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**Question**

1. If A=2i–j, B= 3i+j-11k and C= 4i+4j-5k, find the following:
2. -3A+7B-8C
3. If K= 2A+4B-C, find the direction cosine of K.
4. A×(B×C)
5. (3A× B) (A×2B)
6. A-2B-C
7. Define Perpendicular and Co-planar vectors.

**Solutions**

**(1)**

A=2i–j, B= 3i+j-11k and C= 4i+4j-5k

**(I)**

-3A+7B-8C= -3(2i-j)+7(3i+j-11k)-8(4i+4j-5k)

 = -6i+3j+21i+7j-77k-32i-32j+40k

 = (-6+21-32)i +(3+7-32)j +(-17+40)k

 = -17i-22j-37k.

**(II)**

K= 2A+4B-C

 = 2(2i-j) +(3i+j-11k)

 = 4i-2j+12i+4j-44k

 = 16i+2j-44k

 = $\sqrt{16^{2}+2^{2}+(-44)^{2}}$

 =$\sqrt{2196}$

$∴$Direction Cosine of K= $\frac{16i}{47}$+$\frac{2j}{47}$-$\frac{44k}{47}$

**(III)**

A×(B×C)= ?

(B×C)= (3i+j-11k)×(4i+4j-5k)

 =$\left|\begin{matrix}i&j&k\\3&1&-11\\4&4&-5\end{matrix}\right|$

=[(-5)(-44)]i – [(15)-(-44)]j +[(12-4)]k

 = (-55+44)i-(-15+44)j+8k

 = (39i-29j+8k)

 A×(B×C)= (2i-j)×(39i-29j+8k)

 = $\left|\begin{matrix}i&j &k\\2&-1&0\\39&-29&8\end{matrix}\right|$

 = (-8-0)i -(16-0)j +[(-58-(-39)]k

 $∴$A×(B×C) = -8i-16-19k

**(IV)**

(3A×B) $∙$ (A×2B)

3A= 3(2i-j+0k)

 = (6i-3j+0k)

3A×B= $\left|\begin{matrix}i&j&k\\6&-3&0\\3&1&-11\end{matrix}\right|$

 = i(33-0) –j(-66-0) +k(6+9)

(3A×B)= 33i+66j+15k

 2B= 2(3i+j-11k)

 = (6i+2j-22k)

(A×2B)= $\left|\begin{matrix}i&j&k\\2&-1&0\\6&2&-22\end{matrix}\right|$

 = i(22+0) –j(-44+0) +k(4+6)

(A×2B)= 22i +44j +10k

(3A×B)$∙$(A×2B)= (33i+66j+15k)$∙$( 22i +44j +10k)

 = (33$∙$22)i.i +(66$∙$44)j.j +(15$∙$10)k.k

 = 726+2904+150

 =3780

**(V)**

(A-2B-C)= (2i-j) -2(3i+j-11k) –(4i+4j-5k)

 = (2i-j)-6i-2j+22k-4i-4j+5k

 = (2-6-4)i +(-1-2-4)j +(22+5)k

 = -8i-7j+27k.

**(2)**

**Co-planar vectors** are vectors which are parallel to the same plane, or lie on the same plane.

A vector is said to be coplanar if their supports are parallel to the same plane.

Conditions For Co-planarity Of Vectors

* If the scalar triple product of any three vectors is zero then, they are Co-planar.
* If any three vectors are linearly dependent then, they are Co-planar.
* Vectors are Co-planar if among them no more than two vectors are linearly independent vectors.

 **Perpendicular Vectors**: Two vectors $\overbar{A}$ and $\overbar{B}$ are perpendicular if and only if their scalar product is equal to zero.

$\overbar{A}∙\overbar{B}$ = ABCos$θ$

$\overbar{A}∙\overbar{B}$ = AB Cos90

Since Cos90 = 0

$∴\overbar{A}∙\overbar{B}$ = 0

Vectors $\overbar{A}$ and $\overbar{B}$ are perpendicular if and only if $\overbar{A}∙\overbar{B}$ = 0