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W—79—2018

FACULTY OF SCIENCE

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

OCTOBER/NOVEMBER, 2018

(CBCS/CGPA Pattern)

MATHEMATICS

Paper-IV

(Geometry)

(MCQ+Theory)

(Friday, 19-10-2018) **Time : 10.00 a.m. to 12.00 noon**

Time—Two 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 question No. **1**.

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

MCQ 10

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

(*i*) What are the direction cosines of the axes of co-ordinates ?

(*a*) (1,0,0), (0,1,0), (0,0,1) (*b*) (1,1,0), (0,1,0), (0,0,1)

(*c*) (1,0,0), (0,1,1), (0,0,1) (*d*) (0,0,0), (1,1,1), (0,1,1)

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

(*a*) AB $\sin\theta$ (*b*) AB $\tan\theta$

(*c*) AB $\cos\theta$ (*d*) A $\sin\theta$

P.T.O.

(*iii*) The equation to a plane in normal form is :

(*a*) $\frac{x}{a}+\frac{y}{b}+\frac{c}{c}=1$

(*b*) $lx+my+nz=p$

(*c*) $\frac{x}{l}+\frac{y}{m}+\frac{z}{n}=1$

(*d*) $ax+by+cz=0$

(*iv*) The normal form of the equation $ax+by+cz+d=0$ is :

$$\frac{a}{\sqrt{\Sigma a^2}}x+\frac{b}{\sqrt{\Sigma a^2}}y+\frac{c}{\sqrt{\Sigma a^2}}z=-\frac{d}{\sqrt{\Sigma a^2}}$$

if d is :

(*a*) Positive

(*b*) Positive and negative

(*c*) Zero

(*d*) Negative

(*v*) Any point on the line

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

is given by :

(*a*) $(\alpha+lr, \beta+mr, \gamma+nr)$

(*b*) $(l\alpha, m\beta, n\gamma)$

(*c*) (α, β, γ)

(*d*) None of these

(*vi*) If $Al+Bm+Cn=0$, then the general equation of a plane containing the line $\frac{x-x_1}{l}=\frac{y-y_1}{m}=\frac{z-z_1}{n}$ is :

(*a*) $A(x-x_1)-B(y-y_1)-C(z-z_1)=0$

(*b*) $A(x-x_1)+B(y-y_1)+C(z-z_1)=0$

(*c*) $A(x-x_1)+B(y-y_1)+C(z-z_1)=1$

(*d*) $A(x-x_1)-B(y-y_1)-C(z-z_1)=1$

(*vii*) By any transformation of axes, the degree of an equation is ....

(*a*) altered (*b*) unaltered

(*c*) both (*a*) and (*b*) (*d*) none of these

(*viii*) The centre of the sphere

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

is :

(*a*) (1, 2, 3) (*b*) (–1, –2, 3)

(*c*) (1, –2, 3) (*d*) (1, –2, –3)

(*ix*) The general equation of a sphere through the circle

$$x^2 + y^2 + 2gx + 2fy + c = 0,\ z = 0$$

is :

(*a*) $x^2 + y^2 + z^2 + 2gx + 2fy + 2kz + c = 0$, where k is a parameter

(*b*) $x^2 + y^2 + z^2 + gx + fy + kz + c = 0$, where k is a parameter

(*c*) $x^2 + y^2 + z^2 + 2gx + 2fy + 2z + c = 0$

(*d*) $x^2 + y^2 + z^2 + 2gx + 2fy + 2z + c = 1$

(*x*) The length of the perpendicular from any point on a right circular cylinder to its axis is equal to its ....

(*a*) diameter (*b*) radius

(*c*) circumference (*d*) none of these

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 the plane through the three non-collinear point :

$$(x_1, y_1, z_1),\ (x_2, y_2, z_2), (x_3, y_3, z_3).$$

P.T.O.

(*c*) The direction cosines l, m, n of two lines are connected by the relations $l + m + n = 0$, $2lm + 2ln - mn = 0$. Find them.

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

(*a*) Find the length of the perpendicular from a given point $P(x_1, y_1, z_1)$ to a given line $\frac{x-\alpha}{l} = \frac{y-\beta}{m} = \frac{z-\gamma}{n}$.

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

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

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

(*a*) Find the pole of the plane $lx + my + nz = p$ with respect to the sphere $x^2 + y^2 + z^2 = a^2$.

(*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*) Find the equation of the sphere which touches the plane $3x + 2y - z + 2 = 0$ at the point $(1, -2, 1)$ and cuts orthogonally the sphere $x^2 + y^2 + z^2 - 4x + 6y + 4 = 0$.