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V—71—2017

FACULTY OF SCIENCE

B.Sc. (Second Semester) EXAMINATION

OCTOBER/NOVEMBER, 2017

(CBCS/CGPA Pattern)

MATHEMATICS

Paper IV

(Geometry)

(Monday, 13-11-2017) **Time : 10.00 a.m. to 12.00 noon**

Time— Two Hours *Maximum Marks*—40

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

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

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

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

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

(*i*) If O be the origin of coordinates and (x, y, z) the co-ordinates of a point P : l, m, n are the direction cosines of the line OP and r, the length of the segment OP, then :

(*a*) $x = lr, y = mr, z = nr$ (*b*) $l = rx, m = ry, n = zr$

(*c*) $r = lx, y = mr, z = nr$ (*d*) $x = \frac{l}{r}, y = \frac{m}{r}, z = \frac{n}{r}$

(*ii*) 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*) $\cos^{-1}\left[\frac{aa' + bb' + cc'}{\sqrt{(\Sigma a^2)(\Sigma a'^2)}}\right]$

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

P.T.O.

(*iii*) The distance between the parallel planes $x + 2y - 2z + 1 = 0$ and $2x + 4y - 4z + 5 = 0$ is :

(*a*) $\frac{1}{3}$ (*b*) $\frac{5}{6}$

(*c*) $\frac{3}{2}$ (*d*) $\frac{1}{2}$

(*iv*) The equations of the line passing through a given point $A(x_1, y_1, z_1)$ and having direction cosines l, m, n ; $lmn \neq 0$, are

(*a*) $x - x_1 = l, y - y_1 = m, z - z_1 = n$

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

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

(*d*) None of the above

(*v*) The line $\frac{x - x_1}{l} = \frac{y - y_1}{m} = \frac{z - z_1}{n}$ is parallel to the plane $ax + by + cz + d = 0$ if :

(*a*) $lx + my + nz = 0$ (*b*) $al + bm + cn = 0$

(*c*) $lx_1 + my_1 + nz_1 = 0$ (*d*) $a^2 + b^2 + c^2 \neq 0$

(*vi*) The lines L_1 and L_2 intersect. The shortest distance between them is :

(*a*) Zero (*b*) Positive

(*c*) Negative (*d*) Infinity

(*vii*) Two equations of the first degree in *x, y, z* represents :

(*a*) sphere (*b*) cone

(*c*) cylinder (*d*) line

(*viii*) The centre of the sphere $x^2 + y^2 + z^2 + 2x - 4y - 6z + 5 = 0$ is :

(*a*) (1, 2, 3) (*b*) (1, –2, 3)

(*c*) (–1, 2, 3) (*d*) (1, 2, –3)

(*ix*) The locus of the points of intersection of two spheres is a.............

(*a*) plane (*b*) sphere

(*c*) cone (*d*) circle

(*x*) An individual straight line on the surface of a cone is called its.........................

(*a*) Guiding curve (*b*) Generator

(*c*) Vertex (*d*) None of these

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

(*a*) Prove that the projection of a segment AB on a line CD is AB.cosθ, where θ is the angle between the lines AB and CD.

(*b*) Find the equation of the plane through the three non-collinear points (x_1, y_1, z_1), $(x_2\, y_2, z_2)$, (x_3, y_3, z_3).

(*c*) Find the equation of the plane through the point (2, 3, 4) and parallel to the plane $5x - 6y + 7z = 3$.

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

(*a*) Show that the shortest distance between two lines lies along the line meeting them both at right angles.

(*b*) Show that the line :

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

is parallel to the plane

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

(*c*) Show that the lines :

$$\frac{x+5}{3} = \frac{y+4}{1} = \frac{z-7}{-2},$$

$$3x + 2y + z - 2 = 0 = x - 3y + 2z - 13$$

are coplanar and find the equation to the plane in which they lie.

P.T.O.

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

(*a*) Find the locus of the points of contact of the tangent planes which pass through a given point (α, β, γ) and touch the sphere $x^2 + y^2 + z^2 + 2ux + 2vy + 2wz + d = 0$.

(*b*) Find the equation of the cylinder whose generators intersect the conic $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$, $z = 0$ and are parallel to the line $\frac{x}{l} = \frac{y}{m} = \frac{z}{n}$.

(*c*) Obtain the equations of the circle lying on the sphere :

$$x^2 + y^2 + z^2 - 2x + 4y - 6z + 3 = 0$$

and having its centre at (2, 3, –4).