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**SA—76—2025**

**FACULTY OF SCIENCE**

**B.Sc. (First Year) (Second Semester) EXAMINATION**

**APRIL/MAY, 2025**

**MATHEMATICS**

**Paper IV**

**(Geometry)**

**(Thursday, 24-4-2025)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

*Note :— (i) All questions are compulsory.*

*(ii) Figures to the right indicate full marks.*

1. If  $l, m, n$  are the direction cosines of a line then show that :

$$l^2 + m^2 + n^2 = 1$$

Also, if 6, 2, 3 are direction ratios of a line, then find the direction cosines of that line. 15

*Or*

(a) Prove that every equation of the first degree in  $x, y, z$  represents a plane. 8

(b) Find the equation of the plane through the points : 7

P(2, 2, -1), Q (3, 4, 2), R (7, 0, 6)

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2. To find the equations of the line passing through a given point :

$$A(x_1, y_1, z_1)$$

and having direction cosines  $l, m, n$ .

Also, find the co-ordinates of the point of intersection of the line : 15

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

Or

(a) Show that a plane section of a sphere is a circle. 8

(b) 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). 7

3. Attempt any *two* of the following : 10

(a) Find the centre and radii of the following sphere :

$$x^2 + y^2 + z^2 - 6x + 8y - 10z + 1 = 0$$

(b) Find the equation to the plane which passes through the point :

$$(x_1, y_1, z_1)$$

and the line :

$$\frac{x-a}{l} = \frac{y-b}{m} = \frac{z-c}{n}$$

- (c) Find the angle between the following pairs of planes :

$$2x - y + 2z = 3; 3x + 6y + 2z = 4$$

- (d) If  $\alpha, \beta, \gamma$  be the angles which a line makes with the positive direction of the axes, prove that :

$$\sin^2 \alpha + \sin^2 \beta + \sin^2 \gamma = 2.$$