Padasalai’s Telegram Groups!

(தமிழ் நூல்கள் விளக்கம் பற்றிய விளக்கம் வெளியிடும் தொடர்புகள்!)

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REVOLUTION FOR LEARNING , COIMBATORE
12TH APPLICATIONS OF VECTOR ALGEBRA EX : 6.2 - 6.9
OPEN BOOK TEST

Marks : 80

I. Answer the following questions 10 x 2 = 20
1. Find the angle between the vectors \( \hat{a} = 2\hat{i} + \hat{j} - \hat{k} \) \( \hat{i} + 2\hat{j} + \hat{k} \) by sing cross product
2. Find the volume of parallelepiped , If the edges are \( \hat{a} = -3\hat{i} + 7\hat{j} + 5\hat{k} \),
\( \overrightarrow{b} = -5\hat{i} + 7\hat{j} - 3\hat{k} \), \( \hat{c} = 7\hat{i} - 5\hat{j} - 3\hat{k} \)
3. Let \( \hat{a}, \hat{b}, \hat{c} \) are three mon zero vectors such that \( \hat{c} \) is a unit vector perpendicular to both \( \hat{a} \& \overrightarrow{b} \). If angle between \( \hat{a} \& \overrightarrow{b} \) is \( \frac{\pi}{6} \) show that \( [\hat{a} + \overrightarrow{b} + \hat{c}]^2 = \frac{1}{4} |\hat{a}|^2 |\overrightarrow{b}|^2 \)
4. If \( \hat{a} = -3\hat{i} + 7\hat{j} + 5\hat{k} \), \( \overrightarrow{b} = -5\hat{i} + 7\hat{j} - 3\hat{k} \), \( \hat{c} = 7\hat{i} - 5\hat{j} - 3\hat{k} \) find \( (\hat{a} \times \overrightarrow{b}) \times \hat{c} \)
5. If \( \hat{a}, \overrightarrow{b}, \hat{c}, \overrightarrow{d} \) are coplanar vectors , show that \( (\hat{a} \times \overrightarrow{b}) \times (\hat{c} \times \overrightarrow{d}) = 0 \)
6. If the straight line joining the points (2,1,4) and (a-1 , 4 , -1 ) is parallel to the line joining
the points (0, 2,b-1) and (5,3,-2) , find the values of \( a \) and \( b \).
7. Show that the points (2,3,4),(-1,4,5) and (8,1,2) are collinear
8. Find the angle between the line \( \vec{r} = (2\hat{i} - \hat{j} - 3\hat{k}) + t(\hat{i} + 2\hat{j} + 2\hat{k}) \) and the plane
\( \vec{r} \times (2\hat{i} - \hat{j} - 3\hat{k}) = 8 \)
9. If the points (t , 0 , 3 ) , (1 , 3 , -1 ) and (-5 , -3 , 7 ) are collinear find \( t \)
10. Find the distance from the point ( 1 , -1 , 2 ) to the plane \( x + y + z - 3 = 0 \)

II. Answer the following questions ( any 10 ) 10 x 3 = 30
1. Find the altitude of a paralleloped determined by the vectors \( \hat{a} = -2\hat{i} + 5\hat{j} + 3\hat{k} \),
\( \overrightarrow{b} = \hat{i} + 3\hat{j} - 2\hat{k} \), \( \hat{c} = -3\hat{i} + \hat{j} + 4\hat{k} \) if the base is taken as the parallelogram determined
by \( \overrightarrow{b} \& \hat{c} \)
2. If the vectors \( a\hat{i} + a\hat{j} + c\hat{k} \), \( \hat{i} + \hat{k} \& c\hat{i} + c\hat{j} + b\hat{k} \) are coplanar , prove that \( c \) is
geometric mean of \( a \) and \( b \)
3. For any vector \( \hat{a} \), prove that \( \hat{i} \times (\hat{a} \times \hat{i}) + \hat{j} \times (\hat{a} \times \hat{j}) + \hat{k} \times (\hat{a} \times \hat{k}) = 2\hat{a} \)
4. If \( \hat{a}, \overrightarrow{b}, \hat{c} \) are three unit vectors such that \( \overrightarrow{b} \& \hat{c} \) are non parallel vectors and \( \hat{a} \times (\overrightarrow{b} \times \hat{c}) = \frac{1}{2} \overrightarrow{b} \)
find the angle between \( \hat{a} \& \hat{c} \)
5. Find the parametric form and non parametric form of vector equation and Cartesian
equations of the straight line passing through the point (-2,3,4) and parallel to the straight
line \( \frac{x-1}{-4} = \frac{y+3}{5} = \frac{8-z}{6} \)
6. Find the direction cosines of the normal to the plane \( 12x + 3y -4z = 65 \) Also, find the
non-parametric form of vector equation of a plane and the length of the perpendicular to the plane
from the origin.
7. A plane passes through the point (-1,1,2) and the normal to the plane of magnitude
\( 3\sqrt{3} \) makes equal acute angles with the coordinate axes. Find the equation of the plane.
8. Find the parametric form of vector equation, and Cartesian equations of the plane passing
through the points (2,2,1), (9,3,6) and perpendicular to the plane \( 2x + 6y + 6z = 9 \)
9. Find the parametric vector, non-parametric vector and Cartesian form of the equations of the plane passing through the points (3,6,-2), (-1,-2,6) and (6,-4,-2).
10. If the straight lines \( \frac{x-1}{1} = \frac{y-2}{2} = \frac{z-3}{m^2} \) and \( \frac{x-3}{1} = \frac{y-2}{m^2} = \frac{z-2}{2} \) are coplanar, find the distinct real values of \( m \).
11. Find the distance between the parallel planes \( x - y + 3z + 5 = 0 \), \( 2x -2y +6z +7 = 0 \)

III. Answer the following questions

1. If \( \vec{a} = 2\hat{i} + 3\hat{j} - \hat{k} \), \( \vec{b} = 3\hat{i} + 5\hat{j} + 2\hat{k} \), \( \vec{c} = -\hat{i} - 2\hat{j} - 3\hat{k} \) Verify that \( (\vec{a} \times \vec{b}) \times \vec{c} = (\vec{a} . \vec{c})\vec{b} - (\vec{b} . \vec{c})\vec{a} \)
2. Show that the lines \( \vec{r} = (\hat{i} + \hat{j} - \hat{k}) + s(2\hat{i} - 2\hat{j} + \hat{k}) \), \( \vec{r} = (2\hat{i} - \hat{j} - 3\hat{k}) + t(\hat{i} + 2\hat{j} + 2\hat{k}) \) are skew lines and hence find the shortest distance between them.
3. Show that the lines \( \frac{x-2}{-3} = \frac{y-3}{1} = \frac{z-4}{3} \) and \( \frac{x-1}{-3} = \frac{y-4}{2} = \frac{z-5}{1} \) are coplanar. Also, find the plane containing these lines.
4. Show that the lines \( \frac{x-1}{3} = \frac{y-1}{-1} = \frac{z+1}{0} \) and \( \frac{x-4}{2} = \frac{y}{0} = \frac{z+1}{3} \) intersect and hence find their point of intersection.
5. Find the equation of the plane passing through the line of intersection of the planes \( x + 2y + 3z = 2 \), \( x - y + z +11 = 3 \) and at a distance \( \frac{2}{\sqrt{3}} \) from the point (3, 1, -1).
6. Find the coordinates of the foot of the perpendicular and length of the perpendicular from the point (4,3,2) to the plane \( x + 2y +3z = 2 \)

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