Three Dimensional Geometry

TEST – 01

Q01. Write the direction cosines of the line $x = 2 - 2s,\ y = 3 + s,\ z = 4 - 5s$.

Q02. ABCD is a parallelogram. The vertices A, B and C are represented by the vectors $4\hat{i} + 5\hat{j} - 10\hat{k}$, $2\hat{i} - 3\hat{j} + 4\hat{k}$ and $2\hat{j} - \hat{i} - \hat{k}$ respectively. Find the equation of diagonal BD.

Q03. Find the vector and Cartesian equation of the line passing through the points $(3,4,-7)$ and $(1,-1,6)$.

Q04. Find the angle between a line with d.r.'s $2,2,1$ and another line joining $(3,1,4)$ to $(7,2,12)$.

OR Write the angle between line $\frac{x+1}{2} = \frac{y}{3} = \frac{z-3}{6}$ and the plane $10x + 2y - 11z = 3$.

Q05. Determine the equation of a line passing through $(1,2,-4)$ and perpendicular to the lines: $\frac{x-15}{3} = \frac{y-29}{8} = \frac{5-z}{5}$ and $\frac{x-8}{3} = \frac{y+19}{-16} = \frac{z-10}{7}$.

Q06. Find the image of a bird flying at the point $(1,6,3)$ in the line $x = \frac{y-1}{2} = \frac{z-2}{3}$.

Q07. Find the S.D. and the angle between the lines given below:

$$L_1 : \vec{r} = 4\hat{i} - 3\hat{j} + \lambda(\hat{i} + 2\hat{j} - 2\hat{k}),\ L_2 : \vec{r} = \hat{i} + \hat{j} - 2\hat{k} - \mu(2\hat{i} + 4\hat{j} - 4\hat{k}).$$

Q08. Determine the d.c.'s of normal to the plane and distance from origin for the plane $z = 2$.

Q09. Find the coordinates of the foot of perpendicular drawn from origin to the plane $2x + 3y + 4z = 12$.

OR Find the equation of a plane through the line of intersection of the planes $x + y + z = 1$ and $2x + 3y + 4z = 5$ which is perpendicular to the plane $x - y + z = 0$.

Q10. A line makes the angles α, β, γ and θ with the diagonals of a cube. Prove that:

(a) $\cos^2\alpha + \cos^2\beta + \cos^2\gamma + \cos^2\theta = \frac{4}{3}$ (b) $\sin^2\alpha + \sin^2\beta + \sin^2\gamma + \sin^2\theta = \frac{8}{3}$.

TEST – 02

Q01. Determine the distance of the point $(3,5,3)$ from its image in a line having the d.r.'s $1,2,3$ and passing through the point $(0,1,2)$.

Q02. Write the equation of a line passing through $(2,3,4)$ which is parallel to the z-axis.

OR Write the equation of a line through $(2,-3,5)$ which makes equal angles with the axes.

Q03. Consider the lines, $L_1 : \vec{r} = 4\hat{i} + 3\hat{j} + 2\hat{k} + \lambda(5\hat{i} - 2\hat{j} - 6\hat{k})$, $L_2 : \frac{x-3}{4} = \frac{2-y}{3} = \frac{z-1}{-7}$. Check if the lines L_1 and L_2 intersect? Find the point of intersection (*if they intersect*) and the equation of plane which contains them.

Q04. Find the shortest distance between the lines L_1 and L_2 (*given below*). Find equation of the line of shortest distance and the points in which it meets the given lines:

$$L_1 : \vec{r} = (3,8,3) + \lambda(3,-1,1),\ L_2 : \vec{r} = (-3,-7,6) + \mu(-3,2,4).$$

Q05. Find the length and foot of perpendicular from the point $(7,14,5)$ to the plane $2x + 4y - z = 2$.

Q06. Find the equation of a plane through the point $P(2,3,-1)$ at the right angle to OP.

Q07. Find the equation of a line passing through $(1,-1,2)$ and perpendicular to the plane $2x - y + 3z = 5$. Also find the point of intersection of line and the plane.

OR Find a plane through $(1,-1,2)$ and perpendicular to the planes $x + 2y - 3z = 8$ and $2x + 3y - 2z = 5$.

Q08. Find the equation of plane through the points $(2,-1,0)$ and $(3,-4,5)$ & parallel to the $2x = 3y = 4z$.

Q09. Find the plane passing through $(-1,1,1)$ and $(1,-1,1)$ and perpendicular to $x + 2y + 2z = 9$.

OR A plane meets the axes in A, B, C and (h,p,s) is the centroid of ΔABC. Find the equation of plane.

Q10. If the product of distance of $(1,1,1)$ from the origin & plane $x - y + z + k = 0$ is 5units then, find the value of k.

Answers of Three Dimensional Geometry

TEST 01

Q01. $-\frac{2}{\sqrt{30}}, \frac{1}{\sqrt{30}}, -\frac{5}{\sqrt{30}}$ Q02. $\vec{r} = 2\hat{i} - 3\hat{j} + 4\hat{k} + \lambda(-\hat{i} + 13\hat{j} - 19\hat{k})$

Q03. $\vec{r} = 3\hat{i} + 4\hat{j} - 7\hat{k} + \lambda(-2\hat{i} - 5\hat{j} + 13\hat{k})$; $\frac{3-x}{2} = \frac{4-y}{5} = \frac{z+7}{13}$ Q04. $\cos^{-1}\frac{2}{3}$ or $\sin^{-1}\frac{8}{21}$

Q05. $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z+4}{-6}$ Q06. $(1,0,7)$ Q07. $2\sqrt{5}\,units, 0^{\circ}\,(parallel)$

Q08. $0,0,1;\ 2units$ Q09. $\left(\frac{24}{29}, \frac{36}{29}, \frac{48}{29}\right)$ or $x - z + 2 = 0$.

TEST 02

Q01. $4\sqrt{3}\,units$ Q02. $\vec{r} = 2\hat{i} + 3\hat{j} + 4\hat{k} + \lambda\,\hat{k}$ or $\frac{x-2}{1} = \frac{y+3}{1} = \frac{z-5}{1}$

Q03. $(-1,5,8);\ 4x - 11y + 7z + 3 = 0$ Q04. $3\sqrt{30}\,units;\ \vec{r} = 3\hat{i} + 8\hat{j} + 3\hat{k} + \lambda(2\hat{i} + 5\hat{j} - \hat{k});\ (3,8,3), (-3,-7,6)$

Q05. $3\sqrt{21}\,units;\ (1,2,8)$ Q06. $12x - 4y - z = 169$

Q07. $\vec{r} = \hat{i} - \hat{j} + 2\hat{k} + \lambda(2\hat{i} - \hat{j} + 3\hat{k});\ \left(\frac{3}{7}, -\frac{5}{7}, \frac{8}{7}\right)$ or $5x - 4y - z = 7$

Q08. $29x - 27y - 22z = 85$ Q09. $2x + 2y - 3z + 3 = 0$ or $\frac{x}{h} + \frac{y}{p} + \frac{z}{s} = 3$ Q10. $4\ or\ -6$.

 # If you've any query regarding any question in this test, please write to me on email id at ***theopgupta@gmail.com***