

Parishram (2025)

Physics

DPP: 5

Basic Mathematics

Q1 If $\vec{F} = (10\hat{i} - 10\hat{j})$ and $\vec{r} = (5\hat{i} - 3\hat{j})$, then calculate torque ($\vec{\tau} = \vec{r} \times \vec{F}$).

- (A) $-38\hat{j}$
 (B) $-20\hat{k}$
 (C) $4\hat{i} - 10\hat{j} + 0\hat{k}$
 (D) $5\hat{i} - 3\hat{j} + 0\hat{k}$

Q2 Find a unit vector perpendicular to both the vectors $(2\hat{i} + 3\hat{j} + \hat{k})$ and $(\hat{i} - \hat{j} + 2\hat{k})$.

- (A) $(7\hat{i} + 3\hat{j} - 5\hat{k})/\sqrt{83}$
 (B) $(7\hat{i} - 3\hat{j} - 5\hat{k})/\sqrt{83}$
 (C) $(7\hat{i} + 3\hat{j} + 5\hat{k})/\sqrt{83}$
 (D) $(-7\hat{i} + 3\hat{j} - 5\hat{k})/\sqrt{83}$

Q3 Which of the following is the unit vector perpendicular to \vec{A} and \vec{B} ?

- (A) $\frac{\vec{A} \times \vec{B}}{AB \sin \theta}$
 (B) $\frac{\vec{A} \times \vec{B}}{AB \cos \theta}$
 (C) $\frac{\vec{A} \times \vec{B}}{AB \sin \theta}$
 (D) $\frac{\vec{A} \times \vec{B}}{AB \cos \theta}$

Q4 If $\vec{A} \times \vec{B} = \vec{C}$, then which of the following statements is wrong

- (A) $\vec{C} \perp \vec{A}$
 (B) $\vec{C} \perp \vec{B}$
 (C) $\vec{C} \perp (\vec{A} + \vec{B})$
 (D) $\vec{C} \perp (\vec{A} \times \vec{B})$

Q5 The angle between the vectors \vec{A} and \vec{B} is θ . The value of the triple product $\vec{A} \cdot (\vec{B} \times \vec{A})$ is

- (A) $A^2 B$
 (B) Zero
 (C) $A^2 B \sin \theta$
 (D) $A^2 B \cos \theta$

Q6 If $\vec{A} \times \vec{B} = \vec{B} \times \vec{A}$, then the angle between \vec{A} and \vec{B} is

- (A) $\frac{\pi}{2}$
 (B) $\frac{\pi}{3}$
 (C) π
 (D) $\frac{\pi}{4}$

Q7 A vector \vec{A} points vertically upward and \vec{B} points towards north. The vector product $\vec{A} \times \vec{B}$ is

- (A) Zero
 (B) Along west
 (C) Along east
 (D) Vertically downward

Q8 Area of a parallelogram, whose diagonals are $3\hat{i} + \hat{j} - 2\hat{k}$ and $\hat{i} - 3\hat{j} + 4\hat{k}$ will be:

- (A) 14 unit
 (B) $5\sqrt{3}$ unit
 (C) $10\sqrt{3}$ unit
 (D) $20\sqrt{3}$ unit

Q9 If $|\vec{A} \times \vec{B}| = \sqrt{3} \vec{A} \cdot \vec{B}$, then the value of $|\vec{A} + \vec{B}|$ is

- (A) $\left(A^2 + B^2 + \frac{AB}{\sqrt{3}}\right)^{1/2}$
 (B) $(A^2 + B^2 + \sqrt{3}AB)^{1/2}$
 (C) $(A^2 + B^2 + \sqrt{3}AB)^{1/2}$
 (D) $(A^2 + B^2 + AB)^{1/2}$

Q10 What is the value of linear velocity, if $\vec{\omega} = 3\hat{i} - 4\hat{j} + \hat{k}$ and $\vec{r} = 5\hat{i} - 6\hat{j} + 6\hat{k}$

- (A) $6\hat{i} - 2\hat{j} + 3\hat{k}$
 (B) $6\hat{i} - 2\hat{j} + 8\hat{k}$
 (C) $4\hat{i} - 13\hat{j} + 6\hat{k}$
 (D) $-18\hat{i} - 13\hat{j} + 2\hat{k}$



Answer Key

Q1 (B)
Q2 (B)
Q3 (C)
Q4 (D)
Q5 (B)

Q6 (C)
Q7 (B)
Q8 (B)
Q9 (D)
Q10 (D)



Hints & Solutions

Note: scan the QR code to watch video solution

Q1 Text Solution:

Here we have

$$\vec{F} = (10\hat{i} - 10\hat{j})$$

$$\vec{r} = (5\hat{i} - 3\hat{j})$$

$$\vec{\tau} = \vec{r} \times \vec{F}$$

$$= (5\hat{i} - 3\hat{j}) \times (10\hat{i} - 10\hat{j})$$

$$= -50\hat{k} - 30(-\hat{k})$$

$$= -50\hat{k} + 30\hat{k} = -20\hat{k}$$

Video Solution:



Q2 Video Solution:



Q3 Video Solution:



Q4 Video Solution:



Q5 Video Solution:



Q6 Video Solution:



Q7 Video Solution:



Q8 Video Solution:



Q9 Video Solution:



Q10 Video Solution:



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