

Biyani Girls college ,Jaipur

Model Paper-A (B.Sc. I)

Subject:Mathematics

Paper : Third (Three dimension geometry and optimization theory)

Max Marks: 32

Max Time: 2:30 hrs

Attempt any five questions in all selecting atleast one question from each unit.

UNIT-I

1. a. Find the equation to a sphere which has its center to the origin and touches the line

$$2(x+1) = 2 - y = z + 3.$$

b. Obtain the equation to the sphere which passes through the points (1,0,0) ,(0,1,0) and (0,0,1) and has its radius as small as possible.

2.a. Prove that the line $\frac{x}{l} = \frac{y}{m} = \frac{z}{n}$ where $l^2 - 2m^2 + 3n^2 = 0$ is a generating line of the cone

$$x^2 - 2y^2 + 3z^2 = 0.$$

b. To find the condition that the cone $F(x, y, z) = ax^2 + by^2 + cz^2 + 2fyz + 2gzx + 2hxy = 0$ may have three mutually perpendicular generators.

UNIT-II

3. a. Find the equation of right circular cylinder whose guiding circle is $x^2 + y^2 + z^2 = 9; x - y + z = 3$.

b. Define director sphere of a central conicoid .Find the equation of director sphere of the following central conicoid $Ax^2 + By^2 + Cz^2 = 1$.

4a. To find the condition that the plane $lx + my + nz = p$ touches the conicoid $ax^2 + by^2 + cz^2 = 1$.

b. Tangent planes are drawn the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$ through (α, β, γ) prove that the

perpendiculars to form the origin generate the cone $(\alpha x + \beta y + \gamma z)^2 = a^2 x^2 + b^2 y^2 + c^2 z^2$.

UNIT-III

5a.Reduce the equation $3x^2 - 24y^2 + 8z^2 + 16yz - 10zx - 14xy + 22y + 2z - 4 = 0$ to standard form and find the equation to its axis.

b. Reduce the equation $36x^2 + 4y^2 + z^2 - 4yz - 12zx - 24xy + 4x + 16y - 26z - 3 = 0$ to standard form and state the nature of surface.

6a. Find the equation to the generating lines of the hyperboloid $yz + 2zx + 3xy + 6 = 0$ which passes through the point $(-1, 0, 3)$.

b. Prove that any generator of λ -system intersects any generator of the μ -system of hyperboloid of one sheet.

UNIT-IV

7.a. The set of all feasible solution of a L.P.P. is a convex set.

b. Write relation between primal and dual.

8a. Write the dual of the following L.P.P.

$Min Z = x_1 - 3x_2 - 2x_3$ s.t. $3x_1 - x_2 + 2x_3 \leq 7$; $2x_1 - 4x_2 \geq 12$; $-4x_1 + 3x_2 + 8x_3 = 10$; $x_1, x_2, x_3 \geq 0$
 x_3 is unrestricted in sign.

b. Prove that the intersection of two convex sets is also a convex set.