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PA—76—2024

FACULTY OF SCIENCE

B.Sc. (Second Semester) EXAMINATION

APRIL/MAY, 2024

(New Pattern)

MATHEMATICS

Paper IV

(Geometry)

(Tuesday, 23-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—Two Hours *Maximum Marks*—40

Note :— (*i*) Attempt *all* questions.

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

1. If l, m, n are the direction cosines of a line, then show that : 15

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

Also, if α, β, γ be the angles which a line makes with the positive direction of the axes, then prove that :

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

P.T.O.

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Or

(*a*) Show that every equation of the first degree in x, y, z represent a plane. 8

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

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

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

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

with the plane :

$$3x + 4y + 5z = 5.$$

Or

(*a*) To find the equation of the sphere described on the segment joining the points : 8

$$A(x_1, y_1, z_1), B(x_2, y_2, z_2)$$

as a diameter.

(*b*) Find the equation of the cone whose vertex is (α, β, γ) and base :

$$ax^2 + by^2 = 1, \quad z = 0.$$ 7

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3. Attempt any two of the following : 10

(*a*) If 6, 2, 3 are direction ratios of a line. What are the direction cosines ?

(*b*) Find the angle between the planes :

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

(*c*) Show that the line :

$$\frac{1}{3}(x-2) = \frac{1}{4}(y-3) = \frac{1}{5}(z-4)$$

is parallel to the plane :

$$2x + y - 2z = 3\,.$$

(*d*) Find the radius and centre of the sphere :

$$x^2 + y^2 + z^2 - 2x + 4y - 6z = 2\,.$$

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