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(FOR THE CANDIDATES ADMITTED
DURING THE ACADEMIC YEAR 2024ONLY)

24UMS204

REG.NO. :

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI

END-OF-SEMESTER EXAMINATIONS :MAY-2025

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.
MULTIPLE CHOICE QUESTIONS. **(K1)**

1. Angle between the asymptotes of a hyperbola is _____.
   a) $\sec^{-1}(e)$ b) $2\sec^{-1}(e)$ c)$sec\ (e)$ d) $2\sec(e)$
2. In a conic, the semi-latus rectum is the _____ mean between the segments of a focal chord.
   a) Arithmetic b) Harmonic c) Geometric d) None
3. The plane section of a sphere is a _____.
   a) circle b) straight line c) plane d) sphere
4. The equation of a right circular cone whose vertex is O, axis OZ and semi-vertical angle α is $x^2 + y^2 =$ _____
   a) $z\tan\alpha$ b) $-z\tan\alpha$ c) $z^2\tan^2\alpha$ d) $-z^2\tan^2\alpha$
5. The condition for the plane $lx + my + nz = p$ to touch the conicoid $ax^2 + by^2 + cz^2 = 1$ is $\frac{l^2}{a} + \frac{m^2}{b} + \frac{n^2}{c} =$ _____.
   a) 0 b) 1 c) p d) p^2

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES. **(K2)**

6. Define conjugate points.
7. Write the line perpendicular to $\frac{k}{r} = A\cos\theta + B\sin\theta$.
8. Find the equation of the sphere with centre $(-1,2,-3)$ and radius 3 units.
9. Define a 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) Show that the conjugate lines through a focus of an ellipse are at right angles.

12.a) Derive polar equation of a conic.

(OR)

b) Derive the condition in order that the line $\frac{l}{r} = A\cos\theta + B\sin\theta$ may be a tangent to the conic $\frac{l}{r} = 1 + e\cos\theta$.

(CONTD…….2)

13.a) Find the co-ordinates of the centre and radius of the sphere $2x^2 + 2y^2 + 2z^2 - 2x + 4y + 2z - 15 = 0$.

(OR)

b) Show that the plane $2z - y - 2z = 16$ touches the sphere $x^2 + y^2 + z^2 - 4x + 2y + 2z - 3 = 0$.

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

(OR)

b) Find the general equation to a cone which touches the co-ordinate planes.

15.a) Find the equation of the cylinder whose generators are parallel to the z- axis and the guiding curve is $ax^2 + by^2 = cz, lx + my + nz = p$.

(OR)

b) Find the equations of the tangent planes to $x^2 + y^2 + 4z^2 = 1$ which interest in the line whose equations are $12x - 3y - 5 = 0, z = 11$

SECTION – C (5 X 8 = 40 MARKS)

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

(K4 (Or) K5)

16. a) Prove that the product of the perpendicular drawn from any point on the hyperbola to its asymptotes is constant. **(K4)**

(OR)

b) Find the pole of the line $Ax + By + C = 0$ with respect to the parabola $y^2 = 4ax$. **(K4)**

17.a) Find the equation of the chord of the conic $\frac{l}{r} = 1 + e\cos\theta$ joining the points whose vectorial angles are $\propto -\beta$ and $\propto +\beta$.**(K4)**

(OR)

b) Trace the curve $\frac{10}{r} = 3\cos\theta + 4\sin\theta + 5$. **(K4)**

18. a) Find the equation of the sphere through the four points $(2,3,1), (5,-1,2), (4,3,-1)\ and\ (2,5,3)$. **(K5)**

(OR)

b) Find the equation of the sphere having the circle $x^2 + y^2 + z^2 - 2x + 4y - 6z + 7 = 0$, $2x - y + 2z = 5$ as a great circle. **(K5)**

19.a) Find the equations of the tangent planes to the cone $9x^2 - 4y^2 + 16z^2 = 0$ which contain the line $\frac{x}{32} = \frac{y}{72} = \frac{z}{42}$. **(K4)**

(OR)

b) Find the condition to the cone through the co-ordinate axes and the lines in which plane $lx + my + nz = 0$ cuts the cone $ax^2 + by^2 + cz^2 + 2fyz + 2gzx + 2hxy = 0$. **(K4)**

20.a) Find the equation of a right circular cylinder of radius 3 with axis $\frac{x+2}{2} = \frac{y-4}{6} = \frac{z-1}{2}$. **(K5)**

(OR)

b) Find the locus of a straight line drawn through a fixed point $(\propto, \beta, \gamma)$ at right angles to their polar with respect to the ellipsoid $ax^2 + by^2 + cz^2 = 1$. **(K5)**

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