VECTOR PRODUCT OF TWO VECTORS

PREVIOUS EAMCET BITS

1. Let $a_1\vec{i}+a_2\vec{j}+a_3\vec{k}$ **[EAMCET 2007]**

Assertion (A) : The identify $\left|\vec{a}\times\vec{i}\right|^2+\left|\vec{a}\times\vec{j}\right|^2+\left|\vec{a}\times\vec{k}\right|^2=2\left|\vec{a}\right|^2$ holds for $\vec{a}$

Reason (R) : $\vec{a}\times\vec{i}=a_3\vec{j}-a_2\vec{k},\vec{a}\times\vec{j}=a_1\vec{k}-a_3\vec{i},\vec{a}\times\vec{k}=a_2\vec{i}-a_1\vec{j}$

Which of the following is correct

1) Both A and R are true and R is the correct reason for A

2) Both A and R are true but R is not the correct reason for A

3) A is true, R is false

4) A is false, R is true

Ans: 1

Sol. $axi=a_3J-a_2k;axJ=a_1k-a_3i;axk=a_2i-a_1J$

$\therefore$ R is true

$\left|\vec{a}\right|=a_1^2+a_2^2+a_3^2$

$\left|axi\right|^2+\left|axJ\right|^2+\left|axk\right|^2=2\left(a_1^2+a_2^2+a_3^2\right)=2\left|\vec{a}\right|^2$

2. If $\vec{a}$ and $\vec{b}$ are unit vectors, then the vector $\left(\vec{a}+\vec{b}\right)\times\left(\vec{a}\times\vec{b}\right)$ is parallel to the vector **[EAMCET 2005]**

1) $\vec{a}-\vec{b}$ 2) $\vec{a}+\vec{b}$ 3) $2\vec{a}-\vec{b}$ 4) $2\vec{a}+\vec{b}$

Ans: 2

Sol. By verification

$\left(\vec{a}+\vec{b}\right)\times\left(\vec{a}\times\vec{b}\right).\left(\vec{a}+\vec{b}\right)=\left[\vec{a}+\vec{b}\quad\vec{a}\times\vec{b}\quad\vec{a}+\vec{b}\right]=0$

$\left(\because\left[a\ b\ a\right]=0\right)$

3. Let $\vec{a},\vec{b},\vec{c}$ be the position vectors of the vertices, A, B, C respectively of ΔABC. The vector area of ΔABC is **[EAMCET 2003]**

1) $\frac{1}{2}\left\{\vec{a}\times\left(\vec{b}\times\vec{c}\right)+\vec{b}\times\left(\vec{c}\times\vec{a}\right)+\vec{c}\times\left(\vec{a}\times\vec{b}\right)\right\}$ 2) $\frac{1}{2}\left\{\vec{a}\times\vec{b}+\vec{b}\times\vec{c}+\vec{c}\times\vec{a}\right\}$

3) $\frac{1}{2}\left\{\vec{a}+\vec{b}+\vec{c}\right\}$ 4) $\frac{1}{2}\left\{\left(\vec{b}.\vec{c}\right)\vec{a}+\left(\vec{c}.\vec{a}\right)\vec{b}+\left(\vec{a}.\vec{b}\right)\vec{c}\right\}$

Ans: 2

Sol. $\Delta=\frac{1}{2}\left(\vec{a}\times\vec{b}+\vec{b}\times\vec{c}+\vec{c}\times\vec{a}\right)$

4. If θ is the angle between $\vec{a}$ and $\vec{b}$ and $\left|\vec{a}\times\vec{b}\right|=\left|\vec{a}.\vec{b}\right|$, then $\theta=$ **[EAMCET 2001]**

1) 0 2) π 3) $\frac{\pi}{2}$ 4) $\frac{\pi}{2}$

Ans: 4

Sol. Given $\left|\vec{a}\times\vec{b}\right|=\left|\vec{a}.\vec{b}\right|$

$\Rightarrow|\vec{a}||\vec{b}|\sin\theta=|\vec{a}||\vec{b}|\cos\theta$

$\tan\theta=1\Rightarrow\theta=\frac{\pi}{4}$

5. If θ is the angle between the vectors $2\vec{i}-2\vec{j}+4k$ and $3\vec{j}+\vec{j}+2\vec{k}$, then $\sin\theta=$ **[EAMCET 2000]**

1) $\frac{2}{7}$ 2) $\frac{2}{\sqrt{7}}$ 3) $\frac{\sqrt{2}}{7}$ 4) $\sqrt{\frac{2}{7}}$

Ans: 2

Sol. $\sin\theta=\left|\frac{\vec{a}\times\vec{b}}{|\vec{a}||\vec{b}|}\right|=\frac{2}{\sqrt{7}}$

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