

**CBCS/ SEMESTER SYSTEM**  
**(w.e.f. 2020-21 Admitted Batch)**  
**B.A./B.Sc. MATHEMATICS**

**COURSE-II, THREE DIMENSIONAL ANALYTICAL SOLID GEOMETRY**

**Time: 3Hrs**

**Max.Marks:75 M**

**SECTION - A**

**Answer any FIVE questions. Each question carries FIVE marks 5 X 5 M=25 M**

1. Find the equation of the plane through the point (-1,3,2) and perpendicular to the planes  $x+2y+2z=5$  and  $3x+3y+2z=8$ .
2. Find the bisecting plane of the acute angle between the planes  $3x-2y-6z+2=0$ ,  $-2x+y-2z-2=0$ .
3. Find the image of the point (2,-1,3) in the plane  $3x-2y+z=9$ .
4. Show that the lines  $2x + y - 4 = 0 = y + 2z$  and  $x + 3z - 4 = 0$ ,  $2x + 5z - 8 = 0$  are coplanar.
5. A variable plane passes through a fixed point (a, b, c). It meets the axes in A,B,C. Show that the centre of the sphere OABC lies on  $ax^{-1}+by^{-1}+cz^{-1}=2$ .
6. Show that the plane  $2x-2y+z+12=0$  touches the sphere  $x^2+y^2+z^2-2x-4y+2z-3=0$  and find the point of contact.
7. Find the equation to the cone which passes through the three coordinate axes and the lines  $\frac{x}{1} = \frac{y}{-2} = \frac{z}{3}$  and  $\frac{x}{2} = \frac{y}{1} = \frac{z}{1}$
8. Find the equation of the enveloping cone of the sphere  $x^2 + y^2 + z^2 + 2x - 2y = 2$  with its vertex at (1, 1, 1).

**SECTION - B**

**Answer ALL the questions. Each question carries TEN marks. 5 X 10 M = 50 M**

9(a) A plane meets the coordinate axes in A, B, C. If the centroid of  $\triangle ABC$  is

(a,b,c), show that the equation of the plane is  $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 3$ .

(OR)

(b) A variable plane is at a constant distance p from the origin and meets the axes in A,B,C. Show that the locus of the centroid of the tetrahedron OABC is

$$x^2+y^2+z^2=16p^2.$$

10(a) Find the shortest distance between the lines

$$\frac{x-3}{3} = \frac{y-8}{-1} = \frac{z-3}{1}; \quad \frac{x+3}{-3} = \frac{y+7}{2} = \frac{z-6}{4}.$$

(OR)

(b) Prove that the lines  $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}; \frac{x-2}{3} = \frac{y-3}{4} = \frac{z-4}{5}$  are coplanar. Also find their point of intersection and the plane containing the lines.

11 (a) Show that the two circles  $x^2+y^2+z^2-y+2z=0$ ,  $x-y+z=2$ ;

$x^2+y^2+z^2+x-3y+z-5=0$ ,  $2x-y+4z-1=0$  lie on the same sphere and find its equation.

(OR)

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

12 (a) Find the limiting points of the coaxial system of spheres

$$x^2+y^2+z^2-8x+2y-2z+32=0, \quad x^2+y^2+z^2-7x+z+23=0.$$

(OR)

(b) Find the equation to the cone with vertex is the origin and whose base curve is  $x^2+y^2+z^2+2ux+d=0$ .

13 (a) Prove that the equation  $\sqrt{fx} \pm \sqrt{gy} \pm \sqrt{hz} = 0$  represents a cone that touches the coordinate planes and find its reciprocal cone.

(OR)

(b) Find the equation of the sphere  $x^2+y^2+z^2-2x+4y-1=0$  having its generators parallel to the line  $x=y=z$ .