Grade : XII   **Marks: 40**
marks
Chapter: VECTORS SET -2   **Time: 90**
minutes

SECTION A
(This section comprises of Multiple-choice questions (MCQ) of 1 mark each.)

1. The position vector of the point which divides the join of points with position vectors $\vec{a} + \vec{b}$ and $2\vec{a} - \vec{b}$ in the ratio 1 : 2 is

   (A) $\dfrac{3\vec{a} + 2\vec{b}}{3}$
   (B) $\vec{a}$
   (C) $\dfrac{5\vec{a} - \vec{b}}{3}$
   (D) $\dfrac{4\vec{a} + \vec{b}}{3}$

2. The vector with initial point P (2, –3, 5) and terminal point Q(3, –4, 7) is

   (A) $\hat{i} - \hat{j} + 2\hat{k}$
   (B) $5\hat{i} - 7\hat{j} + 12\hat{k}$
   (C) $-\hat{i} + \hat{j} - 2\hat{k}$
   (D) None of these

3. The angle between the vectors $\hat{i} - \hat{j}$ and $\hat{j} - \hat{k}$ is

   (A) $\dfrac{\pi}{3}$
   (B) $\dfrac{-\pi}{3}$
   (C) $\dfrac{2\pi}{3}$
   (D) $\dfrac{5\pi}{3}$

4. The value of λ for which the two vectors $2\hat{i} - \hat{j} + 2\hat{k}$ and) $3\hat{i} + \lambda j + \hat{k}$ are perpendicular is

   (A) 2
   (B) 4
   (C) 6
   (D) 8

5. The area of the parallelogram whose adjacent sides $\hat{i} + \hat{k}$ are and $2\hat{i} + \hat{j} + 2\hat{k}$ is

   (A) $\sqrt{2}$
   (B) $\sqrt{3}$
   (C) 3
   (D) 4

6. The 2 vectors $\hat{j} + \hat{k}$ and $3\hat{i} - \hat{j} + 4\hat{k}$ represents the two sides AB and AC, respectively of a ΔABC. The length of the median through A is

   (A) $\dfrac{\sqrt{34}}{2}$
   (B) $\dfrac{\sqrt{48}}{2}$
   (C) $\sqrt{18}$
   (D) None of these

7. The projection of vector $\vec{a} = 2\hat{i} - \hat{j} + 2\hat{k}$ along $\vec{b} = \hat{i} + 2\hat{j} + 2\hat{k}$ is

   (A) $\dfrac{2}{3}$
   (B) $\dfrac{1}{3}$
   (C) 2
   (D) $\sqrt{6}$

8. If a b and ρ ρ are unit vectors, then what is the angle between $\vec{a}$ and $\vec{b}$ for to $\sqrt{3}\vec{a} - \vec{b}$ be a unit vector?

   (A) 30°
   (B) 45°
   (C) 60°
   (D) 90°

9. The unit vector perpendicular to the vectors $\hat{i} - \hat{j}$ and $\hat{i} + \hat{j}$ forming a right handed system is

   (A) $\hat{k}$
   (B) $-\hat{k}$
   (C) $\dfrac{\hat{i} - \hat{j}}{\sqrt{2}}$
   (D) $\dfrac{\hat{i} + \hat{j}}{\sqrt{2}}$

10 If a $= |3|$ and $-1 \le k \le 2$, then $|ka|$ lies in the interval

(A) [0, 6]   (B) [– 3, 6]   (C) [3, 6]   (D) [1, 2]

SECTION B

(This section comprises of very short answer type-questions (VSA) of 2 marks each.)

11. Find a unit vector in the direction of PQ , where P and Q have co-ordinates (5, 0, 8) and (3, 3, 2), respectively.

12. Using vectors, find the value of k such that the points (k, – 10, 3), (1, –1, 3) and (3, 5, 3) are collinear.

13. A vector $\vec{r}$ has magnitude 14 and direction ratios 2, 3, – 6. Find the direction cosines and components of $\vec{r}$, given that $\vec{r}$ makes an acute angle with x-axis.

SECTION C

(This section comprises of short answer type questions (SA) of 3 marks each)

14. Find the angle between the vectors $2\hat{i} - \hat{j} + \hat{k}$ and $3\hat{i} + 4\hat{j} - \hat{k}$

15. Using vectors, find the area of the triangle ABC with vertices A(1, 2, 3), B(2, – 1, 4) and C(4, 5, – 1).

16. Using vectors, prove that the parallelogram on the same base and between the same parallels are equal in area.

SECTION D

(This section comprises of long answer-type questions (LA) of 5 marks each)

17. Find the position vector of a point C which divides the line segment joining A and B, whose position vectors are $2\vec{a} + \vec{b}$ and $\vec{a} - 3\vec{b}$, externally in the ratio 1 : 2. Also, show that A is the mid-point of the line segment BC.

18. By computing shortest distance, determine whether the following pair of lines intersect or not $\vec{r} = (4\hat{i} + 5\hat{j}) + \lambda(\hat{i} + 2\hat{j} - 3\hat{k})$ and $\vec{r} = (\hat{i} - \hat{j} + 2\hat{k}) + \mu(2\hat{i} + 4\hat{j} - 5\hat{k})$.

19. Show that area of the parallelogram whose diagonals are given by $\vec{a}$ and $\vec{b}$ is $\dfrac{|\vec{a} \times \vec{b}|}{2}$. Also find the area of the parallelogram whose diagonals are $2\hat{i} - \hat{j} + \hat{k}$ and $\hat{i} + 3\hat{j} - \hat{k}$.