CHAPTER-11

THREE DIMENSIONAL GEOMETRY

02 MARKS TYPE QUESTIONS

Q. NO	QUESTION	MARK
1.	Find the distance between the two planes: 2x+3y+4z=4 and 4x+6y+8z=12	2
2.	Show that the planes: 2x-y+4z=5 and 5x-2.5y+10z=6 are parallel.	2
3.	Find the angle between the planes whose vector equations are $\vec{r}$.(2 i + 2j − 3k)=5 and $\vec{r}$.(3 i − 3j + 5k)=3	2
4.	If the lines $\frac{x-1}{-3} = \frac{y-2}{2k} = \frac{z-3}{2}$ and $\frac{x-1}{3k} = \frac{y-1}{1} = \frac{z-6}{-5}$ are perpendicular ,find the value of k.	2
5.	Find the foot of perpendicular drawn from the point (4,2,3) to the line joining (1,-2,3) and (1,1,0).	2
6.	Check whether the given two lines are coincident, skew, parallel or perpendicular? $\vec{r} = (6\hat{\imath} + 4\hat{\jmath} + 1\hat{k}) + \beta\,(2\hat{\imath} + \hat{\jmath} - 3\hat{k})$ $\vec{r} = (-2\hat{\imath} - \hat{\jmath} + 3\hat{k}) + \alpha\,(6\hat{\imath} + 3\hat{\jmath} - 9\hat{k})$	2
7.	Find the direction cosines of the sides of the triangle with vertices A (1, 3, 5), B (2, 5, 7) and C (-1, -4, 3)	2
8.	Show that the line passing through two points (2, 3, 5) and (5, 6, 8) is parallel to the line through the points (1, 6, -5) and (4, 9, -2).	2
9.	Find the angle between the pair of lines: $\vec{r} = (8\hat{\imath} + 4\hat{\jmath} + 9\hat{k}) + \beta\,(2\hat{\imath} + \hat{\jmath} - 3\hat{k})$ $\vec{r} = (7\hat{\imath} - 3\hat{\jmath} + 1\hat{k}) + \alpha\,(6\hat{\imath} + 3\hat{\jmath} - 9\hat{k})$	2
10.	Find the value of 'm' so that the given lines are perpendicular. $\frac{-x+1}{1} = \frac{y+2}{2} = \frac{z-7}{4}$ and $\frac{x-8}{2} = \frac{y-2}{m} = \frac{z+2}{6}$	2
11.	Find the acute angle which the line with direction cosines $1/\sqrt{2}$, ½ , n makes with positive direction of Z-axis.	2
12.	Find the direction cosine of a line equally inclined to the three co-ordinate axes.	2
13.	The cartesian equation of motion of a rocket is $\frac{x-2}{5} = \frac{y+4}{7} = \frac{6-z}{2}$	2

	 Write the vector equation of the line.	
14.	An insect is crawling along the line passing through two points (-2,-3,4) and (2,-1,3). Find the direction cosine of the line of an insect. 	2
15.	If the x-co-ordinate of a point P on the join of Q (2,2,1) and R (5,1,-2) is 3 then find its y – co-ordinate.	2
16.	Show that the lines given by $\frac{x-5}{2} = \frac{2y+5}{4} = \frac{3z+8}{5}$ and $\frac{3-x}{1} = \frac{y-2}{2} = \frac{8-5z}{6}$	2
17.	Find the angle between the lines whose direction ratios are (a, b, c) and $(b-c, c-a, a-b)$.	2
18.	Find the equation of a line parallel to $x-$ axis and passing through the point P $(1, 2, 3)$.	2
19.	Find equation of a line passing through points P $(3, 4, -1)$ and Q $(-2, 0, 4)$.	2
20.	Find the angle between the lines joining the points A $(1, -2, 3)$, B $(2, -1, 1)$ and C $(0, -2, 2)$, D $(0, 3, 4)$	2
21.	Find the vector equation of the line $\frac{x-5}{3} = \frac{y-5}{3} = \frac{z+1}{5}$ cuts YZ-plane.	2
22.	A line makes angles 60° and 45° with the x and y axes respectively, find the angle which it makes with the z-axis	2
23.	Find the direction cosines of the line passing through the following points: (-2,4, -5), (1,2,3)	2
24.	What are the direction cosines of a line, which makes equal angles with the coordinate axes?	2
25.	Write the equation of the line x-1 = 2y = 3z in vector form	2

ANSWERS:

Q. NO	ANSWER	MARKS
1.	$\frac{2}{\sqrt{29}}$ units	
2.	$\frac{A1}{A2} = \frac{B1}{B2} = \frac{C1}{C2}$ for parallel condition	
3.	$\cos^{-1}\frac{15}{\sqrt{731}}$	
4.	k = $\frac{-10}{7}$	
5.	(1,0,1)	
6.	These are parallel lines because their direction ratios are proportional.	2
7.	Direction cosines of AB are: $\frac{1}{3}, \frac{2}{3}, \frac{2}{3}$ Direction cosines of BC are: $\frac{-3}{\sqrt{106}}, \frac{-9}{\sqrt{106}}, \frac{-4}{\sqrt{106}}$ Direction cosines of CA are: $\frac{2}{\sqrt{57}}, \frac{7}{\sqrt{57}}, \frac{2}{\sqrt{57}}$	2
8.	Direction ratios of 1st line: 3, 3, 3 Direction ratios of 2nd line:3, 3, 3 Since direction ratios of both lines are same/ proportional, hence the lines are parallel.	2
9.	These are parallel lines because their direction ratios are proportional. So, angle between the given lines is 0°	2
10.	m = -11, using condition of perpendicularity i.e. sum of product of direction ratios of two perpendicular lines is zero.	2
11.	$l^2 + m^2 + n^2 = 1$ $(1/2)^2 + (1/\sqrt{2})^2 + n^2 = 1$ ¼ +1/2 + n^2 = 1 n^2 = 1-3/4 n^2 = ¼ n = ½ cos γ = ½ = cos 60^0 γ = 60^0	2
12.	Let direction cosine of a line equally inclined to co-ordinate axes are l,l,l So, $l^2 + l^2 + l^2 = 1$ Or, $3\,l^2 = 1$ Or, $l^2 = 1/3$ Or, $l = \pm\frac{1}{3}$ So, Direction cosines are $+\frac{1}{\sqrt{3}}, +\frac{1}{\sqrt{3}}, +\frac{1}{\sqrt{3}}$ or $-\frac{1}{\sqrt{3}}, -\frac{1}{\sqrt{3}}, -\frac{1}{\sqrt{3}}$	2
13.	The cartesian equation of motion of a rocket is $\frac{x-2}{5} = \frac{y+4}{7} = \frac{6-z}{2}$ Or, $\frac{x-2}{5} = \frac{y+4}{7} = \frac{z-6}{-2}$ The standard form of line of equation is $(x - x_1)/a = (y-y_1)/b = (z-z_1)/c$ By comparing Point is (2,-4,6) and direction ratios are (5,7,-2). So, vector equation of motion of rocket $\vec{r} = 2\hat{\imath} - 4\hat{\jmath} + 6\hat{k} + \lambda(5\hat{\imath} + 7\hat{\jmath} - 2\hat{k})$	2

14.	Let line passing through two points P (-2,-3,4) and Q(2,-1,3) PQ = $\sqrt{16 + 4 + 1} = \sqrt{21}$ So, Direction cosines of the line joining two points are $\frac{2+2}{\sqrt{21}}, \frac{-1+3}{\sqrt{21}}, \frac{3-4}{\sqrt{21}}$ $= \frac{4}{\sqrt{21}}, \frac{2}{\sqrt{21}}, \frac{-1}{\sqrt{21}}$	2
15.	Let P divides QR in the ratio λ :1 Co-ordinates of P are $(\frac{5\lambda+2}{\lambda+1}, \frac{\lambda+2}{\lambda+1}, \frac{-2\lambda+1}{\lambda+1})$ x – co-ordinate of P = 3 So, $\frac{5\lambda+2}{\lambda+1} = 3$ Or, $5\lambda + 2 = 3\lambda + 3$ Or, $\lambda = ½$ So, y – co-ordinate of P = $\frac{\frac{1}{2}+2}{\frac{1}{2}+1} = 5/3$	2
16.	Equations of lines can be written in standard form as : $\frac{x-5}{2} = \frac{y+\frac{5}{2}}{2} = \frac{z+\frac{8}{3}}{\frac{5}{3}}$ and $\frac{x-3}{-1} = \frac{y-2}{2} = \frac{z-\frac{8}{5}}{\frac{-6}{5}}$ So that Direction ratios of the lines are : $\left(2, 2, \frac{5}{3}\right)$ & $(-1, 2, \frac{-6}{5})$ and $2 \times (-1) +$ $2 \times 2 + \frac{5}{3} \times \left(\frac{-6}{5}\right) = 0.$	1 1
17.	Here, $a \times (b - c) + b \times (c - a) + c \times (a - b)$ $= ab - ac + bc - ba + ca - cb = 0$ So that lines are perpendicular.	1 1
18.	Direction – cosines of x – axis are given by $(1, 0, 0)$ So that the equation of line passing through the point P $(1, 2, 3)$ and parallel to $x -$ axis is given by $\frac{x-1}{1} = \frac{y-2}{0} = \frac{z-3}{0}$.	1 1
19.	The direction ratios of the line passing through points P $(3, 4, -1)$ and Q $(-2, 0, 4)$ are : $(5, 4, -5)$. So that its equation can be given as $\frac{x+2}{5} = \frac{y}{4} = \frac{z-4}{-5}$.	1 1
20.	Direction ratios of the line joining the points A $(1, -2, 3)$, B $(2, -1, 1)$ is given by $(2 - 1, -1 + 2, 1 - 3) = (1, 1, -2)$ Direction ratios of the line joining the points C $(0, -2, 2)$, D $(0, 3, 4)$ is given by $(0, 3 + 2, 4 - 2) = (0, 5, 2)$. Therefore, angle between the lines is given by $\cos\theta = \frac{1\times0+1\times5-2\times2}{\sqrt{1+1+4}\times\sqrt{0+25+4}} = \frac{1}{\sqrt{174}}$.	1 1
21.	$\vec{b} = \vec{a} + \lambda\vec{b} \Rightarrow \vec{r} = (5i\hat{} - 4j\hat{} + 6k\hat{} + \lambda(3i\hat{} + 7j\hat{} - 2k)$	2
22.	$\gamma = 60° \text{ or } 120°$	2
23.	Dc's are: $\frac{3}{\sqrt{77}}, \frac{-2}{\sqrt{77}}, \frac{8}{\sqrt{77}}$	2
24.	Dc's are: $\pm\frac{1}{\sqrt{3}} \pm \frac{1}{\sqrt{3}} \pm \frac{1}{\sqrt{3}}$	2
25.	$\vec{r} = (i\hat{} + 0j\hat{} + 0k\hat{}) + \lambda(6i\hat{} + 3j\hat{} + 2k\hat{})$	2