Roll No. | | | | | | | | | | | | | **Total No. of Pages : 03**

Total No. of Questions : 09

Bachelor of Science - Honours (Mathematics). (Sem.–2)

SOLID GEOMETRY

Subject Code : UC-BSHM-202-19

M.Code : 77766

Date of Examination : 22-12-22

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION - B & C. have FOUR questions each.**
3. **Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.**
4. **Select atleast TWO questions from SECTION - B & C.**

SECTION-A

1. Write briefly :

a) Find the angle between the two planes $3x - 2y + z + 17 = 0$, $4x + 3y - 6z + 25 = 0$.

b) Write the equation of a line passing through the points P (x_1, y_1, z_1) and Q (x_2, y_2, z_2).

c) Derive the center-radius form of a sphere.

d) Define great circle.

e) What do you mean by power of a point with respect to a sphere?

f) Define radical planes.

g) Define right circular cone.

h) Define enveloping cylinder.

i) What do you mean by quadratic surfaces? Discuss its different types.

j) Write the equations of an ellipsoid and hyperboloid of one sheet.

SECTION-B

2. a) Find the equation of the plane passing through the points (–1,1,1) and (1,–1,1), and perpendicular to the plane $x + 2y + 2z = 5$.

b) Transform the equations of the line determined by

$x + 2y + z = 3$

$6x + 8y + 3z = 13$

into symmetric form.

3. Find the center and radius of the circle

$x^2 + y^2 + z^2 + 12x - 12y - 16z + 111 = 0,\ 2x + 2y + 2z = 17$

4. a) Find a necessary and sufficient condition for the spheres

$x^2 + y^2 + z^2 + 2u_1x + 2v_1y + 2w_1z + d_1 = 0$

$x^2 + y^2 + z^2 + 2u_2x + 2v_2y + 2w_2z + d_2 = 0$

to intersect orthogonally,

b) Find the locus of a point the powers of which with respect to the spheres

$x^2 + y^2 + z^2 = 1$

$x^2 + y^2 + z^2 + 2x - 2y + 2z + 1 = 0$

$x^2 + y^2 + z^2 - x + 4y - 6z - 2 = 0$

are equal.

5. a) Find the equations of the spheres passing through the circle

$x^2 + y^2 + z^2 - 6x - 2z + 5 = 0,\ y = 0$ and touching the plane $3y + 4z + 5 = 0$.

b) Find the condition when the plane $lx + my + nz = p$ becomes a tangent plane to the sphere $x^2 + y^2 + z^2 + 2ux + 2vy + 2wz + d = 0$.

SECTION C

6. Show that the equation $4x^2 - y^2 + 2z^2 - 3yz + 2xy + 12x - 11y + 6z + 4 = 0$ represents a cone. Also show that its vertex is $(-1, -2, -3)$.

7. a) Find the equation of the right circular cylinder of radius 2 and whose axis is the line

$$\frac{x-3}{5} = \frac{y-1}{4} = \frac{z+2}{2}$$

b) Find the equation of the cylinder whose generators are parallel to $\frac{x}{1}=\frac{y}{2}=\frac{z}{3}$ and which intersects the curve $2x^2 + 3y^2 = 4$, $z = 1$.

8. Identify the surfaces

a) $x^2 + 4y^2 + 3z^2 + 2x - 8y + 9z - 10 = 0$

b) $x^2 + 2y^2 - z^2 + 2x + 4y - 6z - 18 = 0$

9. a) Find the point of intersection of the line $\frac{x+5}{-3} = \frac{y-4}{1} = \frac{z-11}{1}$ = with the hyperboloid $12x^2 - 17y^2 + 7z^2 - 7 = 0$.

b) Find the equation of the tangent plane and normal to the surface $xy = z$ at the point (1, 2, 3).

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.