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AO—70—2018

FACULTY OF SCIENCE

B.Sc. (Second Semester) EXAMINATION

MARCH/APRIL, 2018

(CBCS/CGPA)

MATHEMATICS

Paper IV

(Geometry)

(MCQ & Theory)

(Tuesday, 27-03-2018) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *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 : 1 each

(*i*) The sum of the squares of the direction cosines of every line is :

(*a*) Two (*b*) One

(*c*) Three (*d*) Zero

(*ii*) The intercept on z-axis of the plane $x + y + 2z = 2$ is :

(*a*) 1 (*b*) 2

(*c*) 4 (*d*) 3

(*iii*) The length of the perpendicular from a point (x_1, y_1, z_1) to a plane $ax + by + cz + d = 0$ is :

(*a*) $ax_1 + by_1 + cz_1 + d = 0$ (*b*) $ax_1 + by_1 + cz_1 - d = 0$

(*c*) $\dfrac{ax_1 + by_1 + cz_1 + d}{\sqrt{a^2 + b^2 + c^2}}$ (*d*) $\dfrac{ax_1 + by_1 + cz_1 + d}{a^2 + b^2 + c^2}$

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

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

(*a*) $al + bm - cn = 0,\ ax_1 + by_1 + cz_1 + d = 0$

(*b*) $al + bm + cn = 0,\ ax_1 + by_1 + cz_1 + d = 0$

(*c*) $al + bm + cn = 0,\ ax_1 - by_1 + cz_1 + d = 0$

(*d*) $al + bm + cn = 0,\ ax_1 + by_1 - cz_1 - d = 0$

(*vi*) The perpendicular distance of P(1, 2, 3) from the line $\frac{x-6}{3}=\frac{y-7}{2}=\frac{z-7}{-2}$ is :

(*a*) –6 (*b*) 6

(*c*) –7 (*d*) 7

(*vii*) 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)

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

(*a*) a circle (*b*) a plane

(*c*) a sphere (*d*) a line

(*ix*) The general equation of a sphere through the circle $x^2 + y^2 + 2gx + 2fy + c = 0,\ z = 0$ is :

(*a*) $x^2 + y^2 + z^2 \neq 0$

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

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

(*d*) $x^2 + y^2 + z^2 = 0$

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

(*a*) Circumference (*b*) Diameter

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

Theory

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

(*a*) Show that the projection of the segment joining the points $P(x_1, y_1, z_1)$ and $Q(x_2, y_2, z_2)$ on a line with diagram cosines, l, m, n is

$$(x_2 - x_1)l + (y_2 - y_1)m + (z_2 - z_1)n.$$

(*b*) Show that the equation of every plane is of the first degree *i.e.*, is of the form

$$ax + by + cz + d = 0, \text{ where } a^2 + b^2 + c^2 \neq 0.$$

(*c*) Find the equations of the planes bisecting the angles between the planes $x + 2y + 2z - 3 = 0$, $3x + 4y + 12z + 1 = 0$ and specify the one which bisects the acute angle.

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

(*a*) Transform the equations $ax + by + cz + d = 0$, $a_1x + b_1y + c_1z + d_1 = 0$ of a line to the symmetrical form.

(*b*) Find the equation of the plane containing the line $2x - 5y + 2z = 6$, $2x + 3y - z = 5$ and parallel to the line $x = \frac{-y}{6} = \frac{z}{7}$.

(*c*) Find the equations of the line which intersects each of the two lines $2x + y - 1 = 0 = x - 2y + 3z$; $3x - y + z + 0 = 4x + 5y - 2z - 3$ and is parallel to the line $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$.

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 cone whose vertex is (α, β, γ) and base $ax^2 + by^2 = 1$, $z = 0$.

(*c*) Two spheres of radii r_1 and r_2 cut orthogonally. Prove that the radius of the common circle is $\frac{r_1 r_2}{\sqrt{r_1^2 + r_2^2}}$.

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