DECEMBER 2022 **U/ID 32505/UCM2B**

Time : Three hours Maximum : 75 marks

SECTION A — ($10 \times 2 = 20$ marks)

Answer any TEN questions.

1. Define polar.

2. Define conjugate points.

3. Write the equation of the straight line when slope m and y-intercept c is known.

4. Define concyclic points.

5. Find the direction cosines of normal to the plane $2x - 3y + 6z = 7$.

6. Define orthogonal projection on a plane.

7. Find the intercepts of the plane $2x - 3y + 4z = 12$ on the coordinate axes.

8. Write the equation of the line passing through (x_1, y_1, z_1) and (x_2, y_2, z_2).

9. Find the centre and radius of the sphere $x^2 + y^2 + z^2 + 2x - 4y - 6z + 5 = 0$.

10. Write the condition for the straight lines $\frac{x-x_1}{l_1}=\frac{y-y_1}{m_1}=\frac{z-z_1}{n_1}$ and $\frac{x-x_2}{l_2}=\frac{y-y_2}{m_2}=\frac{z-z_2}{n_2}$ to be coplanar.

11. Define conjugate planes.

12. Define limiting point.

SECTION B — ($5 \times 5 = 25$ marks)

Answer any FIVE questions.

13. Find the equation of chord of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ in terms of its midpoint (x_1, y_1).

14. Find the equation of the circle when it passes through the pole O and the diameter through O as the initial line.

15. Find the equation of the plane passing through the intersection of two planes $x+y+z=6$ and $2x+3y+4z+5=0$ and the point (1, 1, 1).

16. Find the equation of the plane through $P(2,2,-1)$, $Q(3,4,2)$ and $R(7,0,6)$.

17. Show that the lines $\frac{x+3}{0}=\frac{y+5}{3}=\frac{z-7}{-3}$ and $\frac{x+1}{4}=\frac{y+1}{5}=\frac{z+1}{-1}$ are Coplanar.

18. Find the length of perpendicular from the point (4, –5, 3) to the line $\frac{x-5}{3} = \frac{y+2}{-4} = \frac{z-6}{5}$.

19. A point moves so that the sum of the squares of its distance from the six faces of a cube is constant. Show that its locus is a sphere.

SECTION C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

20. Show that the eccentric angles of the ends of a pair of conjugate semi-diameter of art ellipse differ by an odd multiple of $\frac{1}{2}\pi$.

21. Derive the equation of a conic in the form $\frac{l}{r} = 1 + e\cos\theta$.

22. Find the area of the triangle whose vertices are the points (1, 2, 3), (–2, 1, –4), (3, 4, –2).

23. Find the equation of the line that intersect the lines $2x + y - 4 = 0 = y + 2z$ and $x + 3z = 4$, $2x + 5z = 8$ and passes through the point (2, –1, 1).

24. Find the equation of the sphere through the circle $x^2 + y^2 + z^2 = 1$; $2x + 4y + 5z = 6$ and touching the plane $z = 0$.

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