

This question paper contains 3 printed pages]

**VA—76—2024**

**FACULTY OF SCIENCE**

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

**NOVEMBER/DECEMBER, 2024**

**(New Course)**

**MATHEMATICS**

**Paper–IV**

**(Geometry)**

**(Friday, 13-12-2024)**

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

*Time—2 Hours*

*Maximum Marks—40*

**N.B.** :— (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) Find the equation of a plane in terms of the intercepts  $a, b, c$  which it makes on the axes. 8

P.T.O.

- (b) Find the equation of the plane which passes through (2, 2, 1), (9, 3, 6) and is perpendicular to the plane  $2x + 6y + 6z = 9$ . 7
2. Find the length of perpendicular from a given point  $p(x_1, y_1, z_1)$  to a given line : 15

$$\frac{x - \alpha}{l} = \frac{y - \beta}{m} = \frac{z - \gamma}{n}$$

Also, find the length of the perpendicular from the point (4, -5, 3) to the line

$$\frac{x - 5}{3} = \frac{y + 2}{-4} = \frac{z - 6}{5}.$$

Or

- (a) Show that a plane section of a sphere is a circle. 8
- (b) Find the equation of 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 center and radii of the sphere :

$$x^2 + y^2 + z^2 + 2x - 4y - 6z + 5 = 0$$

- (b) Find the angle between the line :

$$\frac{x - x_1}{l} = \frac{y - y_1}{m} = \frac{z - z_1}{n}$$

and the plane

$$ax + by + cz + d = 0.$$

- (c) Find the angle between the pair of planes :

$$2x - y + z = 6; x + y + 2z = 7$$

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

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