2 + y^2 + 4z^2 = 1$ which intersect in the line whose equations are $12x - 3y - 5 = 0,\ z = 1$.

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