UNIT TEST

Duration: 1 hour **Marks: 30**

SECTION A

Each carry 1 mark

1. If the projection of $\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}$ on $\vec{b} = 2\hat{i} + \lambda\hat{k}$ is zero, then the value of λ is

(a) 0 (b) 1 (c) $-\frac{2}{3}$ (d) $-\frac{3}{2}$

2. The angle between two vectors $\vec{a}$ and $\vec{b}$ with magnitudes $\sqrt{3}$ and 4 respectively and $\vec{a} \cdot \vec{b} = 2\sqrt{3}$ is

(a) $\frac{\pi}{6}$ (b) $\frac{\pi}{3}$ (c) $\frac{\pi}{2}$ (d) $\frac{5\pi}{2}$

3. The number of vectors of unit length perpendicular to the vectors $\vec{a} = 2\hat{i} + \hat{j} + 2\hat{k}$ and $\vec{b} = \hat{j} + \hat{k}$ is

(a) One (b) Two (c) Three (d) Infinite

4. Assertion: If $(\vec{a} \times \vec{b})^2 + (\vec{a} \cdot \vec{b})^2 = 144$ and $|\vec{a}| = 4$, then $|\vec{b}| = 9$.

Reason: If $\vec{a}$ and $\vec{b}$ are any two vectors, then $(\vec{a} \times \vec{b})^2$ is equal to $(\vec{a})^2(\vec{b})^2 - (\vec{a} \cdot \vec{b})^2$.

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

(c) Assertion (A) is true but Reason (R) is false.

(d) Assertion (A) is false but Reason (R) is true.

SECTION B

Each carry 2 marks

5. If $\hat{a}, \hat{b}$ and $\hat{c}$ are mutually perpendicular unit vectors, then find the value of $|2\hat{a} + \hat{b} + \hat{c}|$.

6. If $|\vec{a} \times \vec{b}|^2 + |\vec{a} \cdot \vec{b}|^2 = 400$ and $|\vec{a}| = 5$, then find the value of $|\vec{b}|$.

7. Find the projection of $\vec{b} + \vec{c}$ on $\vec{a}$, where $\vec{a} = 2\hat{i} - 2\hat{j} + \hat{k}, \vec{b} = \hat{i} + 2\hat{j} - 2\hat{k}$ & $\vec{c} = 2\hat{i} - \hat{j} + 4\hat{k}$.

SECTION C

Each carry 3 marks

8. Let $\vec{a}, \vec{b}, \vec{c}$ be unit vectors such that $\vec{a} \cdot \vec{b} = \vec{a} \cdot \vec{c} = 0$ and the angle between $\vec{b}$ and $\vec{c}$ is $\frac{\pi}{6}$, prove that $\vec{a} = \pm 2(\vec{b} \times \vec{c})$.

9. If $\vec{a} = 2\hat{i} - 3\hat{j} + \hat{k}, \vec{b} = -\hat{i} + \hat{k}, \vec{c} = 2\hat{j} - \hat{k}$, find the area of the parallelogram having diagonals $\vec{a} + \vec{b}$ and $\vec{b} + \vec{c}$.

SECTION D

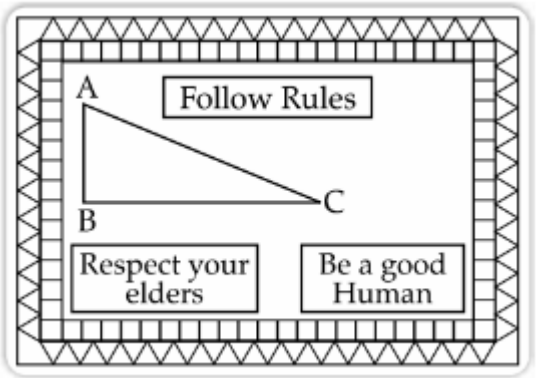
Each carry 5 marks

10. If $\vec{a}, \vec{b}$ and $\vec{c}$ are mutually perpendicular vectors of equal magnitudes, find the angles which the vector $2\vec{a} + \vec{b} + 2\vec{c}$ makes with the $\vec{a}, \vec{b}$ and $\vec{c}$.

11. Three vertices A, B, C and D of a parallelogram ABCD are given by, A(0, –3, 3), B(–5, m – 3, 0) and D(1, –3, 4). The area of the parallelogram ABCD is 6 sq. units. Using vector method, find the value(s) of m.

SECTION E

12. The slogans on chart papers are to be place on a school bulletin board at the points A, B and C displaying A (follow Rules), B (Respect your elders) and C (Be a good human). The coordinates of these points are (1, 4, 2), (3, –3, –2) and (–2, 2, 6), respectively.



(i) If $\vec{a}, \vec{b}$ and $\vec{c}$ be the position vectors of points A, B, C, respectively, then find $|\vec{a} + \vec{b} + \vec{c}|$.

(ii) Find area of $\triangle$ ABC.

UNIT TEST Answers

1. (c) $-\frac{2}{3}$

2. (b) $\frac{\pi}{3}$

3. (b) Two

4. (d) Assertion (A) is false but Reason (R) is true.

5. $\sqrt{6}$.

6. 4

7. 2

8. Proof

9. $\frac{1}{2}\sqrt{21}$ sq. units.

10. $\cos^{-1}\frac{2}{3}$, $\cos^{-1}\frac{1}{3}$, $\cos^{-1}\frac{2}{3}$

11. ± 4

12. (i) $\sqrt{29}$ (ii) $\frac{1}{2}\sqrt{1937}$ sq. units