

B.SC. MATHEMATICS
THIRD SEMESTER
VECTOR ANALYSIS
BSM – 732 [SPECIAL REPEAT]
(USE OMR FOR OBJECTIVE PART)

SET
A

Duration : 1.30 hrs.

Full Marks : 35

Time : 15 min.

(Objective)

Marks : 10

Choose the correct answer from the following:

1×10=10

1. If \vec{a} and \vec{b} are perpendicular to each other, then
 - a. $\vec{a} \cdot \vec{b} = 0$
 - b. $\vec{a} \cdot \vec{b} = 1$
 - c. $\vec{a} = 0$
 - d. $\vec{b} = 0$
2. What is the value of $\vec{a} \times (\vec{b} \times \vec{c}) = ?$
 - a. $(\vec{a} \cdot \vec{b})\vec{c} - (\vec{a} \cdot \vec{c})\vec{b}$
 - b. $(\vec{a} \cdot \vec{c})\vec{b} - (\vec{a} \cdot \vec{b})\vec{c}$
 - c. $(\vec{a} \cdot \vec{c})\vec{b} + (\vec{a} \cdot \vec{b})\vec{c}$
 - d. $(\vec{a} \cdot \vec{c})\vec{b} - (\vec{a} \cdot \vec{b})\vec{c}$
3. The term $\vec{a} \cdot (\vec{b} \times \vec{c})$ represents
 - a. Geometrically the volume V of a rectangle with the three vectors as the coterminous edges
 - b. Geometrically the volume V of a square with the three vectors as the coterminous edges
 - c. Geometrically the volume V of a parallelepiped with the three vectors as the coterminous edges
 - d. Geometrically the volume V of a parallelogram with the three vectors as the coterminous edges
4. What is value of $\vec{a} \times \{ \vec{a} \times (\vec{b} \times \vec{c}) \} = ?$
 - a. $(\vec{b} \times \vec{a})$
 - b. $(\vec{a} \cdot \vec{a})$
 - c. $(\vec{b} \times \vec{a})_a$
 - d. $(\vec{a} \cdot \vec{a})(\vec{b} \times \vec{a})$
5. Which of the following is correct
 - a. $[\vec{a} \ \vec{b} \ \vec{c}] = -[\vec{a} \ \vec{c} \ \vec{b}]$
 - b. $[\vec{a} \ \vec{b} \ \vec{c}] = [\vec{a} \ \vec{c} \ \vec{b}]$
 - c. $[\vec{a} \ \vec{c} \ \vec{b}] = -[\vec{a} \ \vec{b} \ \vec{c}]$
 - d. $[\vec{a} \ \vec{b} \ \vec{c}] = \vec{a} \times (\vec{b} \times \vec{c})$

6. What is the value of $\hat{i} \times \hat{i} = ?$
- a. 1
b. 0
c. -1
d. None of the above
7. If two vectors are equal or collinear, the scalar triple product is
- a. 0
b. 1
c. -1
d. 2
8. For what value of x , the following vectors are coplanar
 $\bar{a} = \hat{i} - \hat{j} + \hat{k}, \bar{b} = 2\hat{i} + \hat{j} - \hat{k}, \bar{c} = x\hat{i} + \hat{j} + x\hat{k}$
- a. 2
b. 1
c. 0
d. -1
9. $[\hat{i} \ \hat{j} \ \hat{k}] + [\hat{i} \ \hat{k} \ \hat{j}] = ?$
- a. 0
b. -1
c. 1
d. None of the above
10. What is the value of $\hat{i} \cdot (\hat{i} \times \hat{j}) = ?$
- a. -1
b. 1
c. 0
d. None of the above

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(Descriptive)

Time : 1 hr. 15 mins.

Marks : 25

[Answer question no.1 & any two (2) from the rest]

1. Determine $[\vec{a} \ \vec{b} \ \vec{c}]$ if $\vec{a} = 2\hat{i} - 3\hat{j}$, $\vec{b} = \hat{i} + \hat{j} - \hat{k}$, $\vec{c} = 3\hat{i} - \hat{k}$ 1+4=5
Simplify: $[\vec{a} + \vec{b} + \vec{c} \ \vec{a} + \vec{b} \ \vec{a} + \vec{c}]$
2. a. Prove that $(\vec{a} \times \vec{b})^2 = a^2 b^2 - (\vec{a} \cdot \vec{b})^2$. 2+3=5
b. By vector method, show that an angle in a semi circle is a right
3. If $|\vec{a} + \vec{b}| = |\vec{a} - \vec{b}|$, prove that the vectors \vec{a} and \vec{b} are perpendicular to each other. 5
4. Write the definition of Resultant of a vector, vector triple product, scalar triple product, coplanar vectors and parallel shift of vectors. 1×5=5
5. If $a\hat{i} + 2\hat{j} = 3\hat{i} + 2\hat{j} - b\hat{k}$, find \vec{a} and \vec{b} . Simplify: $|(2\hat{i} - 3\hat{j}) \times \hat{i}|$ 1+4=5
6. Prove by using vector method in a triangle ABC, 5
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$
7. Prove that $\vec{a} \times (\vec{b} + \vec{c}) + \vec{b} \times (\vec{c} + \vec{a}) + \vec{c} \times (\vec{a} + \vec{b}) = 0$. Find unit vector in the direction of $\hat{i} + \hat{j} - 2\hat{k}$ 2+3=5

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