Exam Code: 0002
Sub. Code: 0145

2071
B.A./B.Sc. (General) Second Semester
Mathematics
Paper – I: Solid Geometry

Time allowed: 3 Hours

Max. Marks: 30

***NOTE:** Attempt <u>five</u> questions in all, selecting atleast two questions each Unit.*

x-x-x

UNIT – I

I. a) Shift the origin to a suitable point so that the equation $2x^2 - 3y^2 + z^2 + 8x + 6y + 3 = 0$ is transformed into an equation in which the first degree terms are absent.

b) Transform the equation $x^2 + 7y^2 + z^2 + 8yz + 16zx - 8xy - 9 = 0$ referred to axis as the lines joining the origin to the points (1,2,2), (2,-2,1) and (2,1,-2) (2x3)

II. a) A sphere of constant radius k passes through the origin and meets the axis in A, B, C. Prove that the centroid of the triangle ABC lies on the sphere $9(x^2 + y^2 + z^2) = 4k^2$.

b) Find the equation of the sphere which passes through the circle $x^2 + y^2 = 4, z= 0$ and is cut by the plane $x + 2y + 2z = 0$ in a circle of radius 3. (2x3)

III. a) Prove that the spheres $x^2 + y^2 + z^2 + 2ax + c = 0$ and $x^2 + y^2 + z^2 + 2by + c = 0$ tough iff $\frac{1}{a^2}+\frac{1}{b^2}=\frac{1}{c}$, $a^2, b^2 > c > 0$.

b) Find the limiting points of the co-axial system of sphere.
$x^2 + y^2 + z^2 - 20x + 30y - 40z + 29 + \lambda(2x - 3y + 4z) = 0$. (2x3)

IV. a) Find the equation of right circular cylinder whose generating circle is $x^2 + y^2 + z^2 = 4, x + y + z = 3$

P.T.O.

b) Find the equation of right circular cylinder which envelops a sphere of centre (a,b,c) and radius r and has its generators parallel to the direction <l,m,n> (2x3)

UNIT – II

V. a) Find the equation of the cone with vertex at the origin and which passes through the curve given by

$x^2 + y^2 + z^2 - x - 1 = 0,\ x^2 + y^2 + z^2 + y - 2 = 0.$

b) Find the equation of the cone of revolution with vertex at the origin, the axis as the y-axis and semi-vertical angle 30^0. (2x3)

VI. a) Find the equation of the cone passing through coordinate axes and the three mutually per perpendicular lines $\frac{x}{2} = y = -z, x = \frac{y}{3} = \frac{z}{5}, \frac{x}{8} = \frac{y}{-11} = \frac{z}{5}$.

b) Find the equation of the cone whose vertex is at the point (-1,1,2) and whose guiding curve is $3x^2 - y^2 = 1, z = 0$. (2x3)

VII. a) Prove that the lines drawn from the origin so as to touch the sphere

$x^2 + y^2 + z^2 + 2ux + 2vy + 2wz + d = 0$ lie on the cone

$d(x^2 + y^2 + z^2) = (ux + vy + wz)^2$.

b) Show that $2y^2 - 8yz - -4zx - 8xy + 6x - 4y - 2z + 5 = 0$ represents a cone. Find the coordinates of its vertex. (2x3)

VIII. a) identify the surface

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

b) Show that the curve

$6x^2 - 3y^2 - 2z^2 + 12x + 12y - 12 = 0$ represents hyperboloid of two sheets.

(2x3)

x-x-x