11. Three Dimensional Geometry

QUESTION 1: Fill in the Blanks :

Each pair of perpendicular lines forms a plane.

The x and y axis form the _____Plane

The x and z axis form the _____ Plane

The y and z axis form the _____ Plane

The three mutually perpendicular planes divide the space into eight parts.

Each part is called an OCTANT

The octant with edges OX , OY and OZ is denoted by _____.

The remaining Octants are OX´YZ , OXY´Z , OXYZ´ , OX´Y´Z , OX´YZ´ OXY´Z´ , _____

QUESTION 2: Fill in the Blanks :

The Sign of Coordinates of a point are determined by the Octant in which it lies.If P is a point , in any octant, let L, M , N be the feet of the perpendiculars drawn from the point P drawn on the Co-ordinate Axis X, Y and Z respectively.

Each coordinate of the point P takes the positive or negative sign depending on whether, L, M, N lies on the positive or negative X , Y and Z axis.

Following this rule , the signs of the triplet of coordinates in the 8 octants will be :

_____ (+, +, +) ,OX´YZ (- , + , +), OX´Y´Z(- , - , +),_____ (+ , - , +), OXYZ´(- , + , +) , _____(-, + , -) _____(- , - , -), _____(+ , - , -) ,

QUESTION 3:.Show that the points (-2, 3 , 5) , (1, 2 , 3) and (7, 0 , -1) are collinear.

QUESTION 4: Find the equation of the set of points which are equidistant from the points

(1, 2 , 3) and (3 , 2 , -1)

QUESTION 5 Find the equation of the plane passing through the points (1, 2, 3) and (0, -1, 0) and parallel to the line $\frac{x-1}{2}=\frac{y+2}{3}=\frac{z}{-3}$

QUESTION 6: A plane which remains at a constant distance 3p from the origin cuts the co-ordinate axes at A, B and C. Show that the locus of the centroid of triangle ABC is $x^{-2} + y^{-2} + z^{-2} = p^{-2}$.

QUESTION 7:

Find the foot of the perpendicular from P(1, 2, 3) on the line

$$\frac{x-6}{3}=\frac{y-7}{2}=\frac{z-7}{-2}$$

Also obtain the equation of the plane containing the line and the point (1, 2, 3)

QUESTION 8:

Prove that the image of the point (3, –2, 1) in the plane $3x - y + 4z = 2$ lies on the plane, $x + y + z + 4 = 0$

QUESTION 9:

Find the equation of the plane passing through the intersection of the planes, $2x+3y-z+1=0$; $x+y-2z+3=0$ and perpendicular the plane $3x-y-2z-4=0$. Also find the inclination of this plane with the xy plane.

QUESTION 10:

Find the distance of the point (3, 4, 5) from the plane $x + y + z = 2$ measured parallel to the line $2x = y = z$.

QUESTION 11:

A plane P is perpendicular to a plane $\vec{r}.\left(5\hat{i}+3\hat{j}-6\hat{k}\right)+8=0$ and contains the line of intersection of the planes $\vec{r}.\left(\hat{i}+2\hat{j}+3\hat{k}\right)-4=0;\vec{r}.\left(2\hat{i}+\hat{j}-\hat{k}\right)+5=0,$ find the equation of P.

QUESTION 12:

Find the vector equation of the line parallel to the line $\frac{x-1}{5}=\frac{3-y}{2}=\frac{z+1}{4}$ and passing through the point(3, 0, – 4). Also find the distance between these two lines.

QUESTION 13(i):

Write the equation of the plane thatpasses through the line common to two intersecting planes $x+y+z-1=0 and 2x+3y-z+4=0$

QUESTION 13(ii):

.Find p , if the points (1,1,p) and (-3, 0 , 1) are equidistant from the plane whose equation is $\vec{r}.\left(3\hat{i}+4\hat{j}-12\hat{k}\right)+13=0$

QUESTION 14:

What is the equation of the plane passing through the point (2, 5, – 8), perpendicular to the plane 2x – 3y + 4z + 1 = 0, and 4x + y – 2z + 6 = 0

QUESTION 15:

Find the equation of a plane that is parallel to the X-axis and passes through the line common to two intersectiing planes $\vec{r}.\left(\hat{i}+\hat{j}+\hat{k}\right)-1=0$ and $\vec{r}.\left(2\hat{i}+3\hat{j}-\hat{k}\right)=-4$