CHAPTER-10
VECTOR ALGEBRA

1 EXERCISE - 10.2

1. Compute the magnitude of the following vectors:
$\vec{a} = \hat{i} + \hat{j} + k$; $\vec{b} = 2\hat{i} - 7\hat{j} - 3\hat{k}$; $\vec{c} = \frac{1}{\sqrt{3}}\ \hat{i} + \frac{1}{\sqrt{3}}\hat{j}$ - $\frac{1}{3}\hat{k}$

2. Write two different vectors having same magnitude.

3. Write two different vectors having same direction.

4. Find the values of x and y so that the vectors $2\hat{i} + 3\hat{j}$ and $x\hat{i} + y\hat{j}$are equal.

5. Find the scalar and vector components of the vector with initial point (2, 1) and terminal point (– 5, 7).

6. Find the sum of the vectors $\vec{a} = \hat{i} - 2\hat{j} + \hat{k}$, $\vec{b} = -2\hat{i} + 4\hat{j} + 5\hat{k}$ and $\vec{c} = \hat{i} - 6\hat{j} - 7\hat{k}$

7. Find the unit vector in the direction of the vector $\vec{a} = \hat{i} + \hat{j} + 2\hat{k}$.

8. Find the unit vector in the direction of vector PQ , where P and Q are the points (1, 2, 3) and (4, 5, 6), respectively.

9. For given vectors, $\vec{a} = 2\hat{i} - \hat{j} + 2\hat{k}$ and $\vec{b} = -\hat{i} + \hat{j} - \hat{k}$, find the unit vector in the direction of the vector $\vec{a} + \vec{b}$.

10. Find a vector in the direction of vector $5\hat{i} - \hat{j} + 2\hat{k}$ which has magnitude 8 units

11. Show that the vectors $2\hat{i} - 3\hat{j} + 4\hat{k}$ and $-4\hat{i} + 6\hat{j} - 8\hat{k}$ are collinear

12. Find the direction cosines of the vector $\hat{i} + 2\hat{j} + 3\hat{k}$

13. Find the direction cosines of the vector joining the points A (1, 2, –3) and B(–1, –2, 1), directed from A to B

14. Show that the vector $\hat{i} + hatj + \hat{k}$ is equally inclined to the axes OX, OY and OZ

15. Find the position vector of a point R which divides the line joining two points P and Q whose position vectors are $\hat{i} + 2\hat{j} - \hat{k}$ and $-\hat{i} + \hat{j} + \hat{k}$ respectively, in the ratio 2 : 1.
(i) internally (ii) externally

16. Find the position vector of the mid point of the vector joining the points P(2, 3, 4) and Q(4, 1, –2).

17. Show that the points A, B and C with position vectors,$\vec{a} = 3\hat{i} - 4\hat{j} - 4\hat{k}$,$\vec{b} = 2\hat{i} - \hat{j} + \hat{k}$ and $\vec{c} = \hat{i} - 3j - 5k$, respectively form the vertices of a right angled triangle.

18. In triangle ABC (Fig 10.18), which of the following is not true:

    (a) $\overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{CA} = \vec{0}$

    (b) $\overrightarrow{AB} + \overrightarrow{BC} - \overrightarrow{CA} = \vec{0}$

    (c) $\overrightarrow{AB} + \overrightarrow{BC} - \overrightarrow{CA} = \vec{0}$

    (d) $\overrightarrow{AB} - \overrightarrow{BC} + \overrightarrow{CA} = \vec{0}$

19. If $\vec{a}$ and $\vec{b}$ are two collinear vectors, then which of the following are incorrect:

    (a) $\vec{b} = \lambda\vec{a}$, for some scalar λ

    (b) $\vec{a} = \pm\vec{b}$

    (c) the respective components of $\vec{a}$ and $\vec{b}$ are not proportiona

    (d) both the vectors $\vec{a}$ and $\vec{b}$ have same direction, but different magnitudes.