(i) **Printed Pages: 3** **Roll No. ....**

(ii) **Questions : 8** **Sub. Code : 0 1 4 5**

Exam. Code : 0 0 0 2

B.A./B.Sc. (General) 2nd Semester

(2042)

MATHEMATICS

Paper : I Solid Geometry

Time Allowed : Three Hours] **[Maximum Marks : 30**

Note :— Attempt **five** questions in all, selecting at least **two** questions from each Unit.

UNIT–I

I. (a) Reduce the equation

$$3x^2 - y^2 - z^2 + 6yz - 6x + 6y - 2z - 2 = 0$$

to the form in which the linear terms are absent.

(b) Find the transformed equation of the surface

$$3x^2 + 5y^2 + 3z^2 + 2yz + 2zx + 2xy = 1$$

referred to the axes through the same origin and having direction numbers $<-1, 0, 1>$, $<1, -1, 1>$, $<1, 2, 1>$.

2×3

II. (a) Show that the equation of the sphere through the three points (3, 0, 2), (–1, 1, 1), (2, –5, 4) and having its centre on the plane $2x + 3y + 4z = 6$ is $x^2 + y^2 + z^2 + 4y - 6z = 1$.

(b) Obtain the equation of spheres which pass through the circle $x^2 + y^2 + z^2 - 2x + 2y + 4z - 3 = 0$, $2x + y + z = 4$ and touch the plane $3x + 4y = 14$. 2×3

III. (a) Find the equation to the cylinder whose generators are parallel to the line $\frac{x}{1}=\frac{y}{-2}=\frac{z}{3}$ and whose guiding curve is the ellipse $x^2 + 2y^2 = 1$, $z = 3$.

(b) Find the equation of right circular cylinder whose axis is $\frac{x-2}{2}=\frac{y-1}{1}=\frac{z}{3}$ and passes through (0, 0, 3). 2×3

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

(b) Find the equation of the enveloping cylinder of the sphere $x^2 + y^2 + z^2 - 2x + 4y + 1 = 0$ and having its generators parallel to the line $x = y = z$. 2×3

UNIT–II

V. (a) Find the equation of the right circular cone whose vertex is (3, 2, 1), axis the line $\frac{x-3}{4}=\frac{y-2}{1}=\frac{z-1}{3}$ and semi-vertical angle 30°.

(b) Find the equation of the cone passing through the co-ordinate axes and the three mutually perpendicular lines

$$\frac{x}{2}=\frac{y}{1}=\frac{z}{-1}, \frac{x}{1}=\frac{y}{3}=\frac{z}{5}, \frac{x}{8}=\frac{y}{-11}=\frac{z}{5}$$

2×3

VI. (a) Find the equation of the cone having vertex (2, 3, 1) and passing through the curve

$$x^2 + y^2 + z^2 - 2x + 4y - 6z + 7 = 0 \text{ and } x + 2y + 2z = 5$$

(b) Find the equations of the line in which the plane $x - 2y - z = 0$ cuts the cone $3x^2 + 4y^2 - z^2 = 0$. Also find angle between them. 2×3

VII. (a) Find the equation of the surface generated by the revolution of the circle $x^2 + y^2 - 6x + 9 - r^2 = 0$; $z = 0$ about y-axis $(r < 3)$.

(b) Identify the following surface :

$$x^2 + y^2 + z^2 + 2x - 4y - 16z - 31 = 0.$$ 2×3

VIII. Prove that surface represented by

$$26x^2 + 20y^2 + 10z^2 - 4yz - 16zx - 36xy + 52x - 36y - 16z + 25 = 0$$

is an elliptic cylinder. Find the equation of its axis also.

1×6