Vector Algebra

Q.No.1:
If the vectors $\overrightarrow{AB} = 3\hat{i} + 4\hat{k}$ and $\overrightarrow{AC} = 5\hat{i} - 2\hat{j} + 4\hat{k}$ are the sides of a triangle ABC, then the length of the median through A is :

JEE 2013

- **A.** $\sqrt{18}$
- **B.** $\sqrt{72}$
- **C.** $\sqrt{33}$
- **D.** $\sqrt{45}$

Q.No.2: Let $\vec{a}$, $\vec{b}$ and $\vec{c}$ be three non-zero vectors such that no two of them are collinear and $\left(\vec{a} \times \vec{b}\right) \times \vec{c} = \frac{1}{3}\left|\vec{b}\right|\left|\vec{c}\right|\vec{a}$. If θ is the angle between vectors $\vec{b}$ and $\vec{c}$ then a value of sin θ is:

JEE 2015

- **A.** $\frac{2\sqrt{2}}{3}$
- **B.** $\frac{-\sqrt{2}}{3}$
- **C.** $\frac{2}{3}$
- **D.** $\frac{-2\sqrt{3}}{3}$

Q.No.3: Let $\vec{a}$, $\vec{b}$ and $\vec{c}$ be three unit vectors such that $\vec{a} \times \left(\vec{b} \times \vec{c}\right) = \frac{\sqrt{3}}{2}\left(\vec{b} + \vec{c}\right)$. If $\vec{b}$ is not parallel to $\vec{c}$, then the angle between $\vec{a}$ and $\vec{b}$ is:

JEE 2016

- **A.** $\frac{\pi}{2}$

B. $\frac{2\pi}{3}$

C. $\frac{5\pi}{6}$

D. $\frac{3\pi}{4}$

Q.No.4: Let $\overrightarrow{a} = 2\hat{i} + \hat{j} - 2\widehat{k}$ and $\overrightarrow{b} = \hat{i} + \hat{j}$. Let $\overrightarrow{c}$ be a vector such that $\left|\overrightarrow{c} - \overrightarrow{a}\right| = 3, \left|\left(\overrightarrow{a} \times \overrightarrow{b}\right) \times \overrightarrow{c}\right| = 3$ and the angle between $\overrightarrow{c}$ and $\overrightarrow{a} \times \overrightarrow{b}$ be 30°. Then $\overrightarrow{a} \cdot \overrightarrow{c}$ is equal to **JEE 2017**

A. $\frac{25}{8}$

B. 2

C. 5

D. $\frac{1}{8}$

Q.No.5: Let $\overrightarrow{u}$ be a vector coplanar with the vectors $\overrightarrow{a} = 2\hat{i} + 3\hat{j} - \hat{k}$ and $\overrightarrow{b} = \hat{j} + \hat{k}$. If $\overrightarrow{u}$ is perpendicular to $\overrightarrow{a}$ and $\overrightarrow{u} \cdot \overrightarrow{b} = 24$, then $\left|\overrightarrow{u}\right|^2$ is equal to : **JEE 2018**

A. 256

B. 84

C. 336

D. 315

Q.No.6: The length of the projection of the line segment joining the points (5, −1, 4) and (4, −1, 3) on the plane, $x + y + z = 7$ is : **JEE 2018**

A. $\frac{1}{3}$

B. $\sqrt{\frac{2}{3}}$

C. $\frac{2}{\sqrt{3}}$

D. $\frac{2}{3}$

Q.No.7: Let $\overrightarrow{a} = \hat{i} - \hat{j},\ \overrightarrow{b} = \hat{i} + \hat{j} + \hat{k}$ and $\overrightarrow{c}$ be a vector such that

$\vec{a} \times \vec{c} + \vec{b} = \vec{0}$ and $\vec{a} \cdot \vec{c} = 4$, then $\left|\vec{c}\right|^2$ is equal to: **JEE 2019**

A. $\frac{19}{2}$
B. 9
C. 8
D. $\frac{17}{2}$

Q.No.8: Let
$\vec{a} = \hat{i} + \hat{j} + \sqrt{2}\hat{k}$, $\vec{b} = b_1\hat{i} + b_2\hat{j} + \sqrt{2}\hat{k}$ and $\vec{c} = 5\hat{i} + \hat{j} + \sqrt{2}\hat{k}$ be three vectors such that the projection vector of $\vec{b}$ on $\vec{a}$ is $\vec{a}$. If $\vec{a} + \vec{b}$ is perpendicular to $\vec{c}$, then $\left|\vec{b}\right|$ is equal to: **JEE 2019**

A. $\sqrt{32}$
B. 6
C. $\sqrt{22}$
D. 4

Q.No.9: Let $\vec{a} = 2\hat{i} + \lambda_1\hat{j} + 3\hat{k}$, $\vec{b} = 4\hat{i} + (3 - \lambda_2)\hat{j} + 6\hat{k}$ and $\vec{c} = 3\hat{i} + 6\hat{j} + (\lambda_3 - 1)\hat{k}$ be three vectors such that $\vec{b} = 2\vec{a}$ and $\vec{a}$ is perpendicular to $\vec{c}$. Then a possible value of $(\lambda_1, \lambda_2, \lambda_3)$ is: **JEE 2019**

A. (1, 3, 1)
B. $\left(-\frac{1}{2}, 4, 0\right)$
C. $\left(\frac{1}{2}, 4, -2\right)$
D. (1, 5, 1)

Q.No.10: Let $\vec{\alpha} = (\lambda - 2)\vec{a} + \vec{b}$ and $\vec{\beta} = (4\lambda - 2)\vec{a} + 3\vec{b}$ be two given vectors where vectors $\vec{a}$ and $\vec{b}$ are non-collinear. The value of λ for which vectors $\vec{\alpha}$ and $\vec{\beta}$ are collinear, is : **JEE 2019**

A. −4
B. −3
C. 4
D. 3