MAY 2022 **U/ID 32505/UCM2B**

Time : Three hours Maximum : 75 marks

PART A — ($10 \times 2 = 20$ marks)

Answer any TEN questions.

1. Define pole.

2. Define conjugate points.

3. Define concyclic points.

4. Write the equation of the straight line which passes through the points $A(x_1, y_1)$ and $B(x_2, y_2)$.

5. Find the direction cosines of normal to the plane $x + 2y + 2z = 1$.

6. Define orthogonal projection on a plane.

7. Find the angle between the planes $3x - 4y + 5z = 0$ and $2x - y - 2z = 5$.

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

9. 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.

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

11. Define conjugate planes.

12. Define limiting point.

PART B — ($5 \times 5 = 25$ marks)

Answer any FIVE questions.

13. Find the equation of chord of the ellipse $\frac{x^2}{9}+\frac{y^2}{4}=1$ having (2, –1) as its midpoint.

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

15. Derive the equation of plane in the form $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}=1$.

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 $\frac{x+5}{3}=\frac{y+4}{1}=\frac{z-7}{-2}$ and $3x+2y+z-2=0=x-3y+2z-13$ 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. Find the equation of the sphere through the circle $x^2+y^2+z^2=9$; $2x+3y+4z=5$ and the point (1, 2, 3).

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

20. Show that the eccentric angles of the ends of a pair of conjugate semi-diameter of an 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 equation of the plane through the points (2, 2, 1) and (9, 3, 6) and perpendicular to the plane $2x + 6y + 6z = 9$.

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 two tangent planes to the sphere $x^2 + y^2 + z^2 - 4x + 2y - 6z + 5 = 0$, which are parallel to the plane $2x + 2y = z$.

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