MATHS

BOOKS - BETTER CHOICE PUBLICATION

THREE DIMENSIONAL GEOMETRY

Solved Examples Section I Multiple Choice Questions

1. If a line has direction ratios $< -2, -1, 2 >$ then its direction - cosines are

A. $< \frac{2}{3}, \frac{-1}{3}, \frac{-2}{3} >$

B. $< \frac{-2}{3}, \frac{-1}{3}, \frac{2}{3} >$

C. $< \frac{-2}{3}, \frac{-1}{3}, \frac{-2}{3} >$

D. None of these

Answer: A

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2. A line makes $90^\circ, 135^\circ, 45^\circ$ with x, y and z axes respectively than its direction cosines are

A. $< 0, 0, 0 >$

B. $< 0, \frac{-1}{\sqrt{2}}, \frac{1}{\sqrt{2}} >$

C. $< \frac{1}{\sqrt{2}}, \frac{-1}{\sqrt{2}}, 0 >$

D. $< \frac{-1}{\sqrt{2}}, 0, \frac{1}{\sqrt{2}} >$

Answer: B

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3. If $< l, m, n, >$ are D. cosines of a line then $l^2 + m^2 + n^2 =$

A. 0

B. 1

C. 2

D. 3

Answer: B

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4. The direction cosines of the line joining the points (-2, 4, -5) and (1, 2, 3) is :

A. $< \frac{-2}{\sqrt{77}}, \frac{8}{\sqrt{77}}, \frac{3}{\sqrt{77}} >$

B. $< -3, 2, 8 >$

C. $< \frac{3}{\sqrt{77}}, \frac{-2}{\sqrt{77}}, \frac{8}{\sqrt{77}} >$

D. $< 3, -2, 8 >$

Answer: D

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5. The planes $2x - y + 4z = 5$ and $5x - 2.5y + 10z = 6$ are :

A. perpendicuar

B. parallel

C. intessect along y-axis

D. passes through (0,0,5/4)

Answer: B

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6. Distance between the two planes: $2x + 3y + 4z = 4$ and $4x + 6y + 8z = 12$ is:

A. 2 units

B. 4 units

C. 8 units

D. $\frac{1}{\sqrt{29}}$ units.

Answer: D

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Solved Examples Section Ii Short Answer Type Questions

1. A line makes $90^\circ, 135^\circ, 45^\circ$ with x, y and z axes respectively than its direction cosines are

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2. Find the direction cosines of a line which makes equal angles with the coordinate axes.

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3. If a line has the direction ratios –18, 12, – 4, then what are its direction cosines ?

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4. Find the direction cosine of a line joining the points (3,7,-4) and (-2,3,5).

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5. If a line marks angles α, β and γ with the coordinates axes, prove that $\sin^2\alpha + \sin^2\beta + \sin^2\gamma = 2$.

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6. Show that the points (2, 3, 4), (– 1, – 2, 1), (5, 8, 7) are collinear.

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7. Show that the line through the points (1, – 1, 2), (3, 4, – 2) is perpendicular to the line through the points (0, 3, 2) and (3, 5, 6).

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8. If P,Q,R,S are the points (-2,3,4),(-4,4,6),(4,3,5),(0,1,2) prove by projection that PQ is perpendicular to RS.

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Solved Examples Section Iii Short Answer Type Questions

1. Find the equation of the line through the point (1,2,0) and is parallel to the vector $2\hat{i}+3\hat{j}-5\hat{k}$.

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2. The cartesian equation of a line is $\frac{x-1}{3}=\frac{y-4}{5}=\frac{z-3}{2}$. Write its vector form.

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3. Find the the vector and cartesian equations of the lines that passes through the origin and (5,-3,3).

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4. Find the cartesian equation of the line which passes through the point (– 2, 4, – 5) and parallel to the line given by $\frac{x+3}{3} = \frac{y-4}{5} = \frac{z+8}{6}$

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Solved Examples Section Iv Short Answer Type Questions

1. Find the angle between the pair of lines

$\vec{r} = 2\hat{i} - 5\hat{j} + \hat{k} + \lambda\left(3\hat{i} + 2\hat{j} + 6\hat{k}\right)$ and

$\vec{r} = 7\hat{i} - 6\hat{k} + \hat{h}\left(\hat{i} + 2\hat{j} + 2\hat{k}\right)$

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2. Find the angle between the lines $\frac{x-2}{2}=\frac{y-1}{5}=\frac{z+3}{-3}$ and $\frac{x+2}{-1}=\frac{y-4}{8}=\frac{z-5}{4}$

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3. Find the angle between a line with direction ratios $<2,1,1>$ and a line joining (1,2,0) to (6,2,4).

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4. Show that the lines $\frac{x-5}{7}=\frac{y+2}{-5}=\frac{z}{1}$ and $\frac{x}{1}=\frac{y}{2}=\frac{z}{3}$ are perpendicular to each other

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5. Find the values of p so that the lines $\frac{1-x}{3}=\frac{7y-14}{2}p=\frac{z-3}{2}$ and $\frac{7-7x}{3}p=\frac{y-5}{1}=\frac{6-z}{5}$ are at right angles.

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6. Find the angle between the lines whose direction cosines are given by the equations $3l + m + 5n = 0, 6mn - 2nl + 5lm = 0$

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7. Find the vector equation of the line passing through the point (1,2,-4) and perpendicular to the lines

$$\frac{x-8}{3} = \frac{y+19}{-16} = \frac{z-15}{3} \text{ and } \frac{x-15}{3} = \frac{y-29}{8} = \frac{z-5}{-5}$$

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Solved Examples Section V Short Answer Type Questions

1. Find the shortest distance between the lines $\vec{r} = \left(\hat{i} + 2\hat{j} + \hat{k}\right) + \lambda\left(\hat{i} - \hat{j} + \hat{k}\right)$ and $\vec{r} = 2\hat{i} - \hat{j} - \hat{k} + \mu\left(3\hat{i} - \hat{j} + \hat{k}\right)$

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2. Determine (by S.D.) whether or not following pair of lines intersect

$\vec{r} = \hat{i} + \hat{j} - \hat{k} + \lambda\left(3\hat{i} - \hat{j}\right)$ and $\vec{r} = 4\hat{i} - \hat{k} + \mu\left(2\hat{i} + 3\hat{k}\right)$

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3. Determine whether the following pair of lines intersect

$\frac{x-1}{4} = \frac{y+1}{3} = z$ and $\frac{x+1}{5} = y - 2 = z - 2$

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Solved Examples Section Vi Short Answer Type Questions

1. In the following case, determine the direction cosines of the normal to the plane and the distance from the origin: $2x + 3y - z = 5$

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2. Find the vector equation of the plane whose cartesian form is $5x - 7y + 2z = 3$.

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3. Find the cartesian equation of the plane vector equation is $\vec{r} \cdot \left(\hat{i} + 2\hat{j} - 3\hat{k}\right) = 1$

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4. Find the intercepts cut off by the plane $2x + y - z = 5$

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5. Reduce the equation $2x + 6y + 3z + 9 = 0$ to the normal form.

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6. Find the vector and cartesian equations of the plane that passes through the point (1, 0, – 2) and the normal to the plane is $\hat{i} + \hat{j} - \hat{k}$

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7. Find the angle between the planes whose vector equations are $\vec{r} \cdot \left(2\hat{i} + 2\hat{j} - 3\hat{k}\right) = 5$ and $\vec{r} \cdot \left(3\hat{i} - 3\hat{j} + 5\hat{k}\right) = 3$

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8. Find the angle between the planes $2x - 3y + 4z = 1$ and $-x + y = 4$.

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9. Find the equation of plane which passes through the point (1,-1,4) and is parallel to the plane $2x - 3y + 7z = 11$.

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10. Find the equation of the plane through the intersection of the planes $3x - y + 2z - 4 = 0$ and $x + y + z - 2 = 0$ and the point (2, 2, 1).I

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

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12. Find the equation of the plane passing through the line of intersection of the planes $\vec{r} \cdot \left(\hat{i} + \hat{j} + \hat{k}\right) = 1$ and $\vec{r} \cdot \left(2\hat{i} + 3\hat{j} - \hat{k}\right) + 4 = 0$ and parallel to x-axis.

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Solved Examples Section Vii Short Answer Type Questions

1. Find the distance of the points (2,3,4) from the plane $\vec{R} \cdot \left(3\hat{i} - 6\hat{j} + 2\hat{k}\right) = -11.$

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2. If the points (1, 1, p) and (– 3, 0, 1) be equidistant from the plane $\vec{r} \cdot \left(3\hat{i} + 4\hat{j} - 12\hat{k}\right) + 13 = 0$ then find the value of p.

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3. Find the distance between the parallel planes $2x - 2y + z + 3 = 0$ and $4x - 4y + 2z + 5 = 0.$

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4. Find the angle between the line $\vec{r} = 2\hat{i} - \hat{j} + 2\hat{k} = 2\hat{i} - \hat{j} + 2\hat{k}$ the plane $\vec{r} \cdot \left(2\hat{i} - \hat{j} + \hat{k}\right)$

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5. Find the coordinates of the points where the line through (5,1,6) and (3,4,1) crosses YZ-plane.

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6. Find the coordinates of the point where the line through (3, – 4, – 5) and (2, – 3, 1) crosses the plane $2x + y + z = 7$

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7. Find the distance of the point $(-1, -5, -10)$ from the point of intersection of the line $\vec{r} = 2\hat{i} - \hat{j} + 2\hat{k} + \lambda\left(3\hat{i} + 4\hat{j} + 2\hat{k}\right)$ and the

plane $\vec{r} \cdot \left(\hat{i} - \hat{j} + \hat{k}\right) = 5$

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8. Evaluate P(E U F), if $P(E) = \frac{3}{4}, P(F) = \frac{2}{5}$ and P(E/F) = $\frac{5}{4}$

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Solved Examples Section Viii Long Answer Type Questions

1. A line makes angles $\alpha, \beta, \gamma, \delta$ with the diagonals of a cube, prove that $\cos^2\alpha + \cos^2\beta + \cos^2\gamma + \cos^2\delta = \frac{4}{3}$

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2. Find the length of perpendicular from point $(2, 3, 4)$ to the $\frac{4-x}{2} = \frac{y}{6} = \frac{1-z}{3}$.

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3. The length of the perpendicular drawn from the point $(3, -1, 11)$ to the line $\frac{x}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ is

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4. Find the shortest distance between the lines. $\frac{x-8}{3}, \frac{y+9}{-16} = \frac{z-10}{7}$ and $\frac{x-15}{3} = \frac{y-29}{8} = \frac{z-5}{-5}$.

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5. Find the equation of the plane passing through the points (2, 1, 0) and (3, 2, 2) and parallel to the line $\frac{x-4}{3} = \frac{y-1}{-2} = \frac{z-1}{1}$.

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6. Show that the three lines with direction cosines $\frac{12}{13}, -\frac{3}{13}, -\frac{4}{13}, \frac{4}{13}, \frac{12}{13}, \frac{3}{13}, \frac{3}{13}, -\frac{4}{13}, \frac{12}{13}$ are mutually perpendicular.

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7. find the image of the point (1,3,4) in the plane $x - y + z = 5$

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8. A variable plane is at a constant distance 'p' from the origin and meets the axes in a,B,C respectively, then show that locus of the centroid of the triangle ABC is $\frac{1}{x^2} + \frac{1}{y^2} + \frac{1}{z^2} = \frac{9}{p^2}$

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9. If E and F are any two events such that P(E) + P(F) - P(E and F) = P(E) Then (A) P(F/E) = 1 , (B) P(E/F) = 1 , (C) P(F/E) = 0 , (D) P(E/F) = 0.

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10. Find the vector equation of plane that contains the lines $\vec{r} = \left(\hat{i} + \hat{j}\right) + s\left(\hat{i} + 2\hat{j} - \hat{k}\right)$ and $\vec{r} = \left(\hat{i} + \hat{j}\right) + t\left(-\hat{i} + \hat{j} - 2\hat{k}\right)$

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

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Assignment Most Important Questions For Practice Section I Multiple Choice Questions

1. Direction cosines of x-axis are

A. $< 0, 0, 1 >$

B. $< 1, 0, 0 >$

C. $< 0, 1, 0 >$

D. $< 0, 1, 1 >$

Answer: B

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2. Vector equation of the line $\frac{x+1}{2} = \frac{y-4}{4} = \frac{z+6}{3}$

A. $\vec{r} = \left(\hat{i} - 4\hat{j} + 6\hat{k}\right) + \lambda\left(2\hat{i} + 4\hat{j} + 3\hat{k}\right)$

B. $\vec{r} = \left(-\hat{i} + 4\hat{j} - 6\hat{k}\right) + \lambda\left(2\hat{i} + 4\hat{j} + 3\hat{k}\right)$

C. $\vec{r} = \left(2\hat{i} + 4\hat{j} + 3\hat{k}\right) + \lambda\left(\hat{i} - 4\hat{j} + 6\hat{k}\right)$

D. $\vec{r} = \left(2\hat{i} + 4\hat{j} + 3\hat{k}\right) + \lambda\left(-\hat{i} + 4\hat{j} - 6\hat{k}\right)$

Answer: B

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3. If a line makes angles α, β, γ with x-axis and z-axis respectively, then $\sin^2\alpha + \sin^2\beta + \sin^2\gamma =$

A. 2

B. 1

C. 0

D. 3

Answer: A::B::C::D

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4. D. cosine of a line are $< \frac{3}{7}, \frac{-2}{7}, \frac{-6}{7} >$ then D. ratios of line are

A. $< 3, 2, 6 >$

B. $< -3, 2, 6 >$

C. $< 7, 7, 7 >$

D. None of these

Answer: B

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5. The value of λ for which the plane $\vec{r} \cdot \left(2\hat{i} - 2\hat{j} + 4\hat{k}\right) = 5$ is perpendicular to plane $\vec{r} \cdot \left(3\hat{i} - 3\hat{j} + \lambda\hat{k}\right) = 7$ is

A. 4

B. 3

C. -3

D. -4

Answer: C

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Assignment Most Important Questions For Practice Section Ii Short Answer Type Questions

1. If a line makes angles $90^\circ, 60^\circ, 45^\circ$ with positive x,y and z axis, find its direction cosines.

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2. If a line has direction ratios $< 2, -1, 2 >$ then what are its direction cosines ?

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3. Write the direction cosine of a vector $\vec{a} = -2\hat{i} + \hat{j} - 5\hat{k}$.

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4. If α, β, γ are direction - angles of a line prove that $\cos 2\alpha + \cos 2\beta + \cos 2\gamma = -1$

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5. Find the direction cosine of the line joining the points $(1, 0, 0)$ and $(0, 1, 1)$.

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6. The direction cosines of the line joining the points (-1, -1, -1) and (2, 3, 4) are,

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7. Find the direction cosines of the sides of the triangle whose vertices are (3, 5, – 4), (– 1, 1, 2) and (– 5, – 5, – 2).

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8. Show that the points $A(1, 2, 7), B(2, 6, 3)$ ਅਤੇ $C(3, 10, -1)$ are collinear.

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9. Show that the line through the points (4, 7, 8), (2, 3, 4) is parallel to the line through the points (– 1, – 2, 1), (1, 2, 5).

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10. Show that the line joining the origin to the point (2, 1, 1) is perpendicular to the line determined by the points (3, 5, – 1), (4, 3, – 1).

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11. Find the projection of the line segment joining the points (1,2,3), (4,3,1) on the line with direction ratios $< 3, -6, 2 >$.

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12. If P,Q,R,S are the points $(1, -1, 0), (2, 1, -1), (-3, 2, 2)$ and $(0, -2, -1)$ respectively. Find the projection of PQ on RS.

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Assignment Most Important Questions For Practice Section Iii Short Answer Type Questions

1. Find the eqution of a line which is

parallel to $2\hat{i} + \hat{j} - \hat{k}$ and passes through the point (1,2,3).

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2. Find the eqution of a line which is

parallel to $\hat{i}+\hat{j}+\hat{k}$ and passes through the point (2,3,1).

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3. Find the eqution of a line which is

passes through the point (1,1,1) and parallel to $2\hat{i}+\hat{j}-3\hat{k}$.

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4. Find a vector equation for the following line

$$\frac{x+3}{2}=\frac{y-5}{4}=\frac{z+5}{2}$$

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5. Find a vector equation for the following line

$$\frac{3-x}{5}=\frac{y+4}{7}=\frac{2z-6}{4}$$

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6. Find the vector and cartesion equation of the line through the point (5,2,-4) and parallel to vector $3\hat{i} + 2\hat{j} = 8\hat{k}$.

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7. Find the vector and cartesion equation of the line through the point with position vector $2\hat{i} - \hat{j} + 3\hat{k}$ and in the direction of $\hat{i} + 2\hat{j} - \hat{k}$

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8. Find the vector and cartesion equation of the line through the point (1,2,3) and (2,-1,4).

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9. Find the vector and cartesion equation of the line through the point (1,2,3) and is parallel to the line $\frac{-x-2}{3}=\frac{y+3}{7}=\frac{2z-6}{3}$

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10. Find the vector and cartesion equation of the line through the point (3,0,3) and is parallel to the line $\frac{x-2}{3}=\frac{y+1}{1}=\frac{z-7}{9}$.

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11. Find the vector equation of the line through the point (2,-1,-1) and is parallel to the line $6x-2=3y+1=2z-2$.

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Assignment Most Important Questions For Practice Section Iv Short Answer Type Questions

1. Find the angle between the pairs of line $r = 3\hat{i} + 2\hat{j} - 4\hat{k} + \lambda\left(\hat{i} + 2\hat{j} + 2\hat{k}\right)$ and $\hat{r} = 5\hat{i} - 2\hat{j} + \mu\left(3\hat{i} + 2\hat{j} + 6\hat{k}\right)$

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2. Find the angle between the following lines

$\vec{r} = 3\hat{i} + \hat{j} - 2\hat{k} + \lambda\left(\hat{i} - \hat{j} - 2\hat{k}\right)$ and

$r = 2\vec{i} - \vec{j} - 6\vec{k} + \mu\left(3\vec{i} - 5\vec{j} - 4\vec{k}\right)$

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3. Find the angle between the following lines

$\frac{x+1}{1} = \frac{y-4}{1} = \frac{z-5}{2}$ and $\frac{x+3}{3} = \frac{y-2}{5} = \frac{z+5}{4}$

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4. Find the angle between the following lines

$$\frac{x-5}{1}=\frac{2y+6}{-2}=\frac{z-3}{1} \text{ and } \frac{x-2}{3}=\frac{1+y}{4}=\frac{z-6}{5}$$

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5. Find the angle between the following lines

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

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6. Find the angle between the pairs of line with direction ratios

$$<5, -12, 13>, <-3, 4, 5>$$

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7. Find the angle between the lines whose direction ratios are a, b, c and b-c, c-a, a-b

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8. Show that the following lines are perpendicular

$$\frac{x-3}{2}=\frac{y+1}{-3}=\frac{z-2}{4} \text{ and } \frac{x+2}{2}=\frac{y-4}{4}=\frac{z-5}{2}$$

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9. Show that the following lines are perpendicular

$$\frac{-x+2}{-2}=\frac{y-1}{7}=\frac{z+3}{-3} \text{ and } \frac{x+2}{-1}=\frac{2y-8}{4}=\frac{z+5}{4}$$

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10. 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.

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11. Find the value of λ of the following pair of lines are perpendicular to each other

$$\frac{1-x}{3}=\frac{7y-14}{2\lambda}=\frac{5z-10}{11} \text{ and } \frac{7-7x}{3\lambda}=\frac{y-5}{3\lambda}=\frac{6-z}{5}$$

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12. Find the value of λ of the following pair of lines are perpendicular to each other

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

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13. Find the value of λ of the following pair of lines are perpendicular to each other

$$\frac{x-5}{5\lambda+2}=\frac{2-y}{5}=\frac{1-z}{-1} \text{ and } \frac{x}{1}=\frac{2y+1}{4\lambda}=\frac{1-z}{-3}$$

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14. The angle between the lines whose direction cosines are given by the equatios $l^2 + m^2 - n^2 = 0, m + n + l = 0$ is

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15. If a line makes angles 30°,60° and 90° with x,y and z-axis respectively, find its direction cosines.

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16. Find the angle between the two lines whose direction cosines are given by the equation

$l + m + n = 0, 2l + 2m - mn = 0$

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17. Find the equation of a line passing through the point P(2,-1,-3) and perpendicular to the lines

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

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18. Find the vector and cartesian equation of the line passing through the point (2,1,3) and perpendicular to the lines.

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

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Assignment Most Important Questions For Practice Section V Short Answer Type Questions

1. Find the shortest distance between the lines

$\vec{r}=\left(4\hat{i}-\hat{j}\right)+\lambda\left(\hat{i}+4\hat{j}-3\hat{k}\right)$ and

$\vec{r}=\left(\hat{i}-\hat{j}+2\hat{k}\right)+\mu\left(2\hat{i}+3\hat{j}-2\hat{k}\right)$

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2. Find the shortest distance between the lines

$\vec{r} = \hat{i} - \hat{j} + \lambda\left(2\hat{i} + \hat{k}\right)$ and $\vec{r} = 2\hat{i} - \hat{j} + \mu\left(\hat{i} + \hat{j} - \hat{k}\right)$

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3. Find the shortest distance between the lines

$\vec{r} = \hat{i} + 2\hat{j} + 3\hat{k} + \lambda\left(2\hat{i} + 3\hat{j} + 4\hat{k}\right)$ and

$\vec{r} = 2\hat{i} + 4\hat{j} + 5\hat{k} + \mu\left(3\hat{i} + 4\hat{j} + 4\hat{k}\right)$

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4. Find the shortest distance between the lines

$\vec{r} = 4\hat{i} - 3\hat{j} + \lambda\left(\hat{i} + 2\hat{j} - 2\hat{k}\right)$ and

$\vec{r} = \hat{i} + \hat{j} - \hat{k} - \mu\left(2\hat{i} + 4\hat{j} - 4\hat{k}\right)$

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5. Find the shortest distance between the lines

$\vec{r} = \hat{i} + 2\hat{j} + 3\hat{k} + \lambda\left(2\hat{i} + 3\hat{j} + 4\hat{k}\right)$ and

$\vec{r} = (2\mu - 1)\hat{i} + (1 + \mu)\hat{j} + (9 - 3\mu)\hat{k}$

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6. Find shortest distance between lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x-2}{3} = \frac{y-4}{4} = \frac{z-5}{5}$

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7. if a line has the direction ratios 3,-1,2 , then what are its direction cosines?

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8. Determine whether the following pair of lines intersect

$\vec{r} = \hat{i} - \hat{j} + \lambda\left(2\hat{i} - \hat{k}\right)$ and $\vec{r} = \left(2\hat{i} - \hat{j}\right) + \mu\left(\hat{i} - \hat{j} - \hat{k}\right)$

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9. Determine whether the following pair of lines intersect

$\vec{r} = \left(\hat{i} - 2\hat{j} + 3\hat{k}\right) + \lambda\left(-\hat{i} + \hat{j} - 2\hat{k}\right)$ and

$\vec{r} = \left(\hat{i} - \hat{j} - \hat{k}\right) + \mu\left(\hat{i} + 2\hat{j} - 2\hat{k}\right)$

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10. Prove that the lines : $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x-2}{3} = \frac{y-3}{4} = \frac{z-4}{5}$ are coplanar.

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Assignment Most Important Questions For Practice Section Vi Short Answer Type Questions

1. Find the cartesian equation of plane $\vec{r} \cdot \left(\hat{i} + \hat{j} - \hat{k}\right) = 2$

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2. Find the Cartesian equation of the following plane: $\vec{r} \cdot \left[(s - 2t)\hat{i} + (3 - t)\hat{j} + (2s + t)\hat{k}\right] = 15$

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3. Find the vector equation of the plane whose cartesian from of the equation is $x - 2y + 32 + 1 = 0$

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4. Find the direction cosine of the perpendicular from origin to plane $\vec{r} \cdot \left(\hat{i} + 2\hat{j} - 2\hat{k}\right) = 18$

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5. The length of the perpendicular drawn from the origin to $2x - 3y + 6z + 21 = 0$

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6. Find the intercepts cut off by the plane $x + 2y - 2z = 9$ with the axes.

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7. Find the vector and cartesian equation of the plane passing through the point (1,2,3) and perpendicular to the line with direction ratio $< 2, 3, -4 >$.

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8. Find the equation of the plane passing through origin and parallel to the plane $x + 3y - 2z + 7 = 0$.

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9. Find the equation of plane passing through the point (1,4,-2) and parallel to the plane $2x - y + 3z = 0$

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10. Find the angle between the following planes

$3x - 6y - 2z = 7$ and $2x + y - 2z = 5$

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11. Find the angle between the following planes

$2x - y - z = 6$ and $x + y + 2z = 7$

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12. Find the angle between the following planes

$\vec{r} \cdot \left(\hat{i} + \hat{j} - 2\hat{k}\right) = 3$ and $\vec{r} \cdot \left(2\hat{i} - 2\hat{j} + \hat{k}\right) = 2$

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13. Find the angle between the following planes

$\vec{r} \cdot \left(3\hat{i} - 4\hat{j} + 5\hat{k}\right) = 0$ and $\vec{r} \cdot \left(2\hat{i} - \hat{j} - 2\hat{k}\right) = 0$

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14. Find the angle between the following pair of lines

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15. Find the equation of plane passing through the intersection of the planes $2x - 7y + 4z = 3, 3x - 5y + 4z + 11 = 0$ and the point $(-2, 1, 3)$

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16. Find the vector equation of the plane through the intersection of the planes $\vec{r} \cdot \left(\hat{i} + \hat{j} + \hat{k}\right) = 6$ and $\vec{r} \cdot \left(2\hat{i} + 3\hat{j} + 4\hat{k}\right) = -5$ and the point (1,1,1).

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

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18. Find the equation of the plane passing through the line of intersection of the planes $2x + y - z = 3$ and $5x - 3y + 4z = 9$ and parallel to the lines $\frac{x-1}{2} = \frac{y-3}{4} = \frac{z-5}{5}$

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19. Find the equation of the through to the line of intersection of the planes $3x - 4y + 5z = 10$ and $2x + 2y - 3z = 4$ and parallel to the lines $x = 2y = 3z$.

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20. Find the equations of the planes passing through the following points

$(3, -1, 2), (-1, -1, 6), (5, 2, 4)$

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21. Find the equations of the planes passing through the following points

$(-3, 5, 1), (4, -1, 2), (2, 3, 4)$

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22. Find the equations of the planes passing through the following points

$(2, 5, -3), (-2, -3, 5), (5, 3, -3)$

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23. Find the equations of the planes passing through the following points

$(1, 1, 1), (1, -1, 1), (-7, -3, -5)$

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24. Show that the points $(-6, 3, 2), (3, -2, 4), (5, 7, 3)$ and $(-13, 17, -1)$ are coplanar.

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Assignment Most Important Questions For Practice Section Vii Short Answer Type Questions

1. Write the distance of the $2x + y + 2z + 1 = 0$ from the origin.

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2. Find the distance of a point (6,0,0) from the plane $2x - 3y + 6z - 2 = 0.$

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3. Find the distance of a point (2,5,-3) from the plane $\vec{R} \cdot \left(6\hat{i} - 3\hat{j} + 2\hat{k}\right) = 4$

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4. Find the distance between the parallel planes $2x - 3y + z + 3 = 0$ and $4x - 6y + 2z + 5 = 0$

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5. Find the angle between the following line and plane respectively

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

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6. Find the angle between the following line and plane respectively

$$\frac{x+1}{2} = \frac{y-1}{2} = \frac{z-2}{4}, 2x + y - 3z + 4 = 0$$

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7. Find the angle between the following line and plane respectively

$$\vec{v} = 2\hat{i} - \hat{j} + 3\hat{k} + \lambda\left(3\hat{i} - \hat{j} + 2\hat{k}\right), \vec{r} \cdot \left(3\hat{i} + 4\hat{j} + \hat{k}\right) + 5 = 0$$

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8. Find the angle between the following line and plane respectively

$\vec{r} = \left(\hat{i} - \hat{j} + \hat{k}\right) + \lambda\left(2\hat{i} - \hat{j} + 3\hat{k}\right), \vec{r} \cdot \left(2\hat{i} - \hat{j} + \hat{k}\right) = 4$

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9. Find the coordinate of the point where the line through (5,1,6) and (3,4,1) meet the XY-plane

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10. Find the points where the line $\frac{x+1}{2} = \frac{y-2}{-3} = \frac{z+3}{4}$ meets the plane $2x + 4y - z = 1$.

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11. Find the distance of a point (3,4,5) from the point of intersection of the line $\vec{r} = 3\hat{i} + 4\hat{j} + 5\hat{k} + \lambda\left(\hat{i} + 2\hat{j} + 3\hat{k}\right)$ and the plane $\vec{r} \cdot \left(\hat{i} + \hat{j} + \hat{k}\right) = 2$

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12. Find the distace of a point (2,12,5) from the point where the line $\frac{x-2}{3} = \frac{y+4}{4} = \frac{z-2}{2}$ meets the plane $x - 2y + z = 0$

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13. Show that the lines

$\vec{r} = 3\hat{i} + 2\hat{j} - 4\hat{k} + \lambda\left(\hat{i} + 2\hat{j} + 2\hat{k}\right)$

$\vec{r} = 5\hat{i} - 2\hat{j} + \hat{k} + \mu\left(3\hat{i} + 2\hat{j} + 6\hat{k}\right)$

intersect, Hence find the point of intersection.

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Assignment Most Important Questions For Practice Section Viii Long Answer Type Questions

1. Find the length of perpendicular from (2,1,3) on the line

$$\frac{x-4}{5}=\frac{y-2}{4}=\frac{z-3}{3}$$

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2. Find the perpendicular distance of (1,0,0) from the line

$$\frac{x-1}{2}=\frac{y+1}{-3}=\frac{z+10}{8}$$

Also find the coordinates of foot of perpendicular and the equation of the perpendicular.

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3. Find the length and foot of perpendicular drawn from the point (2,-1,3) to the line

$$\frac{x-11}{10}=\frac{y+2}{-4}=\frac{z+8}{-11}$$

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4. Find the equation of line parallel to x-axis

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5. Find the image of the point (2,-1,5) in the line $\frac{x-11}{10}=\frac{y+2}{-4}=\frac{z+8}{-11}$. Also find the equation of the line joining the given point and its. Also the length of that line segment .

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6. Find the image of the point P(3,4,2) in the line $\vec{r}=-\hat{i}+3\hat{j}+\hat{k}+\lambda\left(\hat{i}+3\hat{j}-\hat{k}\right)$

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7. Show that the lines $\frac{x+3}{-3}=\frac{y-1}{1}=\frac{z-5}{5}$ and $\frac{x+1}{-1}=\frac{y-2}{2}=\frac{z-5}{5}$ are coplanar. Also find the equation of the plane containing the lines.

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8. Write the vector equation of the following lines and hence find distance between them $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z+4}{6}, \frac{x-3}{4}=\frac{y-3}{6}=\frac{z+5}{12}$

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9. Find the equation of the plane through the point (0, 0, 0) and (3, -1 , 2) and parallel to the line. $\frac{x-4}{1}=\frac{y+3}{-4}=\frac{z+1}{7}$.

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

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11. Find the equation of the plane through the points (2,-3,-1) and (5,2,-1) and perpendicular to the plane $x - 2y + 4z = 10$.

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12. Find the vector equation of the plane through the points (2,1,-1) and (-1,3,4) and perpendicular to the plane $x - 2y + 4z = 10$.

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13. Find the equation of the plane passing through (1,1,-1) and perpendicular to the planes $x + 2y + 3z - 7 = 0, 2x - 3z + 4y = 0$

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14. Find the equation of the plane passing through (-1,-1,2) and perpendicular to the planes $2x + 3y + 3z = 2$ and $5x - 4y + z = 6$.

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

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16. Find the image of (2,-1,3) in the plane $3x - 2y - z = 9$.

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17. A variable plane which remains at a constant distance 3p from the origin cuts the coordinate axes at A,B,C. Show that locus of the O centroid of the triangle ABC is

$$\frac{1}{x^2}+\frac{1}{y^2}+\frac{1}{z^2}=\frac{1}{p^2}.$$

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18. Find the cartesian and vector equations of the planes passing through the intersection of te planes $\vec{r}\cdot\left(2\hat{i}+6\hat{j}\right)+12=0$ and $\vec{r}\cdot\left(3\hat{i}-\hat{j}-4\hat{k}\right)=0$ which are at a unit distance from the origin.

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19. Find the distance of the point P(6,5,9) and from the plane through the points (3,-1,2), (5,2,4) and (-1,-1,6).

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20. Find the distance of the point (2,3,4) measured parallel to the line $\frac{x-3}{3}=\frac{y-2}{6}=\frac{z}{2}$ from the plane $3x+2y+2z-5=0$

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21. Find the distance of the point (-2,3,-4) from the line. $\frac{x+2}{3}=\frac{2y+3}{4}=\frac{3z+4}{5}$ measured parallel to the line $\frac{x}{2}=\frac{y}{3}=\frac{z}{-6}$.

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22. Find the distance of the point (1,-2,3) from the plane $x-y+z=5$ measured parallel to the line $\frac{x}{2}=\frac{y}{3}=\frac{z}{-6}$.

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23. Find the vector and cartesian equation of the plane containing the two lines

$\vec{r} = 2\hat{i} + \hat{j} - 3\hat{k} + \lambda\left(\hat{i} + 2\hat{j} + 5\hat{k}\right)$

and $\vec{r} = 3\hat{i} + 3\hat{j} - 7\hat{k} + \mu\left(3\hat{i} - 2\hat{j} + 5\hat{k}\right)$

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24. Find the equation of the plane containing the lines

$\frac{x-4}{1} = \frac{y-3}{4} = \frac{z-2}{5}$ and $\frac{x-3}{1} = \frac{y-2}{-4} = \frac{z}{5}$

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Previous Years Board S Question For Practice M C Q

1. If a line passing through two points (-2,4,-5) and (1,2,3) then its direction cosines will be :

A. $< 3, -2, 5 >$

B. $< \frac{-2}{\sqrt{77}}, \frac{3}{\sqrt{77}}, \frac{8}{\sqrt{77}} >$

C. $< \frac{3}{\sqrt{77}}, \frac{-2}{\sqrt{77}}, \frac{8}{\sqrt{77}} >$

D. None of these

Answer: C

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2. If a line makes equal angles with coordinates axes its direction - cosines are.

A. $< \frac{1}{\sqrt{3}}, \frac{-1}{\sqrt{3}}, \frac{1}{\sqrt{3}} >$

B. $< \pm \frac{1}{\sqrt{3}}, \pm \frac{-1}{\sqrt{3}}, \pm \frac{1}{\sqrt{3}} >$

C. $< 0, 0, 0 >$

D. $< 1, 1, 1 >$

Answer: B

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3. If a line makes angles $90^\circ, 60^\circ$ and 30° with the positive direction of x,y and z-axis reapectively, then direction cosines are

A. $< 1, \frac{1}{2}, \frac{\sqrt{3}}{2} >$

B. $< 0, \frac{1}{2}, \frac{\sqrt{3}}{2} >$

C. $< 0, \frac{-1}{2}, \frac{\sqrt{3}}{2} >$

D. None of these

Answer: B

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4. Find the intercepts cut off by the plane $2x + y - z = 5$

A. $\frac{5}{2}, 5, -5$

B. $\frac{1}{2}, 1, -1$

C. $2, 1, -1$

D. None of these

Answer: A

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5. The distance between the planes $3x + 2y - 6z = 14 = 0$ and $3x + 2y - 6z + 21 = 0$ is

A. 35

B. 7

C. 1

D. 5

Answer: D

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6. Distance between plane defined by $3x + 4y + 5 = 0$ and the point (5, 0, 7) is

A. 3

B. 4

C. 5

D. 6

Answer: B

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7. Direction casines of z-axis are

A. $1 < 0, 0, 1 >$

B. $< 1, 0, 0 >$

C. $< 0, 0, 0 >$

D. $< 0, 1, 0 >$

Answer: A

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Previous Years Board S Question For Practice

1. Find the length of perpendicular drawn from the point (3,4,5) on the line $\frac{x-2}{2}=\frac{y-3}{5}=\frac{z-1}{3}$

Also find the foot of perpendicular.

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2. Find the length of perpendicular from the point (5,8,1) on the line $\frac{x-1}{2}=\frac{y-3}{5}=\frac{z-8}{1}$.

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3. Find the length of perpendicular from the point (5,4,-1) on the line $\frac{x-1}{2}=\frac{y}{9}=\frac{z}{5}$

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4. Find the shortest distance between the following lines

$\vec{r} = \hat{i} + \hat{j} + \lambda\left(\hat{i} - \hat{k}\right)$ and $\vec{r} = 2\hat{i} - \hat{j} + \mu\left(\hat{i} + \hat{j} + \hat{k}\right)$

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5. Find the shortest distance between the following lines

$\vec{r} = \hat{i} + \hat{j} + \lambda\left(\hat{i} - \hat{j} + \hat{k}\right)$ and $\vec{r} = 2\hat{i} + \hat{j} - \hat{k} + \mu\left(3\hat{i} - 4\hat{j} + \hat{k}\right)$

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6. Find the shortest distance between the following lines

$\vec{r} = \hat{i} - \hat{j} - \hat{k} + \lambda\left(\hat{i} + \hat{j} - \hat{k}\right)$ and

$\vec{r} = 3\hat{i} - \hat{j} - 2\hat{k} + \mu\left(-\hat{i} + 2\hat{j} + \hat{k}\right)$

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7. Find the shortest distance between the following lines

$\vec{r} = -\hat{i} + 2\hat{j} - \hat{k} + \lambda\left(\hat{i} + \hat{j} - \hat{k}\right)$ and

$\vec{r} = \hat{i} - \hat{j} + 2\hat{k} + \mu\left(-\hat{i} + \hat{j} + \hat{k}\right).$

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8. Find the shortest distance between the following lines

$\vec{r} = \hat{i} + \hat{j} - 2\hat{k} + \lambda\left(\hat{i} + \hat{j} + \hat{k}\right)$ and $\vec{r} = \hat{i} + \hat{j} + \hat{k} + \mu\left(\hat{i} + \hat{j} + \hat{k}\right)$

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9. Find the equation of the plane containing the line $\frac{x+3}{2} = \frac{y-2}{-1} = \frac{z-4}{4}$ and perpendicular to the plane $x + 2y + z - 6 = 0.$

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10. Find the equation of the plane through the point (1,1,1) and perpendicular to the plane $x - 2y + z = 3, 4x + 3y - z = 5.$

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11. Determine whether the lines

$\vec{r} = 3\hat{i} - \hat{j} + \lambda\left(3\hat{i} + \hat{k}\right)$ and $\vec{r} = \hat{i} - \hat{j} + \mu\left(2\hat{i} + \hat{j} - 2\hat{k}\right)$ intersect or not

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12. Find the equation of the plane passing through the points (0,-1,1), (4,5,1) and (3,9,4)

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13. Find the equation of the plane passing through the point (1,1,0),(1,2,1) and (2,3,2).

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14. Find the angle between the following pairs of lines $\frac{x}{2}=\frac{y}{2}=\frac{z}{1}$ and $\frac{x-5}{4}=\frac{y-5}{1}=\frac{z-3}{8}$

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15. $\vec{r}=(1-t)\hat{i}+(t-2)\hat{j}-(3-2t)\hat{k}$ and $\vec{r}=(1-t)\hat{i}(t-2)\hat{j}-(3-2t)\hat{k}.$

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16. Find the angle between these two lines $\frac{x+2}{1}=\frac{y-1}{-2}=\frac{z-1}{1}$ and $\frac{x-3}{2}=\frac{y+5}{-2}=\frac{z-7}{1}.$

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17. Find the vector equation of the plane which is at a distance of 7 units from the origin and which is normal to the vector $3\hat{i} + 5\hat{j} - 6\hat{k}$.

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18. Find the equation of the plane through intersection of the planes :

$x - 2y + 3z - 4 = 0$ and $x + 2y + z - 2 = 0$ and the point (2,2,1)

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19. Find the equation of the plane passing through the points

$(1, 2, -1), (2, 4, -3), (4, -2, 1)$

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20. Find the equation of the plane passing through the points

$(1, 1, 0), (1, 3, 0), (2, 5, 1)$

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21. Find the direction cosine of a line parallel to the line $\frac{2x-5}{4} = \frac{y+4}{3} = \frac{6-z}{6}$

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22. Find the equation of the straight line passing through the point (2,-1,3) and perpendicular to the lines

$\vec{r} = \left(\hat{i} + \hat{j} - \hat{k}\right) + \lambda\left(2\hat{i} + \hat{j} - 3\hat{k}\right)$ and

$\vec{r} = \left(\hat{i} - \hat{j} - \hat{k}\right) + \mu\left(\hat{i} + \hat{j} + \hat{k}\right).$

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23. Find the equation of a plane through the points

$(1, 0, 1), (1, 2, -2), (2, -1, 0)$

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

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25. Find the equation of the plane through the point (-1, -1, 2) and (3, 4, 2) and parallel to the line $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{1}$

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26. Find the equation of the plane passing through the point(-1, 3, 2) and perpendicular to the planes x + 2y + 3z = 5 and 3x + 3y + z = 0.

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27. A variable plane which is at a constant 6 p from the origin meets the axes in A,B and C respectively. Show that the locus of the centroid of the triangle ABC is $\frac{1}{x^2}+\frac{1}{y^2}+\frac{1}{z^2}=\frac{1}{4p^2}$

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28. Show that the lines $\frac{x-1}{2}=\frac{y-3}{4}=-z$ and $\frac{x-4}{2}=\frac{y-1}{-2}=\frac{z-1}{1}$ are coplanar Also find the equation of the plane containing the lines.

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29. Show that the lines $\frac{x+3}{-3}=\frac{y-1}{1}=\frac{z-5}{5}$ and $\frac{x+1}{-1}=\frac{y-2}{2}=\frac{z-5}{5}$ are coplanar. Also find the equation of the plane containing the lines.

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30. Prove that the lines : $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ and $\frac{x-2}{3}=\frac{y-3}{4}=\frac{z-4}{5}$ are coplanar.

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31. Prove that if a plane has the intercepts a, b, c and is at a distance of p units from the origin, then $\frac{1}{a^2}+\frac{1}{b^2}+\frac{1}{c^2}=\frac{1}{p^2}$

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32. Find the vector equation of the plane through the intersection of the planes $\vec{r}\cdot\left(2\hat{i}-2\hat{j}+3\hat{k}\right)=2, \vec{r}\cdot\left(\hat{i}-3\hat{j}+2\hat{k}\right)=-3$ and the point (1,2,3).

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33. Find the equation of the plane through the intersection of the planes $\vec{r} \cdot \left(2\hat{i} + \hat{j} + 3\hat{k}\right) = 7$ and $\vec{r} \cdot \left(2\hat{i} + 3\hat{j} + 3\hat{k}\right) = 9$ and passing through the point (2,1,3).

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34. Find the equation of the straight line through the point (1,-3,2) and perpendicular to the lines $\frac{x-1}{1} = \frac{y-2}{2} = \frac{z-3}{3}$ and $\frac{x-1}{-3} = \frac{y-2}{2} = \frac{z-1}{5}$.

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35. Find the equation of the straight line passing through the point (2,3,-1) and is perpendicular to the lines $\frac{x-2}{2} = \frac{y+1}{1} = \frac{z-3}{-3}$ and $\frac{x-3}{1} = \frac{y+2}{1} = \frac{z-1}{-1}$.

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36. Find the shortest distance between the line $\vec{r} = \hat{i} - 7\hat{j} - 2\hat{k} + \lambda\left(\hat{i} + 3\hat{j} + 2\hat{k}\right)$ and $\vec{r} = 3\hat{i} + 4\hat{j} - 2\hat{k} + \mu\left(-\hat{i} + 2\hat{j} + \hat{k}\right)$.

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37. Find the equation of the plane through the point $(1, 1, 1)$, parallel to the line $\frac{x-1}{2} = \frac{y-2}{-3} = \frac{z-3}{3}$ and perpendicular to the plane $x - 2y + z - 6 = 0$.

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38. Find the distance between the point with position vector $-\hat{i} - 5\hat{j} - 10\hat{k}$ and the point of intersection of the line $\frac{x-2}{3} = \frac{y+1}{4} = \frac{z-12}{12}$ with the plane $x - y + z = 5$.

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39. Show that the two lines $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ and $\frac{x-4}{5}=\frac{y-1}{2}=z$ intersect each other . Find also the point of intersection.

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40. Show that the lines $\frac{x+3}{-3}=\frac{y-1}{1}=\frac{z-5}{5}$ and $\frac{x+1}{-1}=\frac{y-2}{2}=\frac{z-5}{5}$ are coplanar. Also find the equation of the plane containing the lines.

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41. Find the foot of perpendicular drawn from origin to the plane $2x+3y+4z-12=0$

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42. Find the vector equation of the line passing through (1, 2, 3) and perpendicular to the plane $\vec{r} \cdot \left(\hat{i} + 2\hat{j} - 5\hat{k}\right) + 9 = 0$

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43. Find the equation of the plane passing through (a, b, c) and parallel to the plane $\vec{r} \cdot \left(\hat{i} + \hat{j} + \hat{k}\right) = 2$

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44. Find the shortest distance between the lines whose vector equations are :

$\vec{r} = \left(-2\hat{i} + 3\hat{j} + 5\hat{k}\right) + \lambda\left(7\hat{i} - \hat{k}\right)$

and $\vec{r} = 4\hat{i} + 5\hat{j} + 6\hat{k} + \mu\left(2\hat{i} + 3\hat{j} + \hat{k}\right)$

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45. Find the shortest distance between the lines whose vector equations are :

$\vec{r}_1 = 2\hat{i} + 3\hat{j} + 4\hat{k} + \lambda\left(2\hat{i} - \hat{j} + \hat{k}\right)$

$\vec{r}_2 = 3\hat{i} - 2\hat{j} - \hat{k} + \mu\left(3\hat{i} + 2\hat{j} - 4\hat{k}\right)$

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46. Find the shortest distance between the lines whose vector equations are :

$\vec{r} = 6\hat{i} + 2\hat{j} + 2\hat{k} + \lambda\left(\hat{i} - 2\hat{j} + 2\hat{k}\right)$ and

$\vec{r} = -4\hat{i} - \hat{k} + \mu\left(3\hat{i} - 2\hat{j} - 4\hat{k}\right)$

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47. Find the equation of the plane through the points (0,-1,0),(2,1,-1) and (1,1,1).

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48. Find the equation of the plane passing through the points (0,-1,0), (1,1,1) and (3,3,0).

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49. Find the equation of the plane passing through the points (2,2,1), (9,3,5) and perpendicular to the plane $2x + 6y + 6z - 1 = 0$.

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50. Find the angle between the pair of lines $\frac{x+3}{3} = \frac{y-1}{5} = \frac{z+3}{4}$ and $\frac{x+1}{1} = \frac{y-4}{1} = \frac{z-5}{2}$

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51. Find the shortest distance between the lines

$\vec{r} = \hat{i} + \hat{j} + \lambda\left(2\hat{i} - \hat{j} + \hat{k}\right)$ and $\vec{r} = 2\hat{i} + \hat{j} - \hat{k} + \mu\left(3\hat{i} - 5\hat{j} + 2\hat{k}\right)$

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52. Find the coordinate of the point where the line through the points A(3,4,1) and B(5,1,6) crosses the

xy-plane

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53. Find the coordinate of the point where the line through the points A(3,4,1) and B(5,1,6) crosses the

yz-plane

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54. Find the coordinate of the point where the line through the points A(3,4,1) and B(5,1,6) crosses the

zx-plane

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55. Find the vector equation of the plane passing through the intersection of the planes $\vec{r} \cdot \left(2\hat{i} + 2\hat{j} - 3\hat{k}\right) + 7 = 0$ and $\vec{r} \cdot \left(2\hat{i} + 5\hat{j} + 3\hat{k}\right) = 9$ and passing through the point (2,1,3).

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56. Show that the points whose position vectors are $-2\hat{i} + 3\hat{j} + 5\hat{k}$, $\hat{i} + 2\hat{j} + 3\hat{k}$ and $7\hat{i} - \hat{k}$ are collinear.

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57. Find the image of the point (2,0,1) in the line

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

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58. Find the angle between the lines

$$\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4} \text{ and } \frac{x-2}{3}=\frac{y-4}{4}=\frac{z-5}{5}$$

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59. Find the equation of the plane through the points (2, 2, 1) and (9, 3, 6) and perpendicualr to the plane 2x + 6y + 6z = 1.

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60. Find the co-ordinates of the foot of perpendicular drawn from the point (2, 3, 5) on the plane given by the equation : $2x-3y+4z+10=0$

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