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? $\vec{r} = (6\hat{i} + 4\hat{j} + 1\hat{k}) + \beta\,(2\hat{i} + \hat{j} - 3\hat{k})$ $\vec{r} = (-2\hat{i} - \hat{j} + 3\hat{k}) + \alpha\,(6\hat{i} + 3\hat{j} - 9\hat{k})$ | 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: $\vec{r} = (8\hat{i} + 4\hat{j} + 9\hat{k}) + \beta\,(2\hat{i} + \hat{j} - 3\hat{k})$ $\vec{r} = (7\hat{i} - 3\hat{j} + 1\hat{k}) + \alpha\,(6\hat{i} + 3\hat{j} - 9\hat{k})$ | 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 |

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| | <br>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.<br> | 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: $\frac{1}{3},\frac{2}{3},\frac{2}{3}$<br>Direction cosines of BC are: $\frac{-3}{\sqrt{106}},\frac{-9}{\sqrt{106}},\frac{-4}{\sqrt{106}}$<br>Direction cosines of CA are: $\frac{2}{\sqrt{57}},\frac{7}{\sqrt{57}},\frac{2}{\sqrt{57}}$ | 2 |
| 8. | Direction ratios of $1^{st}$ line: 3, 3, 3<br>Direction ratios of $2^{nd}$ line:3, 3, 3<br>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. | $l^2 + m^2 + n^2 = 1$<br>$(1/2)^2 + (1/\sqrt{2})^2 + n^2= 1$<br>¼ +1/2 + $n^2$ = 1<br>$n^2$ = 1-3/4<br>$n^2$ = ¼<br><br>n = ½<br>cos $\gamma$ = ½ = cos $60^0$<br>$\gamma$ = $60^0$ | 2 |
| 12. | Let direction cosine of a line equally inclined to co-ordinate axes are l,l,l<br>So, $l^2 + l^2 + l^2 = 1$<br>Or, 3 $l^2$ = 1<br>Or, $l^2$ = 1/3<br>Or, l = $\pm\frac{1}{3}$<br>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<br>$\frac{x-2}{5} = \frac{y+4}{7} = \frac{6-z}{2}$<br>Or, $\frac{x-2}{5} = \frac{y+4}{7} = \frac{z-6}{-2}$<br>The standard form of line of equation is<br>$(x – x_1)/a = (y-y_1)/b = (z-z_1)/c$<br>By comparing Point is (2,-4,6) and direction ratios are (5,7,-2).<br>So, vector equation of motion of rocket<br>$\vec{r} = 2\hat{\imath} -4\hat{\jmath} +6\hat{k} + \lambda(5\hat{\imath} +7\hat{\jmath} -2\hat{k})$ | 2 |

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