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BF—73—2016

FACULTY OF SCIENCE

B.Sc. (Second Semester) EXAMINATION

OCTOBER/NOVEMBER, 2016

MATHEMATICS

Paper IV

(Geometry)

(MCQ+Theory)

(Thursday, 20-10-2016) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) *All* questions are compulsory.

(*ii*) First **30** minutes for Question No. **1** and remaining time for other questions.

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

(*iv*) Use black ball pen to darken the circle on OMR sheet for Q. No. **1**.

(*v*) Negative marking system is applicable for Q. No. **1** (MCQ).

(MCQ)

1. Choose the *correct* alternative for each of the following : 1 each

(*i*) The equation of XOY-plane is .....

(*a*) Y = 0 (*b*) Z = 0

(*c*) X = 0 (*d*) Z = C, C ≠ 0

(*ii*) If l, m, n are the direction cosines of a line, then .....

(*a*) $l^2 + m^2 + n^2 = 1$ (*b*) $l^2 + m^2 + n^2 = 0$

(*c*) $l + m + n = 1$ (*d*) $l = m = n = 1$

(*iii*) The angle between the planes :

$ax + by + cz + d = 0$ and $a'x + b'y + c'z + d' = 0$

is :

(*a*) $\cos^{-1}(aa' + bb' + cc')$ (*b*) $\sin^{-1}(aa' + bb' + cc')$

(*c*) $\cos^{-1}\left(\dfrac{aa' + bb' + cc'}{\sqrt{(\Sigma a^2)(\Sigma a'^2)}}\right)$ (*d*) $\sin^{-1}\left(\dfrac{aa' + bb' + cc'}{\sqrt{(\Sigma a^2)(\Sigma a'^2)}}\right)$

P.T.O.

(*iv*) The equation of the plane through the origin and parallel to the plane :

$$3x - 4y + 5z - 6 = 0$$

is :

(*a*) $3x - 4y + 5z + 6 = 0$ (*b*) $3x + 4y - 5z + 6 = 0$

(*c*) $3x - 4y - 5z - 6 = 0$ (*d*) $3x - 4y + 5z = 0$

(*v*) The value of λ for which the lines :

$$\frac{x-1}{1} = \frac{y-2}{\lambda} = \frac{z+1}{-1} \text{ and } \frac{x+1}{-\lambda} = \frac{y+1}{2} = \frac{z-2}{1}$$

are perpendicular to each other is .....

(*a*) 1 (*b*) –1

(*c*) 0 (*d*) 2

(*vi*) The lines $\frac{x-1}{1} = \frac{y-2}{z} = \frac{z-3}{3}$ and $\frac{x}{2} = \frac{y+2}{2} = \frac{z-3}{-2}$ are .....

(*a*) skew (*b*) parallel

(*c*) at right angles (*d*) intersecting

(*vii*) The straight line passing through (a, b, c) and parallel to the x-axis is .....

(*a*) $\frac{x-a}{0} = \frac{y-b}{0} = \frac{z-c}{1}$ (*b*) $\frac{x-a}{1} = \frac{y-b}{0} = \frac{z-c}{0}$

(*c*) $\frac{x-a}{1} = \frac{y-b}{1} = \frac{z-c}{0}$ (*d*) $\frac{x-a}{0} = \frac{y-b}{1} = \frac{z-c}{1}$

(*viii*) The two equations

$$x^2 + y^2 + z^2 + 2ux + 2vy + 2wz + d = 0 \text{ and } lx + my + nz = p$$

taken together represent a .....

(*a*) circle (*b*) sphere

(*c*) plane (*d*) pair of planes

(*ix*) The equation of the sphere passing through (0, 0, 0), (a, 0, 0), (0, b, 0) (0, 0, c) is .....

(a) $x^2 + y^2 + z^2 - ax - by - cz = 0$

(b) $x^2 + y^2 + z^2 + 2ax + 2by + 2cz = 0$

(c) $x^2 + y^2 + z^2 - 2ax - 2by - 2cz = 0$

(d) $x^2 + y^2 + z^2 + ax + by + cz = 0$

(*x*) Guiding curve of a right circular cylinder is .....

(a) ellipse (b) any closed curve

(c) circle (d) pair of straight lines

(Theory)

2. Attempt any *two* of the following : 5 each

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

(b) Find the equation of a plane in terms of the intercepts a, b, c which it makes on the axes.

(c) The projection of a line on the axes are 2, 3, 6. What is the length of the line ?

3. Attempt any *two* of the following : 5 each

(a) 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.

(b) Find the condition that two given straight lines :

$$\frac{x - x_1}{l_1} = \frac{y - y_1}{m_1} = \frac{z - z_1}{n_1},$$

$$\frac{x - x_2}{l_2} = \frac{y - y_2}{m_2} = \frac{z - z_2}{n_2}$$

are coplanar.

(c) Show that the lines :

$$\frac{x-4}{1} = \frac{y+3}{-4} = \frac{z+1}{7}, \quad \frac{x-1}{2} = \frac{y+1}{-3} = \frac{z+10}{8}$$

intersect and find the co-ordinates of the point of intersection.

P.T.O.

4. Attempt any *two* of the following : 5 each

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

(*b*) Find the equation of the cone whose vertex is the point (α, β, γ) are whose generators intersect the conic :

$$ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0,\ z = 0 .$$

(*c*) 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).