CWS-8. Cross Product 8th foundation +

Thank

(1)

Given $|\vec{A}| = 80$; $|\vec{B}| = 100$ $\theta = 30^\circ$.

$\vec{A} \times \vec{B} = |A||B| \sin\theta$

$= 80 \times 100 \times \sin 30^\circ$

$= 80 \times 100 \times \frac{1}{2} \Rightarrow 4000$

$\rightarrow A$

(2)

$\hat{j} \times \hat{k} = \hat{i}$ here Angle b/w $\hat{j}$ and $\hat{k}$ is 90°

$\rightarrow A$

(3)

Given $\vec{A} = 2\hat{i} + 3\hat{j} + \hat{k}$ & $\vec{B} = \hat{i} - \hat{j} + \hat{k}$.

$$\vec{A} \times \vec{B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & 3 & 1 \\ 1 & -1 & 1 \end{vmatrix} = \hat{i}[3\times1 - (1)(-1)] - \hat{j}[2\times1 - 1\times1] + \hat{k}[2(-1) - 3(1)]$$

$\Rightarrow \hat{i}[3+1] - \hat{j}[2-1] + \hat{k}[-2-3]$

$\Rightarrow 4\hat{i} - \hat{j} - 5\hat{k}$

$|\vec{A} \times \vec{B}| = \sqrt{4^2 + (-1)^2 + (-5)^2} = \sqrt{16+1+25} = \sqrt{42}$.

$\therefore$ The unit vector Perpendicular to $\vec{A} \times \vec{B}$ is

$$= \frac{\vec{A} \times \vec{B}}{|\vec{A} \times \vec{B}|} = \frac{4\hat{i} - \hat{j} - 5\hat{k}}{\sqrt{42}} \rightarrow A$$

(4)

Given $\vec{A} = 6\hat{i} + 8\hat{j}$; $\vec{B} = 210\hat{i} + 280\hat{k}$

$\vec{C} = 5.1\hat{i} + 6.8\hat{j}$. $\vec{D} = 3.6\hat{i} + 8\hat{j} + 48\hat{k}$

If $\vec{P}$ and $\vec{Q}$ are parallel vectors

$\vec{P} = m\vec{Q}$

$\vec{c} = 1.7[3\hat{i} + 4\hat{j}]$ $\quad$ $\vec{a} = 2(3\hat{i} + 4\hat{j})$

$\vec{c} = \frac{1.7}{2}(6\hat{i} + 8\hat{j})$ $\quad$ $\cancel{\vec{a} = 1.7}$

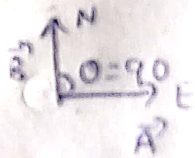
$\vec{c} = \frac{1.7}{2}\vec{a}$ so $\vec{a}$ and $\vec{c}$ are parallel

→ B

(5)

Given $|\vec{A}| = 3$ points towards east

$|\vec{B}| = 4$ points towards north



$\frac{A \cdot B}{\vec{A} \times \vec{B}} = \frac{AB\cos\theta}{AB\sin\theta} = \cot\theta$

$= \cot 90 = 0 : 1 \to C$

(6)

Given $r = 4m$; $F = 20N$; $\theta = 30°$

Torque $= Fr\sin\theta$

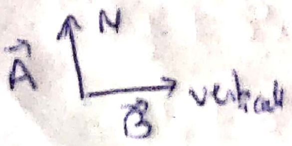
$= 4 \times 20 \times \sin 30°$

$= 4 \times 20 \times \frac{1}{2}$

$= 40Nm \to C$

(9)

Given



The direction of $\vec{A} \times \vec{B}$ is perpendicular to both $\vec{A}$ & $\vec{B}$

Direction of $\vec{A}$ towards north $\vec{A} = a\hat{j}$

Direction of $\vec{B}$ along z-axis [upwards] $\vec{B} = b\hat{k}$

Now $\vec{A} \times \vec{B} = a\hat{j} \times b\hat{k} = ab(\hat{j} \times \hat{k})$
$= ab(\hat{i})$

$\therefore \vec{A} \times \vec{B}$ is towards east. [$\hat{i}$ is unit

vector along west] $\rightarrow$ C.

(9)

Given adjacent sides of a triangle

are $\vec{A} = 4\hat{i} + 3\hat{j} + 4\hat{k}$ and $\vec{B} = 5\hat{i}$

Area $= \frac{1}{2} |\vec{A} \times \vec{B}|$; $\vec{A} \times \vec{B} = \begin{vmatrix} i & j & k \\ 4 & 3 & 4 \\ 5 & 0 & 0 \end{vmatrix}$

$\vec{A} \times \vec{B} = i[3\times0 - 4\times0] - j[4\times0 - 5\times4] + k[4\times0 - 3\times5]$

$= i[0] - j[-20] + k[-15]$

$= 20\hat{j} - 15\hat{k}$

$|\vec{A} \times \vec{B}| = \sqrt{20^2 + (-15)^2} = 25$

Area $= \frac{1}{2} \times 25 = 12.5$ sq cm

(10)

Here $\vec{A} \cdot \vec{B} = AB\cos\theta$

$\vec{A} \times \vec{B} = AB\sin\theta$.

~~So the con~~ Here cos and sin are perpendicular

So angle b/w $\vec{A} \cdot \vec{B}$ and $\vec{A} \times \vec{B}$ is $90° = \frac{\pi}{2}$

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(8)

Given $\vec{A} = 4\hat{i} - \hat{j} - \hat{k}$, $\vec{B} = 4\hat{i} + \hat{j} - 4\hat{k}$

$$\vec{A} \times \vec{B} = \begin{vmatrix} i & j & k \\ 4 & -1 & -1 \\ 4 & 1 & -4 \end{vmatrix}$$

$$\Rightarrow i[-1\times-4 - 1\times-1] - j[4\times-4 - 4\times-1] + k[4\times1 - 4\times-1]$$

$$\Rightarrow i[4+1] - j[-16+4] + k[4+4]$$

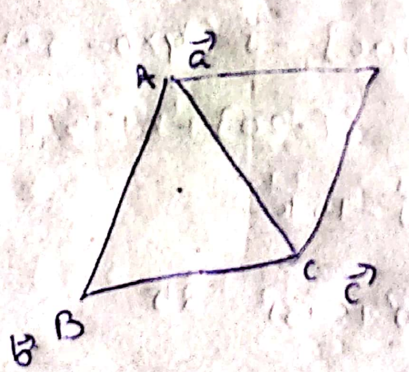
$$= 5\hat{i} + 12\hat{j} + 8\hat{k}$$

$$|\vec{A}\times\vec{B}| = \sqrt{5^2+12^2+8^2} = \sqrt{25+144+64} = \sqrt{233}$$

$\therefore$ The unit vector perpendicular to $\vec{A}$ & $\vec{B}$ is

$$\frac{5\hat{i}+12\hat{j}+8\hat{k}}{\sqrt{233}}.$$

(11)



Area of Parallelogram

$= |\vec{BA} \times \vec{BC}|$

Area of Δ^{le} ABC $= \frac{|\vec{BA}\times\vec{BC}|}{2}$

$$= \frac{(\vec{b}-\vec{a})\times(\vec{c}-\vec{b})}{2}$$

$$= \frac{1}{2}|(\vec{b}-\vec{a})\times\vec{c} - (\vec{b}-\vec{a})\times\vec{b}|$$

$$= \frac{1}{2}|\vec{b}\times\vec{c} - \vec{a}\times\vec{c} - \vec{b}\times\vec{b} + \vec{a}\times\vec{b}|$$

$$= \frac{1}{2}|\vec{b}\times\vec{c} - \vec{a}\times\vec{c} - 0 + \vec{a}\times\vec{b}|$$

$$= \frac{1}{2}|\vec{b}\times\vec{c} - \vec{a}\times\vec{c} + \vec{a}\times\vec{b}|$$

$$= \frac{1}{2}|\vec{b}\times\vec{c} + \vec{c}\times\vec{a} + \vec{a}\times\vec{b}|$$

B, R

(12)

If a vector having zero magnitude it is a null vector, direction is not defined.

If $\vec{A} \times \vec{B} = 0 \Rightarrow |\vec{A}| = 0$ or $|\vec{B}| = 0$

or $\sin\theta = 0$.

The component of a vector is a scalar.

all are false.

(13)

According to law of conservation of linear momentum $\vec{L} = \text{constant}$

i.e. $\vec{L} \cdot \vec{L} = \text{constant}$

$$\Rightarrow \frac{d}{dt}(\vec{L} \cdot \vec{L}) = 0$$

$$\Rightarrow \frac{d}{dt} L^2 = 0 \Rightarrow 2\vec{L} \frac{d\vec{L}}{dt} = 0$$

i.e. $\vec{L}$ and $\frac{d\vec{L}}{dt}$ are perpendicular.

Since $\tau = \vec{A} \times \vec{L}$

$\Rightarrow \frac{d\vec{L}}{dt} = \vec{A} \times \vec{L}$ so $\frac{d\vec{L}}{dt}$ must be perpendicular to $\vec{A}$ as well as $\vec{L}$.

Further the component of $\vec{L}$ along $\vec{A} = \frac{\vec{A} \cdot \vec{L}}{A}$

Also $\frac{d}{dt}(\vec{A} \cdot \vec{L}) = \vec{A} \cdot \frac{d\vec{L}}{dt} + \vec{L} \cdot \frac{d\vec{A}}{dt} = 0$

$\vec{A} \cdot \vec{L} = \text{constant}$.

$\therefore \frac{d\vec{L}}{dt}$ $\perp^{er}$ to $\vec{L}$, it cannot change $\vec{L}$, but surely direction changed.

(15)

A) let $\vec{A} = 3\hat{i} + 4\hat{j}$

$|\vec{A}| = \sqrt{3^2 + 4^2} = 5$

B) $F = 3\hat{i} + 4\hat{j}$ N ; $\vec{S} = 6\hat{j}$ m

work $= \vec{F} \cdot \vec{S} = (3\hat{i} + 4\hat{j}) \cdot 6\hat{j}$

$= 4 \times 6 = 24$ J

C) Given $F = 20$ N ; $\theta = 60^\circ$

component of force $= F \cancel{\sin\theta} \cos\theta$

$= 20 \cancel{\cos} 60^\circ$

$= 20 \times \frac{\sqrt{3}}{2}$

$= 10\sqrt{3}$ N

(17), (18)

Given $\vec{A} = 3\hat{i} - 2\hat{j} + \hat{k}$; $\vec{B} = \hat{i} + 2\hat{j} + 3\hat{k}$

$$|\vec{A} \times \vec{B}| = \begin{vmatrix} i & j & k \\ 3 & -2 & 1 \\ 1 & 2 & 3 \end{vmatrix} = i[-2 \times 3 - 2] - j[9 - 1] + k[6 + 2]$$

$= -8\hat{i} - 8\hat{j} + 8\hat{k}$

$|\vec{A} \times \vec{B}| = \sqrt{(-8)^2 + (-8)^2 + 8^2} = 8\sqrt{3}$

Area of triangle $= \frac{1}{2}|\vec{A} \times \vec{B}| = \frac{1}{2} \times 8\sqrt{3} = 4\sqrt{3}$ sq unit

Area of Parallelogram $= |\vec{A} \times \vec{B}| = 8\sqrt{3}$ sq units

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(19)

Given $r = 4m$; $F = 20N$; $\theta = 30°$

Torque $= rF \sin\theta$

$= 4 \times 20 \times \sin 30 = 4 \times 20 \times \frac{1}{2} = 40 Nm$

$= 4 \times 10 Nm$

(20)

The value of $\hat{i} \cdot (\hat{j} \times \hat{k}) + \hat{j} \cdot (\hat{k} \times \hat{i}) + \hat{k} \cdot (\hat{i} \times \hat{j})$

$= \hat{i} \cdot \hat{i} + \hat{j} \cdot \hat{j} + \hat{k} \cdot \hat{k}$

$= 1 + 1 + 1 = 3$

Here $\hat{j} \times \hat{k} = \hat{i}$; $\hat{k} \times \hat{i} = \hat{j}$; $\hat{i} \times \hat{j} = \hat{k}$.

L Task CUQ's

(1)

Given $A \cdot B = 0$ ie A is perpendicular to B

$A \cdot C = 0$ ie A is perpendicular to C

$\therefore$ A is perpendicular to that the plane formed by B and C

$\rightarrow B \times C$ gives a vector perpendicular to both B and C.

$\therefore$ A is Parallel to $B \times C \rightarrow$ c

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(4) we know that $\vec{\tau} = \vec{r} \times \vec{F} = rF \sin\theta \, \hat{n}$

$\hat{n}$ is the unit vector which shows direction of torque which is perpendicular to both $\vec{r}$ & $\vec{F}$.

$\Rightarrow \vec{F} \perp \vec{T}$ and $\vec{r} \perp \vec{T}$.

For $\vec{r} \perp \vec{T} \Rightarrow \vec{r} \cdot \vec{T} = 0$.

IIly for $\vec{F} \perp \vec{T} \Rightarrow \vec{F} \cdot \vec{T} = 0 \rightarrow D$

(5)

we know $\vec{A} \times \vec{B} = -\vec{B} \times \vec{A}$.

$\therefore (\vec{A} + \vec{B}) + (\vec{B} \times \vec{A}) = -(\vec{B} \times \vec{A}) + (\vec{B} \times \vec{A})$

$= 0$ Null vector $\rightarrow D$

(6)

According to right hand thumb rule

$\vec{C}$ is perpendicular to both $\vec{A}$ and $\vec{B}$

$\rightarrow D$

(8)

$\vec{A} \times \vec{B} = AB \sin\theta \;\; \therefore \vec{B} \times \vec{A} = -\vec{A} \times \vec{B}$

$= -AB \sin\theta$

i.e

$= AB \sin(180 + \theta)$

angle between

$\vec{A} \times \vec{B}$ and $\vec{B} \times \vec{A}$ is $180° = \pi$

$\rightarrow B$

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(9) Given $\vec{A}\times\vec{B}=0$ and $\vec{B}\times\vec{C}=0$

$\Rightarrow \hat{n}\,AB\sin\theta_1=0$ $\hat{n}\,BC\sin\theta_2=0$

i.e., $\vec{A}$ and $\vec{B}$ are Parallel $\vec{B}$ & $\vec{C}$ also Parallel

From here $\vec{A}$ and $\vec{C}$ also Parallel

$\vec{A}\times\vec{C}=|\vec{A}|\,|\vec{C}|\sin 0°\,\hat{n}=0$

(10)

If $\vec{A},\vec{B},\vec{C}$ are coplanar

$\vec{C}$ must be Perpendicular to $\vec{A}\times\vec{B}$.

i.e $\vec{C}\perp\vec{A}\times\vec{B}$

$\therefore\ (\vec{A}\times\vec{B})\cdot\vec{C}=|\vec{A}\times\vec{B}|\,|\vec{C}|\cos\theta$

$=|\vec{A}\times\vec{B}|\,|\vec{C}|\cos 90°$

$=0\rightarrow B$

(11)

We know Angular momentum $\vec{L}=\vec{r}\times\vec{p}$.

i.e. the direction of $\vec{L}$ is $\perp$er to both $\vec{r}$ and $\vec{p}$

Given $\vec{r}=\hat{i}\rightarrow$ Direction is along x-axis

$\vec{p}=4\hat{j}\rightarrow$ Direction is along y-axis

$\therefore$ Direction of $\vec{L}$ is z-axis [perpendicular to both x and y-axis]

SAQ's

(1)

Given $(\hat{i}+\hat{j}+\hat{k}) \times (2\hat{i}+3\hat{j}+\hat{k})$

$$= \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & 1 & 1 \\ 2 & 3 & 1 \end{vmatrix} = \hat{i}[1\times1 - 1\times3] - \hat{j}[1\times1 - 2\times1] + \hat{k}[3\times1 - 1\times2]$$

$$\Rightarrow \hat{i}[1-3] - \hat{j}(1-2] + \hat{k}(3-2)$$

$$\Rightarrow -2\hat{i} + \hat{j} + \hat{k} \rightarrow B$$

(2)

Given $F = 2\hat{i}+3\hat{j}+4\hat{k}$ N.

$r_1 = 3\hat{i}+4\hat{j}+5\hat{k}$ and $r_2 = \hat{i}+2\hat{j}+3\hat{k}$

$$\vec{r} = \vec{r}_1 - \vec{r}_2 = 3\hat{i}+4\hat{j}+5\hat{k} - (\hat{i}+2\hat{j}+3\hat{k})$$

$$= 3\hat{i}+4\hat{j}+5\hat{k} - \hat{i} - 2\hat{j} - 3\hat{k}$$

$$\Rightarrow 2\hat{i}+2\hat{j}+2\hat{k}$$

$$\therefore \vec{r} \times \vec{F} = \begin{vmatrix} i & j & k \\ 2 & 2 & 2 \\ 2 & 3 & 4 \end{vmatrix} = i[8-6] - j[8-6] + k[6-4]$$

$$\Rightarrow 2\hat{i} - 2\hat{j} + 2\hat{k}$$

(6)

Given $|\vec{a}\cdot\vec{b}|^2 + |\vec{a}\times\vec{b}|^2 = (ab\cos\theta)^2 + (ab\sin\theta)^2$

$$\Rightarrow a^2b^2\cos^2\theta + a^2b^2\sin^2\theta$$

$$\Rightarrow a^2b^2(\cos^2\theta + \sin^2\theta)$$

$$\Rightarrow a^2b^2 \rightarrow D$$

(4)

Since $A \cdot B = 0$, $A \cdot C = 0$

A is Perpendicular to both $\vec{B}$ and $\vec{C}$.

$\Rightarrow \vec{A}$ " " $(\vec{B} \times \vec{C})$

$$\Rightarrow \vec{A} = \pm \frac{\vec{B} \times \vec{C}}{|\vec{B} \times \vec{C}|}$$

$$\vec{A} = \frac{\vec{B} \times \vec{C}}{|\vec{B}||\vec{C}| \sin\theta} = \frac{\vec{B} \times \vec{C}}{1 \times 1 \times \sin 30}$$

$\vec{A} = 2(\vec{B} \times \vec{C})$ Given angle between $\vec{B}$ and $\vec{C}$ is $\frac{\pi}{3}$.

$\rightarrow$ C

(5)

Given $\vec{F_1}$ is acting along $+x$-axis. so

$$\vec{F_1} = x\hat{i}$$

also given that $\vec{F_1} \times \vec{F_2} = 0$. ie $\vec{F_1}$ is Parallel to $\vec{F_2}$

so $\vec{F_2}$ also acts along x-direction.

This is ~~pos~~ shown $\vec{F_2} = -5\hat{i}$

$$\vec{F_1} \times \vec{F_2} = x\hat{i} \times (-5)\hat{i} = -5x(\hat{i} \times \hat{i}) = -5(x)(0)$$
$$= 0$$

C.

(7)

Given $(\vec{a} \cdot \vec{b})^2 - (\vec{a} \times \vec{b})^2$

$\Rightarrow (ab\cos\theta)^2 - (ab\sin\theta)^2$

$\Rightarrow a^2b^2\cos^2\theta - a^2b^2\sin^2\theta$

$\Rightarrow a^2b^2(\cos^2\theta - \sin^2\theta)$

$\Rightarrow a^2b^2\cos 2\theta$ $[\cos 2\theta = \cos^2\theta - \sin^2\theta]$

C

(8)

let $\vec{r} = 2\hat{i} + 3\hat{j} - 3\hat{k}$

$\vec{\omega} = 4\hat{i} + \hat{j} - 2\hat{k}$

$$\vec{r} \times \vec{\omega} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & 3 & -3 \\ 4 & 1 & -2 \end{vmatrix}$$

$$\Rightarrow \hat{i}\,(3\times -2 - 1\times(-3)) - \hat{j}\,[2\times -2 - 4\times -3] + \hat{k}\,[2\times 1 - 3\times 4]$$

$$\Rightarrow \hat{i}\,[-6+3] - \hat{j}\,[-4+12] + \hat{k}\,[2-12]$$

$$\Rightarrow -3\hat{i} - 8\hat{j} - 10\hat{k}$$

$$v = -\vec{\omega} \times \vec{r} = -[-3\hat{i} - 8\hat{j} - 10\hat{k}]$$

$$= 3\hat{i} + 8\hat{j} + 10\hat{k} \rightarrow B$$

(9)

Given $\vec{V} = 3\hat{i} + 2\hat{j}$ m/s ; $\vec{B} = 2\hat{i} + 3\hat{k}$ T

Force acting on a charged particle

$$F = q(\vec{V} \times \vec{B})$$

$$\Rightarrow ma = q(\vec{V} \times \vec{B})$$

$$\Rightarrow \vec{a} = \frac{q}{m}(\vec{V} \times \vec{B}) \rightarrow (1)$$

$$\vec{V} \times \vec{B} = \begin{vmatrix} i & j & k \\ 3 & 2 & 0 \\ 2 & 0 & 3 \end{vmatrix} = \hat{i}\,[2\times 3 - 0] - \hat{j}\,[3\times 3 - 0] + \hat{k}\,(0 - 2\times 2)$$

$$= 6\hat{i} - 9\hat{j} - 4\hat{k}$$

From (1) $\vec{a} = \frac{q}{m}(6\hat{i} - 9\hat{j} - 4\hat{k})$

$$= 0.96\times 10^8\,(6\hat{i} - 9\hat{j} - 4\hat{k}) \rightarrow B$$

$\frac{q}{m} \rightarrow$ specific charge

(10)

(a) $\vec{A}\times\vec{B} = AB\sin\theta = AB\sin 0 = 0.$

(b) $\vec{A}\times\vec{B} = AB\sin\theta = AB\sin 30 = \frac{AB}{2}$

(c) $\vec{A}\times\vec{B} = AB\sin\theta = AB\sin 120 = \frac{\sqrt{3}}{2}AB$

c, b, a → D.

(13)

work done is the dot Product of $\vec{F}$ and $\vec{s}$

$\omega = \vec{F}\cdot\vec{s}$ so work is a scalar

because the dot Product of any two vectors is always scalar.

(14)

Given $\vec{A} = 3\hat{i} + \hat{j} + 6\hat{k}$; $\vec{B} = 3\hat{i} - 6\hat{j} + 4\hat{k}$

$$\vec{A}\times\vec{B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 3 & 1 & 6 \\ 3 & -6 & 4 \end{vmatrix} = \hat{i}(1\times4 - 6\times(-6)) - \hat{j}(3\times4 - 6\times3) + \hat{k}[3\times-6 - 1\times3]$$

$\Rightarrow \hat{i}(4+36) - \hat{j}(12-18) + \hat{k}(-18-3)$

$= 40\hat{i} + 6\hat{j} - 21\hat{k}$

$|\vec{A}\times\vec{B}| = \sqrt{40^2 + 6^2 + (-21)^2} = \sqrt{2077}$

The unit vector Perpendicular to $\vec{A}\times\vec{B} = \frac{40\hat{i} + 6\hat{j} - 21\hat{k}}{\sqrt{2077}}$

(16)

Given $(\hat{i}\cdot\hat{i}) + (\hat{i}\times\hat{i})$

$\Rightarrow 1 + 0$

$\Rightarrow 1$

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(17)

Given
$$(\vec{A}\cdot\vec{B})(\vec{A}\times\vec{B}) + (\vec{B}\cdot\vec{A})(\vec{B}\times\vec{A})$$

$$\Rightarrow AB\cos\theta \; AB\sin\theta + BA\cos\theta(-BA\sin\theta)$$

$$\Rightarrow A^2B^2\cos\theta\sin\theta - A^2B^2\cos\theta\sin\theta$$

$$= 0$$

(18)

Given $(\hat{i}+\hat{j})\cdot(2\hat{i}+2\hat{k})$

$$\Rightarrow 2\hat{i}\cdot\hat{i} + 2\hat{i}\cdot\hat{j} + 2\hat{i}\cdot\hat{k} + 2\hat{j}\cdot\hat{k}$$

$$\Rightarrow 2 + 2(0) + 2(0) + 2(0)$$
$$= 2$$

$\hat{i}\cdot\hat{j} \Rightarrow |\hat{i}||\hat{j}|\cos\theta$

$= 1\times1\times\cos 90^\circ$

$= 0$

||^{ly} $\hat{j}\cdot\hat{k}$ are Perpendicular

$\hat{i}\cdot\hat{k}$

(19)

Given $\vec{A} = 2\hat{i}+3\hat{j}+6\hat{k}$ & $\vec{B} = 3\hat{i}-6\hat{j}+2\hat{k}$

$$\vec{A}\times\vec{B} = \begin{vmatrix} i & j & k \\ 2 & 3 & 6 \\ 3 & -6 & 2 \end{vmatrix} = \hat{i}[2\times3 - 6\times-6] - \hat{j}[2\times2 - 3\times6] + \hat{k}[-6\times2 - 3\times3]$$

$$\Rightarrow \hat{i}[6+36] - \hat{j}[4-18] + \hat{k}[-12-9]$$

$$\Rightarrow 42\hat{i} + 14\hat{j} - 21\hat{k}$$

$$\Rightarrow 7(6\hat{i}+2\hat{j}-3\hat{k})$$

Given the vector $\vec{c}$ (let it be) Perpendicular to Both $\vec{A}$ and $\vec{B}$

is $k(6\hat{i}+2\hat{j}-3\hat{k})$

$\therefore k = 7$

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(12)

(a) $\hat{j} \cdot \hat{i} = |\hat{j}||\hat{i}| \cos\theta = 1 \times 1 \times \cos 90 = 0.$

(b) $|\hat{j} + \hat{i}| = \sqrt{1^2 + 1^2} = \sqrt{2}$

(c) $|\hat{k} + \hat{k}| = |2\hat{k}| = 2.$

(d) $\hat{j} \times \hat{k} = -\hat{k}$

~~k~~3.

13.