

### Short Questions

Write the short answers of the following:

- Q.1: What is scalar? Give examples.
- Q.2: What is a vector? Give example.
- Q.3: What is unit vector?
- Q.4: Find the formula for magnitude of the vector  $\vec{r} = xi + yj + zk$ .
- Q.5: Find the magnitude of vector  $-2i - 4j + 3k$ .
- Q.6: What are parallel vectors?
- Q.7: Find  $\alpha$ , so that  $|\alpha i + (\alpha + 1)j + 2k| = 3$
- Q.8: If  $\cos\alpha$ ,  $\cos\beta$ ,  $\cos\gamma$  are direction cosines of a vector  $\vec{r} = xi + yj + zk$ , then show that  $\cos^2\alpha + \cos^2\beta + \cos^2\gamma = 1$
- Q.9: Find the unit vector along vector  $4i - 3j - 5k$ .
- Q.10: Find the unit vector parallel to the sum of the vectors  $\vec{a} = [2, 4, -5]$ ,  $\vec{b} = [1, 2, 3]$
- Q.11: Given the vectors,  $\vec{a} = 3i - 2j + k$ ,  $\vec{b} = 2i - 4j - 3k$   
 $\vec{c} = -i + 2j + 2k$ , Find  $a + b + c$
- Q.12: Given the vectors  $\vec{a} = 3i + j - k$  and  $\vec{b} = 2i + j - k$ , find magnitude of  $3\vec{a} - \vec{b}$
- Q.13: Find a vector whose magnitude is 2 and is parallel to  $5i + 3j + 2k$ .
- Q.14: Define scalar product of two vectors.
- Q.15: Find  $\vec{a} \cdot \vec{b}$  if  $\vec{a} = i + 2j + 2k$ ,  $\vec{b} = 3i - 2j - 4k$
- Q.16: Find  $(\vec{a} + \vec{b}) \cdot (\vec{a} - \vec{b})$  if  $\vec{a} = 2i + 2j + 3k$ ,  $\vec{b} = 2i - j + k$
- Q.17: Define Vector product.
- Q.18: If  $\vec{a} = 2i + 3j + 4k$ ,  $\vec{b} = i - j + k$   
 Find  $|\vec{a} \times \vec{b}|$

Q.19: Find the area of parallelogram with adjacent sides,

$$\vec{a} = 7\mathbf{i} - \mathbf{j} + \mathbf{k} \text{ and } \vec{b} = 2\mathbf{j} - 3\mathbf{k}$$

Q.20: For what value of  $\lambda$ , the vectors  $2\mathbf{i} - \mathbf{j} + 2\mathbf{k}$  and  $3\mathbf{i} + 2\lambda\mathbf{j}$  are perpendicular.

Q.21: Under what conditions does the relation  $\vec{a} \cdot \vec{b} = |\vec{a}| |\vec{b}|$  hold?

Q.22: Find scalars  $x$  and  $y$  such that  $x(\mathbf{i} + 2\mathbf{j}) + y(3\mathbf{i} + 4\mathbf{j}) = 7$

Q.23: Prove that if  $\vec{a} = \mathbf{i} + 3\mathbf{j} - 2\mathbf{k}$  and  $\vec{b} = \mathbf{i} - \mathbf{j} - \mathbf{k}$ , then  $\vec{a}$  and  $\vec{b}$  are perpendicular to each other.

### Answers

5.  $\sqrt{29}$

7.  $1, -2$

9.  $\frac{4\mathbf{i} - 3\mathbf{j} - 5\mathbf{k}}{5\sqrt{2}}$

10.  $\frac{3\mathbf{i} + 6\mathbf{j} - 2\mathbf{k}}{7}$

11.  $4\mathbf{i} - 4\mathbf{j} + 0\mathbf{k}$

12.  $\sqrt{54}$

13.  $\frac{10\mathbf{i} + 6\mathbf{j} + 4\mathbf{k}}{\sqrt{38}}$

15.  $-9$

16.  $8$

18.  $\sqrt{78}$

19.  $\sqrt{14}$  sq. unit

20.  $\lambda = 3$

21.  $\theta = 0^\circ$

22.  $x = \frac{-1}{2}, y = 5/2$