This question paper contains **4** printed pages]

# Y—93—2019

## FACULTY OF SCIENCE

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

## OCTOBER/NOVEMBER, 2019

MATHEMATICS

Paper IV

(Geometry)

(MCQ + Theory)

**(Tuesday, 19-11-2019)** **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** (MCQs)

(MCQ)

1. Choose the *correct* alternative for each of the following : 10

(*i*) The direction cosines of $z$-axis are :

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

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

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

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

(*c*) $ax + by + cz = p$ (*d*) $lx + my + nz = p$

P.T.O.

(*iii*) The equation of the plane passes through the intersection of the planes $x + y + z = 6$ and $2x + 3y + 4z + 5 = 0$ and the point (1, 1, 1) then the value of 'K' is :

(*a*) $\frac{3}{14}$ (*b*) $\frac{2}{14}$

(*c*) 14 (*d*) 1

(*iv*) The value of 'K', so that the lines $\frac{x-1}{-3} = \frac{y-2}{2k} = \frac{z-3}{2}$ and $\frac{x-1}{3k} = \frac{y-5}{1}$ $= \frac{z-6}{-5}$ are perpendicular to each other is .....

(*a*) $\frac{-10}{7}$ (*b*) $\frac{-6}{7}$

(*c*) $\frac{-8}{7}$ (*d*) 1

(*v*) The equation of the line through two points $(x_1, y_1 z_1)$ and $(x_2, y_2, z_2)$ :

(*a*) $\frac{x - x_1}{x_2 - x_1} = \frac{y - y_1}{y_2 - y_1} = \frac{z - z_1}{z_2 - z_1}$

(*b*) $\frac{x + x_1}{x_2 - x_1} = \frac{y + y_1}{y_2 - y_1} = \frac{z + z_1}{z_2 - z_1}$

(*c*) $\frac{x + x_1}{x_2 + x_1} = \frac{y + y_1}{y_2 + y_1} = \frac{z + z_1}{z_2 + z_1}$

(*d*) $\frac{x - x_1}{x_2 + x_1} = \frac{y - y_1}{y_2 + y_1} = \frac{z - z_1}{z_2 + z_1}$

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

(*a*) Parallel (*b*) Skew

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

(*vii*) The equation to the sphere on the join of $(x_1, y_1, z_1)$ and $(x_2, y_2, z_2)$ as the diameter is :

(*a*) $(x - x_1)(x - x_2)(y - y_1)(y - y_2)(z - z_1)(z - z_2) = 0$

(*b*) $\frac{x-x_1}{x-x_2}+\frac{y-y_1}{y-y_2}+\frac{z-z_1}{z-z_2}=0$

(*c*) $\sqrt{(x-x_1)(x-x_2)}+\sqrt{(y-y_1)(y-y_2)}+\sqrt{(z-z_1(z-z_2}=0$

(*d*) None of the above

(*viii*) The Locus of points, common to a sphere and a plane, is :

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

(*c*) a line (*d*) a plane

(*ix*) Guiding curve of a right circular cylinder is :

(*a*) ellipse (*b*) circle

(*c*) any closed curve (*d*) pair of straight lines

(*x*) The number of arbitrary constants in the equation of a cone, is :

(*a*) 3 (*b*) 4

(*c*) 5 (*d*) 7

**(Theory)**

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

(*i*) Show that the projection of a segment AB on a line CD is AB $\cos\theta$, where is the angle between the line AB and CD.

P.T.O.

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

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

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

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

(*ii*) Find the angle between the line $\frac{x-x_1}{l} = \frac{y-y_1}{m} = \frac{z-z_1}{n}$ and the plane $ax + by + cz + d = 0$

(*iii*) Find the equation of the plane containing the line $\frac{x+2}{2} = \frac{y-3}{3} = \frac{z-4}{-2}$ and the point (0, 6, 0)

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

(*i*) Show that the locus of points common to a sphere and a plane is a circle.

(*ii*) Find the equation of the right circular cone whose vertex is the point $(\alpha, \beta, \gamma)$ and whose axis is the line $\frac{x-\alpha}{l} = \frac{y-\beta}{m} = \frac{z-\gamma}{n}$ and semi-vertical angle $\theta$.

(*iii*) Find the right circular cylinder whose radius is 2 and axis is the line $\frac{x-1}{2} = \frac{y-2}{1} = \frac{z-3}{2}$.