6. LINE AND PLANE

I. Multiple choice questions…..**(2 marks)**

1)The equation of X axis is…

A) x = y= z (B)y = z (C) y = 0 ,z = 0 (D) x = 0 , y = 0

2)If the perpendicular distance of the plane 2x+3y-z = k from the origin is $\sqrt{14}$ units , then k = …

A) 14 (B) 196 (C) $2\sqrt{14}$ (D) $\frac{\sqrt{14}}{2}$

3) The equation of the plane passing through the points (1 ,-1 , 1) ,

(3 ,2 , 4) and parallel to Y axis is…

A)3x + 2z – 1 = 0 (B) 3x – 2z = 1 (C) 3x+2z+1 = 0 (D)3x+2z = 2

4)The direction ratios of the line 3x+1 = 6y –2 = 1 – z are

A)2 ,1 ,6 (B)2 ,1 ,-6 (C)2 ,-1 , 6 (D) -2,1 ,6

5)If the planes 2x – my + z = 3 and 4x – y + 2z = 5are parallel then m = …

A)– 2 (B) 2 (C) $\frac{-1}{2}$ (D) $\frac{1}{2}$

6) The direction cosines of the normal to the plane 2x – y + 2z = 3 are

A)$\frac{2}{3}$,$\frac{-1}{3}$,$\frac{2}{3}$ (B) $\frac{-2}{3}$, $\frac{1}{3}$,$\frac{-2}{3}$ (C) 2 , -1 ,2 (D) -2 ,1 ,-2

7)If the foot of the perpendicular drawn from the origin to the plane is (4 ,-2 ,5) , then the equation of plane is…

A)4x+y+5z = 14 (B) 4x-2y-5z = 45 (C) x-2y-5z =10 (D)4x+y+6z=11

8)The perpendicular distance of the origin from the plane x-3y+4z=6 is….

A) 6 (B) $\frac{6}{\sqrt{26}}$ (C) 36 (D) $\frac{1}{\sqrt{26}}$

9)The coordinates of the foot of perpendicular drawn from the origin to the plane 2x+y-2z = 18 are…

A)(4 ,2 ,4) (B) (-4 ,2 ,4) (C) (-4 ,-2 ,4) (D) (4 ,2 ,-4)

II. Very Short answers (1 marks)

1)Find the Cartesian equation of a plane passing through A(1 ,2 ,3) and direction ratios of it's normal are 3 ,2 ,5.

2)Find the direction ratios of the normal to the plane 2x+3y+z=7.

3)Find the vector equation of the line

$\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3}$

4)Verify if the point having position vector $4\hat{\imath}-11\hat{\jmath}+2\hat{k}$ lies on the line

$\bar{r} = (6\hat{\imath}-4\hat{\jmath}+5\hat{k}) + \mu\,(2\hat{\imath}+7\hat{\jmath}+3\hat{k})$,

5)Find the Cartesian equation of the line passing through

A (1 ,2 ,3)and having direction ratios 2,3,7.

6)Find the vector equation of the line passing through the point having position vector $4\hat{\imath} - \hat{\jmath}+2\hat{k}$ and parallel to the vector $-2\hat{\imath} -\hat{\jmath}+\hat{k}$.

7)Find the Cartesian equation of the plane passing through the points (3 ,2 ,1) and (1 ,3 ,1)

8) What is the condition that the line $\vec{r} = \vec{a} + \lambda\vec{b}$ parallel to the plane $\vec{r} \cdot \vec{n} = \vec{a} \cdot \vec{n}$?

III Short answer questions (2 marks)

1) Find the direction ratios of the line perpendicular to the lines

$\frac{x-7}{2} = \frac{y+7}{-3} = \frac{z-6}{1}$ and $\frac{x+5}{1} = \frac{y+3}{2} = \frac{z-6}{-2}$

2)Find direction cosines of the normal to the plane $\bar{r}.(3\hat{\imath}+4\hat{k}) = 5$

3)If the normal to the plane has direction ratios 2 ,-1 ,2 and it's perpendicular distance from origin is 6 ,find its equation.

4)Reduce the equation $\bar{r}.(3\hat{\imath} + 4\hat{\jmath} + 12\hat{k})$ 6767 =8 to normal form.

5) Find the Cartesian equation of the line passing through A(1 ,2 ,3) and

B (2, 3, 4)

6)Find the perpendicular distance of origin from the plane 6x-2y+3z -7=0

7)Find the acute angle between the lines x=y ; z=0 and x=0 z=0.

IV. Short answer questions (3 marks)

1)Find Cartesian equation of the line passing through the point A(2 ,1 ,-3) and perpendicular to vectors $\hat{\imath}+\hat{\jmath}+\hat{k}$ and $\hat{\imath}+2\hat{\jmath}-\hat{k}$

2)Find the vector equation of the line passing through the point having position vector $-\hat{\imath}-\hat{\jmath}+2\hat{k}$ and parallel to the line $\bar{r}=(\hat{\imath}+2\hat{\jmath}+3\hat{k})+\mu(3\hat{\imath}+2\hat{\jmath}+\hat{k})$;μ is a parameter.

3)Find the Cartesian equation of the line passing through (-1 ,-1 ,2) and parallel to the line 2x-2 = 3y+1 = 6z – 2.

4)Find the Cartesian equation of the plane passing through A(7 ,8 ,6)and parallel to XY plane.

5)Find the coordinates of the foot of perpendicular from the origin to the plane

2x+6y -3z =63.

6)Find the vector equation of a plane at a distance 6 units from the origin and to which vector $2\hat{\imath}-\hat{\jmath}+2\hat{k}$ is normal.

7)Find the Cartesian equation of the plane passing through the points A(1 ,1 ,2),

B(0 ,2 ,3) C(4 ,5 ,6).

8)Find acute angle between the lines $\frac{x-1}{1}=\frac{y-2}{-1}=\frac{z-3}{2}$ and $\frac{x-1}{2}=\frac{y-1}{1}=\frac{z-3}{1}$

9)Find the distance between the parallel lines $\frac{x}{2}=\frac{y}{-1}=\frac{z}{2}$ and $\frac{x-1}{2}=\frac{y-1}{-1}=\frac{z-3}{2}$.

10)Find the equation of the plane passing through the point (7 ,8 ,6) and parallel to the plane $\bar{r}.(6\hat{\imath}+8\hat{\jmath}+7\hat{k})=0$

11) Find m, if the lines $\frac{1-x}{3}=\frac{7y-14}{2m}=\frac{z-3}{2}$ and $\frac{7-7x}{3m}=\frac{y-5}{1}=\frac{6-z}{5}$ are at right angles.

13) Find the equation of the plane containing lines $\frac{x-5}{4}=\frac{y-7}{4}=\frac{z+3}{-5}$ and $\frac{x-8}{7}=\frac{y-4}{1}=\frac{z-5}{3}$

14) Find the equation of the plane which is parallel to the plane $x-2y+2z=5$ and whose distance from the point $(1,2,3)$ is 1

V. Long answer questions (4 marks)

1) show that the lines $\frac{x+1}{-10} = \frac{y+3}{-1} = \frac{z-4}{1}$ and $\frac{x+10}{-1} = \frac{y+1}{-3} = \frac{z-1}{4}$ intersect each other.also find the coordinates of the point of intersection.

2)A(-2 ,3 ,4) B(1 ,1 ,2) C(4 ,-1 ,0) are three points. Find the Cartesian equation of line AB and show that points A, B ,C are collinear.

3)find the Cartesian and vector equation of the line passing through the point having position vector $\hat{\imath}+2\hat{\jmath}+3\hat{k}$ and perpendicular to vectors $\hat{\imath}+\hat{\jmath}+\hat{k}$ and $2\hat{\imath}-\hat{\jmath}+\hat{k}$.

4)Find the vector equation of the plane which bisects the segment joining A(2 ,3 ,6) and B (4 ,3 ,-2) at right angles.

5)Find vector equation of the plane passing through A(-2 ,7 ,5)and parallel to vectors $4\hat{\imath}-\hat{\jmath}+3\hat{k}$ and $\hat{\imath}+\hat{\jmath}+\hat{k}$.

6)Find the Cartesian and vector equation of the plane which makes intercepts 1 ,1 ,1 on the coordinate axes.

8) Find the distance of the point of intersection of the line $\frac{x-3}{1} = \frac{y-4}{2} = \frac{z-5}{2}$and the plane $x + y + z = 17$ from the point (3, 4, 5) is given by

9) Show that$\frac{x+5}{1} = \frac{y-3}{7} = \frac{z+3}{3}$ and $x - y + 2z - 4 = 0 = 2x + y - 3z + 5$ are parallel