

Date - 18-07-24

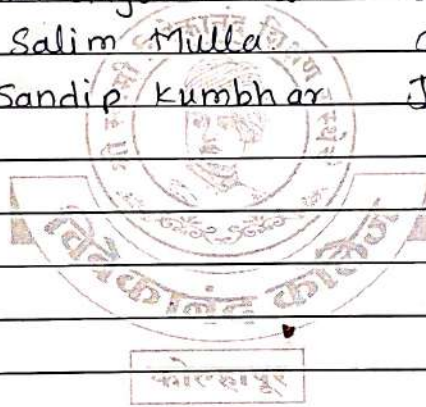
Unit Test no. I

Mechanics-I

Department of Physics

Mark - 25.

Gr. No.	Name of Student	Sign	Marks.
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2.	Grishma Sachin Tripathkar	<u>Tripathkar</u>	04
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4.	Shreya Pandurang Powar	<u>Powar</u>	04
5.	Anushka Jingonda Patil	<u>APatil</u>	08
6.	Jiya Salim Mulla	<u>Jmulla</u>	21
7.	Aditi Sandip Kumbhar	<u>Aditi Kumbhar</u>	16.



Jiya Salim Mulla

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Suppliment No. :

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Subject : Mechanics - I

Test / Tutorial No. : 1

Div. :

Q. 1. What is Vector. state its any four characteristics.

Q. 2. Write the expression for area of parallelogram using vector product

Q. 3. Define unit vector and axial vector.

Q. 4. If the co-ordinate of P (4, 5, 10) then find $\overline{OP}$, its magnitude & direction.

Q. 5. If $\vec{a}$ & $\vec{b}$ are (3, 4, 5) & (6, 8, 9) then find $\vec{a} \times \vec{b}$

Answers

Q. 1. Vector :- Vector is a quantity which have magnitude as well as direction characteristics :-

① Vector product doesn't obey commutative Law
i.e. $\vec{a} \times \vec{b} \neq \vec{b} \times \vec{a}$
 $\vec{a} \times \vec{b} = -\vec{b} \times \vec{a}$



② Vector product with itself, result is zero
i.e. $\vec{a} \times \vec{a} = 0$

③ $\hat{i} \times \hat{i} = \hat{j} \times \hat{j} = \hat{k} \times \hat{k} = 0$

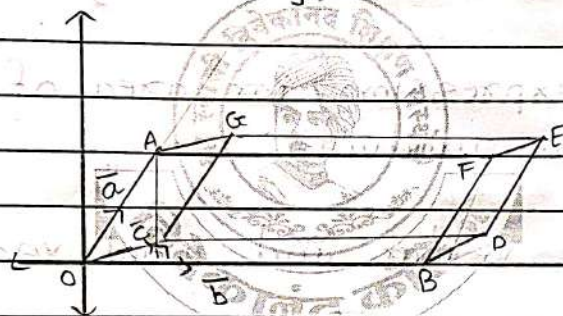
and

$$\hat{i} \times \hat{j} = \hat{k}, \quad \hat{j} \times \hat{k} = \hat{i}, \quad \hat{k} \times \hat{i} = \hat{j}$$

$$\hat{j} \times \hat{i} = -\hat{k}, \quad \hat{k} \times \hat{j} = -\hat{i}, \quad \hat{i} \times \hat{k} = -\hat{j}$$

④ vector product obeys distributive law.
i.e. $\vec{a} \times (\vec{b} + \vec{c}) = (\vec{a} \times \vec{b}) + (\vec{a} \times \vec{c})$

Q. 2. Area of Parallelogram :-



let $\vec{a}$ & $\vec{b}$ are two vectors

$$\vec{a} = a_x \hat{i} + a_y \hat{j} + a_z \hat{k}$$

$$\vec{b} = b_x \hat{i} + b_y \hat{j} + b_z \hat{k}$$

$$\vec{a} \times \vec{b} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ a_x & a_y & a_z \\ b_x & b_y & b_z \end{vmatrix} = \hat{i} (a_y b_z - a_z b_y) - \hat{j} (a_x b_z - a_z b_x) + \hat{k} (a_x b_y - a_y b_x)$$

the expression for area of parallelogram is $|\vec{a} \times \vec{b}|$



Q 3 unit vector :-

it is a vector whose magnitude is one.

if $\vec{a}$ is a vector then its unit vector is $\hat{a}$.

$$\therefore \hat{a} = \frac{\vec{a}}{|\vec{a}|}$$

Q 4 Axial vector :-

it is vector which is along with coordinate axis

Q 4. $P = (4, 5, 10)$

$O = (0, 0, 0)$

now,

$$\vec{OP} = \vec{P} - \vec{O}$$

$$= (4\hat{i} + 5\hat{j} + 10\hat{k}) - (0\hat{i} + 0\hat{j} + 0\hat{k})$$

$$= 4\hat{i} + 5\hat{j} + 10\hat{k}$$

$$|\vec{OP}| = \sqrt{4^2 + 5^2 + 10^2}$$

$$= \sqrt{16 + 25 + 100}$$

$$= \sqrt{141}$$

$$|\vec{OP}| = \sqrt{141}$$

Q 5. $\vec{a} = (3, 4, 5)$

$\vec{b} = (6, 8, 9)$

$$\vec{a} \cdot \vec{b} = \vec{a} \cdot \vec{b} = (3\hat{i} + 4\hat{j} + 5\hat{k}) \cdot (6\hat{i} + 8\hat{j} + 9\hat{k})$$

$$= 18 + 32 + 45$$

$$= 95$$



NAME :- Aditi Sandip kumbhar.

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Subject : Mechanic's 1

Test / Tutorial No. : 1

Div. : -

Q. 1 What is vector? state its any four characteristics.

Q. 2 Write an expression for area of parallelogram using vector product.

Q. 3 Define unit vector and axial vector.

Q. 4 If the co-ordinate of P be (4, 5, 10) then Find $\vec{OP}$, its magnitude and direction.

Q. 5 If A and B are (3, 4, 5) & (6, 8, 9) then Find $\vec{AB}$.



Answers

① Vector is define as a quantity which can measure in terms of both magnitude and direction.

② characteristics of vector -

1) Vector product doesn't obeys the commutative law.

i.e. $\vec{A} \times \vec{B} \neq \vec{B} \times \vec{A}$

$\Rightarrow \vec{A} \times \vec{B} = -\vec{B} \times \vec{A}$

2) Vector products obey distributive law of addition.

i.e. $\vec{A} \times (\vec{B} + \vec{C}) = (\vec{A} \times \vec{B}) + (\vec{A} \times \vec{C})$

3) $\hat{i} \times \hat{i} = \hat{j} \times \hat{j} = \hat{k} \times \hat{k} = 0$

$\hat{i} \times \hat{j} = \hat{k}$, $\hat{j} \times \hat{k} = \hat{i}$, $\hat{i} \times \hat{k} = -\hat{j}$

4) $\vec{A} = A_x \hat{i} + A_y \hat{j} + A_z \hat{k}$

$\vec{B} = B_x \hat{i} + B_y \hat{j} + B_z \hat{k}$

$\hat{i}$	$\hat{j}$	$\hat{k}$
A_x	A_y	A_z
B_x	B_y	B_z

$\vec{A} \times \vec{B} = (A_x B_y - A_y B_x) \hat{k} + (A_x B_z - A_z B_x) \hat{j} + (A_y B_z - A_z B_y) \hat{i}$

5) $\vec{A} \times \vec{A} = 0$

Q. 3 Unit vector $\hat{u}$ The vector who shows the direction of vector is a unit vector.

Q. 4) $P = (4, 5, 10)$

$\vec{OP} = ?$

$\rightarrow P = 4\hat{i} + 5\hat{j} + 10\hat{k}$

Magnitude of P

$$\begin{aligned} |P| &= \sqrt{(4)^2 + (5)^2 + (10)^2} \\ &= \sqrt{16 + 25 + 100} \\ &= \sqrt{141} \\ &= \sqrt{141} \end{aligned}$$



Q. 5) $\vec{A} = 3\hat{i} + 4\hat{j} + 5\hat{k}$
 $\vec{B} = 6\hat{i} + 8\hat{j} + 9\hat{k}$

$$\vec{A} \times \vec{B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 3 & 4 & 5 \\ 6 & 8 & 9 \end{vmatrix}$$

$$= \hat{i}(36 - 40) - \hat{j}(27 - 30) + \hat{k}(24 - 24)$$

$$= -4\hat{i} + 3\hat{j} + 0$$

$$|\vec{A} \times \vec{B}| = \sqrt{(-4)^2 + (3)^2}$$

$$= \sqrt{16 + 9}$$

$$= \sqrt{25}$$

$$= 5$$



Name :- Shreya Sachin Patil.

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Subject : Mechanics - I

Test / Tutorial No. : 1

Div. :

Q.1) What is vector. state it's any 4 characteristics?

Ans. Vector: Vector is defined as both magnitude and direction.

Characteristics: 1) If vector $\vec{A}$ and $\vec{B}$ are two unit vectors. This vector at an angle θ . Vector or dot product is perpendicular to plane. $\vec{A} \cdot \vec{B} = AB \sin \theta$

2) This vector is parallel to value is zero

3) $\hat{i} \cdot \hat{i} = \hat{j} \cdot \hat{j} = \hat{k} \cdot \hat{k} = 1$ and $\hat{i} \cdot \hat{j} = \hat{j} \cdot \hat{k} = \hat{k} \cdot \hat{i} = 0$

4) Vector does not obey commutative law.

Q.2) Write the expression form parallelogram using vector product.

Q.3) Define unit vector and axial vector.

Ans. • Unit Vector: If the vector is given direction of unit vector is called unit vector.

• Axial Vector



Q.4) IF the co-ordinates of 'P' be (4, 5, 10) then Find $\overrightarrow{OP}$ it's magnitude and direction.

Q.5) IF A and B are (3, 4, 5) and (6, 8, 9) then Find $\overrightarrow{AB}$

Ans. Given:

$$\vec{A} = 3\hat{i} + 4\hat{j} + 5\hat{k}$$

$$\vec{B} = 6\hat{i} + 8\hat{j} + 9\hat{k}$$

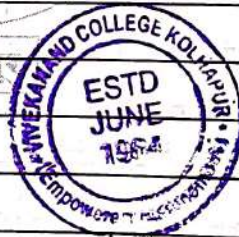
$$\vec{A} \cdot \vec{B} = (3\hat{i} + 4\hat{j} + 5\hat{k}) \cdot (6\hat{i} + 8\hat{j} + 9\hat{k})$$

$\therefore$	$\hat{i}$	$\hat{j}$	$\hat{k}$
	3	4	5
	6	8	9

$$= \hat{i}(36 - 40) - \hat{j}(27 - 30) + \hat{k}(24 - 24)$$

$$= -4\hat{i} + 3\hat{j} + 0\hat{k}$$

$$\overrightarrow{AB} = -4\hat{i} + 3\hat{j}$$



Name - Geshma Sachin Tipankar

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Class : BSc-Iyr

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Supervisor

Subject : Physics.

Test / Tutorial No. : 1

Div. :

04
25

- Q1 - What is Vector. state its any 4 characteristics?
- Q2 - Write the expression of area of parallelogram using Vector product?
- Q3 - Define Unit vector and axial vector?
- Q4 - IF the co-ordinates of P be (4,5,10) then find $\vec{OP}$, its magnitude and direction?
- Q5 - IF A & B are (3,4,5) & (6,8,9) then find $\vec{AB}$?

Answers -

Q1

The vector defined as both quantities direction and Magnitude is called vector state.

Characterstics of Vector state - 1] It does not obey commutative law.
vector cross product

2] This vector parallel to value is zero

3] $\hat{i} \cdot \hat{i} = \hat{j} \cdot \hat{j} = \hat{k} \cdot \hat{k} = 1$ & $\hat{i} \cdot \hat{j} = \hat{j} \cdot \hat{k} = \hat{i} \cdot \hat{k} = 0$

Q2

4] IF vector $\vec{A}$ & $\vec{B}$ are to unit



$$\underline{\underline{B = 6, 8, 9}}$$

$\overline{AB} =$	$\overline{i}$	$\overline{j}$	$\overline{k}$
	3	4	5
	6	8	9

$$= \bar{i}(36-40) - \bar{j}(27-30) + \bar{k}(24-24)$$

$$= -4\bar{i} + 3\bar{j}$$

$$\bar{A}\bar{B} = -4\bar{i} + 3\bar{j}$$



Q5] $\vec{A} = (3\hat{i}, 4\hat{j}, 5\hat{k})$ $\vec{B} = (6\hat{i}, 8\hat{j}, 9\hat{k})$

$\vec{AB} = (18\hat{i}, 38\hat{j}, 45\hat{k})$



Vaishnavi Sachin Sawul.

Date - 18-7-2024

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BSC-I

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Subject : Mechanics I

Test / Tutorial No. : 1

Div. :

- Q. 1. What is vector. state it's any four characteristics.
- Q. 2. Write an expression for area of parallelogram using vector product.
- Q. 3. Define unit vector & axial vector.
- Q. 4. If the co-ordinates of P be (4, 5, 10) then find $\overline{OP}$ & it's magnitude & direction.
- Q. 5. If a & b are (3, 4, 5) & (6, 8, 9) then find $\overline{AB}$.

Q. 1) → Vector product :-

The vector product of two vectors is the product of magnitude of two vectors.

Characteristics :-

1) It does not obey commutative law.

$$\vec{a} \times \vec{b} \neq \vec{b} \times \vec{a}.$$

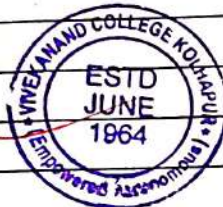
2) It obeys distributive law of vector addition.

$$\vec{a} \cdot \vec{a} = \vec{b} \cdot \vec{b} = \vec{c} \cdot \vec{c} =$$

$$\vec{a} \cdot \vec{b} = \vec{b} \cdot \vec{c} = \vec{c} \cdot \vec{a} =$$

3) Vector product with itself is zero.

4) Vector product is $\perp$ & antiparallel makes.



Q. 5. Given,

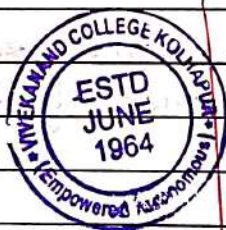
$$\vec{A} = (3, 4, 5)$$

$$\vec{B} = (6, 8, 9)$$

$$\therefore \vec{AB} = (3\hat{i} + 4\hat{j} + 5\hat{k}) \times (6\hat{i} + 8\hat{j} + 9\hat{k})$$

$$\therefore \vec{AB} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 3 & 4 & 5 \\ 6 & 8 & 9 \end{vmatrix} = \hat{i}(36 - 40) - \hat{j}(27 - 30) + \hat{k}(24 - 24)$$
$$= -4\hat{i} + 3\hat{j}$$

Q. 4. Give $\vec{P} = (2, 5, 10)$

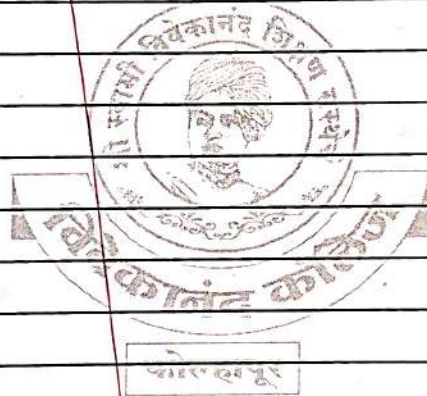
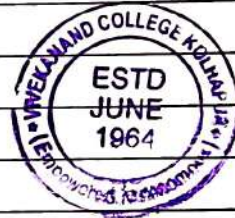


Q. 3. Unit vector:-

Unit vector is vector which having single unit. ~~is co~~

Axial vector:-

Axial vector is vector which



Shreya Pandurang Powde.

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Subject :

Test / Tutorial No. :

Div. :

① What is vector State its any four charcter

② right an expression from area of parale. grow using vector

③ definid unit vector axist product

④ Tf the co-ord $(P, B) \cdot (4.5, 10)$ then find op it
magitude & direction.

⑤ Tf AB are $(3, 4, 5)$ & $(6, 8, 9)$ Find $\overline{AB}$?



①

Vector ~~state~~ :-

The vector product is two vector a & b is denoted by $a \times b$ is it perpendicular to b .

②

$\hat{i}$	$\hat{j}$	$\hat{k}$	
3	4	5	$= \hat{i} (36 - 40) - \hat{j} (27 - 30) + \hat{k} (20 - 24)$
6	8	9	$= \hat{i} (-4) - \hat{j} (-3) + \hat{k} (0)$



Name - Anushka Jingonda Patil.

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Test / Tutorial No. : 01

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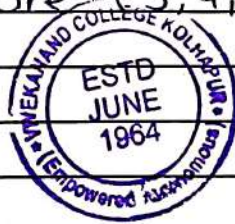
Q1. What is vector. State its any four character-
stics.

Q2. Write an expression for area of parallelo-
gram using vector product.

Q3. Define unit vector and axial product.

Q4. If the co-ordination P, B, (4, 5, 10) then
find $\vec{OP}$, its magnitude & direction.

Q5. If A & B are (3, 4, 5) and (6, 8, 9) then find
 $\vec{AB}$.



Q1. $\rightarrow$ Vector : If vector product is of two vectors, a & b . is denoted by $a \times b$. it is perpendicular to a and b .

3 characteristics :

$$1) (\hat{i} \times \hat{i}, \hat{j} \times \hat{j}, \hat{k} \times \hat{k}) = 0 \quad (\hat{i} \times \hat{j}, \hat{j} \times \hat{k}, \hat{k} \times \hat{i}) = 1$$

2)

Q5 If A & B are $(3, 4, 5)$ & $(6, 8, 9)$ then find $\overline{AB}$

$$\overline{AB} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 3 & 4 & 5 \\ 6 & 8 & 9 \end{vmatrix}$$

$$= \hat{i}(36 - 40) - \hat{j}(27 - 30) + \hat{k}(24 - 24)$$

$$= \hat{i}(-4) - \hat{j}(-3) + \hat{k}(0)$$

$$\overline{AB} = -4\hat{i} + 3\hat{j} + \hat{k}$$

