## CHAPTER – 10

## **VECTORS**

## **CASE STUDY BASED QUESTIONS**

SL NO	QUESTIONS		
1	Sai Chandan starts walking from his house to bring his daughter from her school. Instead of		
	walking to the school directly, he first goes to a ATM to withdraw some money, from there to a		
	library to lend some books and then reaches the school. In the diagram A, B, C and D represents		
	the coordinates of house, ATM, library and school respectively.		
	the coordinates of house, ATM, library and school respectively.		
	Based on the above information, answer the followings:		
	(i)Distance between the house and the school is		
	(a) $3\sqrt{2}$ unit (b) $2\sqrt{3}$ unit (c) 2 unit (d) 3 unit		
	(ii) Total distance travelled by Sai Chandan to reach the school is		
	(a) $3\sqrt{2}$ unit (b) 2 $\sqrt{3}$ unit (c) $9\sqrt{2}$ unit (d) 6 $\sqrt{3}$ unit		
	(iii) Area of the quadrilateral ABCD is		
	(a) $36\sqrt{2}$ sq.unit (b) $32\sqrt{3}$ sq.unit (c) $18$ sq. unit (d) $36$ sq. unit		
	(iv) Angle between $\overrightarrow{AB}$ and $\overrightarrow{BC}$ is		

	<sup>(a)</sup> $30^{\circ}(b) 60^{\circ}(c) 45^{\circ}(d) 90^{\circ}$		
2	If two vectors are represented by the two sides of a triangle taken in order, then their sum is represented by thethird side of the triangle taken in opposite order and this is known as triangle law of vector addition. Based on the above information, answer the following questions.		
	(i) If $\vec{p}, \vec{q}, \vec{r}$ are the vectors represented by the sides of a triangle taken in order, then $\vec{q} + \vec{r} =$		
	(a) $\vec{p}$ (b) $2\vec{p}$ (c) $-\vec{p}$ (d) None of these		
	(ii) If ABCD is a parallelogram and AC and BD are its diagonals, then $\overrightarrow{AB} + \overrightarrow{BD} =$		
	(a) $2 \overrightarrow{DA}$ (b) $2 \overrightarrow{AB}$ (c) $2 \overrightarrow{BC}$ (d) $2 \overrightarrow{BD}$		
	(iii) If ABCD is a parallelogram, where $\overrightarrow{AB} = 2\vec{a}$ and $\overrightarrow{BC} = 2\vec{b}$ ,then $\overrightarrow{AC} - \overrightarrow{BD} =$		
	(a) $3\vec{a}$ (b) $4\vec{a}$ (c) $2\vec{b}$ (d) $4\vec{b}$		
	(iv) If ABCD is a quadrilateral whose diagonals are $\overrightarrow{AC}$ and $\overrightarrow{BD}$ then $\overrightarrow{BA} + \overrightarrow{CD}$ =		
	(a) $\overrightarrow{AC} + \overrightarrow{DB}$ (b) $\overrightarrow{AC} + \overrightarrow{BD}$ (c) $\overrightarrow{BC} + \overrightarrow{AD}$ (d) $\overrightarrow{BD} + \overrightarrow{CA}$		
	(v) If T is the mid-point of side YZ of $\triangle$ XYZ, then $\overrightarrow{XY} + \overrightarrow{XZ}$ =		
	$r \rightarrow z$		
	(a) $2 \overrightarrow{YT}$ (b) $2 \overrightarrow{XT}$ (c) $2 \overrightarrow{TZ}$ (d) None of these		
3	Geetika's house is situated at Shalimar Bagh at point O, for going to Alok's house she first travels 8 km by bus inthe East. Here at point A, a hospital is situated. From Hospital, Geetika takes an auto and goes 6 km in the North, here at point B school is situated. From school, she travels by bus to reach Alok's house which is at 30° East,6 km from point B.		



	2.What are the components to the edge vector $\vec{B}$ defined by $\vec{B}$ = PV of P4 – PV of P1? (where PV stands for position vector) a.0,0,8 b. 0,8,6 c. 6,0,8 d. 6,8,6 3.What is the magnitude of the vectors $\vec{A}$ and in what units? a. 10 b. 15 c. 225 d. 100
	<ul> <li>4.What is the magnitude of the vector B and in what units?</li> <li>a.36</li> <li>b.7</li> <li>c. 64</li> <li>d.10</li> <li>5. What are the components to the vector N , perpendicular to A and B and the surface of the roof?</li> <li>a90,120</li> <li>b90,0,120</li> <li>c. 120,0,90</li> <li>d. 120,90,0</li> </ul>
5	There was a competitive examination. A group of student went appearing for a competitive examination was asked to attempt the following questions. Read carefully the question and choose correct answer.
	Let $\vec{a}$ , $\vec{b}$ and $\vec{c}$ bethree non zero vectors. <b>1.</b> If $\vec{a}$ and $\vec{b}$ are such that $ a + b^{\vec{i}}  =  a - b^{\vec{i}} $ then a. $\vec{a}$ perpendicular to $\vec{b}$ b. $\vec{a}$ is parallel to $\vec{b}$

c.  $\vec{a} = \vec{b}$ d. None of these **2.** If  $\vec{a} = \tilde{\imath} - 2\tilde{\jmath}$ ,  $\vec{b} = 2\tilde{\imath} + \tilde{\jmath} + 3\tilde{k}$  then value  $(2\vec{a} + \vec{b}) \cdot [(\vec{a} + \vec{b}) \times (\vec{a} - 2\vec{b})]$  is: a. 0 b. 4 c. 3 d. 2 **3.** If  $\vec{a}$  and  $\vec{b}$  are unit vectors and be the angle between them then  $|\vec{a} - \vec{b}|$  is a. *sinθ*/2 b. 2*sinθ*/2 c. 2*cosθ*/2 d. *cosθ*/2 **4.** Let  $\vec{a}$ ,  $\vec{b}$  and  $\vec{c}$  be unit vectors such that  $\vec{a} \cdot \vec{b} = \vec{a} \cdot \vec{c} = 0$  and angle between  $\vec{b}$  and  $\vec{c}$  is  $\pi/6$  then  $\vec{a} =$ a.  $2(\vec{b} \times \vec{c})$ b.  $-2(\vec{b} \times \vec{c})$ c.  $\pm 2(\vec{b} \times \vec{c})$ d.  $2(\vec{b} \pm \vec{c})$ Ginni purchased an air plant holder which is in the shape of a tetrahedron. Let A, B, C and D are the 6. coordinates of the air plant holder where A = (1, 1, 1), B = (2, 1, 3), C = (3, 2, 2) and D = (3, 3, 4).This Dhate Based on above information, answer the following questions. Find the position vector of  $\overrightarrow{AB}$ . (i) (a)  $-\hat{1} - 2\hat{k}$ (b)  $2\hat{i} + \hat{k}$ (c)  $\hat{i} + 2 \hat{k}$ 

(d)  $-2\hat{i} - \hat{k}$ Find the position vector of  $\overrightarrow{AC}$  . (ii) (a)  $2\hat{1} - \hat{1} - \hat{k}$ (b)  $2\hat{i} + \hat{j} + \hat{k}$ (c)  $-2\hat{1} - \hat{1} + \hat{k}$ (d)  $\hat{i} + 2\hat{j} + \hat{k}$ Find the position vector of  $\overrightarrow{AD}$ . (iii) (a) 2î - 2ĵ - 3 k (b)  $\hat{i} + \hat{j} - 3 \hat{k}$ (c)  $3\hat{i} + 2\hat{j} + 2\hat{k}$ (d)  $2\hat{i} + 2\hat{j} + 3\hat{k}$ Area of triangle ABC = (iv) (a)  $\frac{\sqrt{11}}{2}$  sq. units (b)  $\frac{\sqrt{14}}{2}$  sq. units (c)  $\frac{\sqrt{13}}{2}$  sq. units (d)  $\frac{\sqrt{17}}{2}$  sq. units Find the unit vector along  $\overrightarrow{AD}$ . (v) (a)  $\frac{1}{\sqrt{17}}$  (2î + 2 ĵ + 3  $\hat{k}$  ) (b)  $\frac{1}{\sqrt{17}}$  (3î +3 ĵ + 2 k̂ ) (c)  $\frac{1}{\sqrt{11}}$  (2î + 2 ĵ + 3  $\hat{k}$  ) (d)  $(2\hat{1} + 2\hat{j} + 3\hat{k})$ Rohit is a student of class XII. In a class he observes the moments of an insect on white board and 7. spot the motion on Cartesian plane. He marked four different positions A(-3, 3), B(1, 5), C(4, -1) and D(1, -5) and draw it diagram as shown in figure.



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	(v) Find the value of $\overrightarrow{OC}$ . $\overrightarrow{OD}$ .				
		(a) - 1			
		(b) 1			
		(c) -9			
		(d) 9			
8	<ul> <li>(d) 9</li> <li>8 A plane started from airport situated at 0 with a velocity of 120 m/s towards east. air is blowing at a velocity of 50 m/s towards the north as shown in the figure. the plane travelled 1 hr in OP direction with the resultant velocity. from P to R the plane travelled 1 hr keeping velocity of 120 m/s and finally landed at R </li> <li>North <ul> <li>North <ul> <li>R</li> <li>Plane speed 120 m/s</li> </ul> </li> <li>East</li> </ul> </li> <li>Based on the above information answer the following questions <ul> <li>(i) What is the resultant velocity from 0 to P</li> <li>(a) 100 m/s</li> <li>(b)130 m/s</li> <li>(c) 126 m/s</li> <li>(d)180m/s</li> </ul> </li> <li>(ii) What is the digetament from 0 to P</li> <li>(a) tan<sup>-1</sup>5/12</li> <li>(b)tan<sup>-1</sup>12/3</li> <li>(c) 50 (d)80</li> </ul> <li>(iii) What is the displacement from 0 to P <ul> <li>(a) 600 km</li> <li>(b)468 km</li> <li>(c) 532 km</li> <li>(d) 500 km</li> </ul> </li> <li>(iv) What is the resultant velocity from P to R <ul> <li>(a) 120 m/s</li> <li>(b)70 m/s</li> <li>(c) 170 m/s</li> <li>(d) 200m/s</li> </ul> </li> <li>(v) What is the displacement from P to R <ul> <li>(a) 450 km</li> <li>(b)532 km</li> <li>(c) 610 km</li> <li>(d) 612 km</li> </ul> </li>				
9	Three slogans on chart papers are to be placed on a school bulletin board at the points A, B and C displaying A(Hub of learning), B(Creating a better world for tomorrow) and C(Education comes first) the coordinates of these points are $(1,4,2)$ , $(3, -3, -2)$ and $(-2,2,6)$ respectively.				

	A	Hub of Learning	
	В	C	
	better	r world comes first	
	for to	morrow	
	Based on	the above information answer the following questions	
	(i)	Let $\vec{a}$ , $\vec{b}$ and $\vec{c}$ are the position vectors of points A B and C respectively then $\vec{a} + \vec{b} + \vec{c}$ is	
		equal to	
	(ii)	(a)2i+3j+6k (b)2i-3j-6k (c) 2i+8j+6k (d)2(7i+8j+3k) Which of the following is not true	
	(11)	(a) $\overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{CA} = \overrightarrow{0}$ (b) $\overrightarrow{AB} + \overrightarrow{BC} - \overrightarrow{AC} = \overrightarrow{0}$	
	(c) $\overrightarrow{AB} + \overrightarrow{BC} - \overrightarrow{CA} = \overrightarrow{0}$ (d) $\overrightarrow{AB} - \overrightarrow{CB} + \overrightarrow{CA} = \overrightarrow{0}$		
	(iii)	Area of triangle ABC is	
		(a)19 sq. units (b) $\sqrt{1937}$ sq. units	
	(i).)	(c) $\sqrt{1937/2}$ sq. units (d) $\sqrt{1837}$ sq. units Suppose if the given slegges are to be placed on a straight line then the value of $\vec{13}$ $\vec{Y}\vec{P} \pm \vec{P}$	
	(17)	$\vec{c} + \vec{c} \times \vec{a}$ will be equal to	
		(a)-1 (b)-2 (c) 2 (d)0	
	(v)	If a equal to 2 i + 3 j + 6k then unit vector in the direction of vector a is (a)2i/7-3i/7-6k/7 (b)2i/7+3i/7+6k/7	
		(c) 3i/7+2j/7+6k/7 (d) None of these	
10	Let a vect	for ABmakes an angle $\theta$ with a given directed line l(say), in the anticlockwise direction. Then	
	the project	ction of AB on I is a vector p is the same (or opposite) to that of the line I, depending upon $\cos \theta$ is +ve or -ve.	
	i) The ang	le between two vector $\vec{a}$ and $\vec{b}$ with magnitude 1 and 2 respectively and $\vec{a}$ . $\vec{b}$ =1 is	
	a) $\frac{\pi}{4}$ b) $\frac{\pi}{3}$	c) $\frac{\pi}{6}$ d) $\frac{3\pi}{2}$	
	ii) The val	ue of $\lambda$ so that vectors $\vec{a}$ = 2î+ $\lambda$ ĵ + $\hat{k}$ and $\vec{b}$ =- î-2ĵ + 3 $\hat{k}$ are perpendicular to each other	
	a) $\frac{5}{2}$ b) $\frac{2}{5}$ c) $\frac{1}{2}$ d)1		
	iii) The wo	ork done by the force $ec{F}$ =î+ĵ + $\hat{k}$ acting on a particle if the particle is displaced from the point	
	A(3,3,3) a	and B(4,4,4) is	
	iv) The pr	ojection of the vector $\vec{a} = \hat{i} - \hat{i}$ on the vector $\vec{b} = -\hat{i} + \hat{i}$ is	
	a) 0	b) 1 c) 2 d) 4	
	v) For any	y two vectors $\vec{a}$ and $\vec{b}$ , which is true for CAUCHY-SEHWARZ INEQUALITY	
	$ \mathbf{a}  \mathbf{\vec{a}}\cdot\mathbf{\vec{b}}  =$	$ \mathbf{a}  \mathbf{b}  \mathbf{b}\rangle  \mathbf{\vec{a}},\mathbf{b}\rangle  \leq  \mathbf{a}  \mathbf{b} $	
11	$c) \vec{a}.b  <$	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	
ΤŢ	rotated c	e-unnensional right-handed rectangular co-ordinate system, when the positive x-axis is counterclockwise into the positive y-axis, a right-handed screw would advance in the	

	direction of positive z-axis. Thus, in a right-handed point in the direction of the positive z-axis when			
	the fingers are curled in the direction away from the positive x-axis toward the positive y-axis.			
	i) Given $ \vec{a} =10$ , $ \vec{b} =2$ and $ \vec{a},\vec{b} =12$ , then the value of $ \vec{a}X\vec{b} $ is			
	a) 20 b) 16 c) 12 d) 8			
	ii) The value of p if $(2\hat{i}+6\hat{j}+27\hat{k})X(\hat{i}-3\hat{j}+p\hat{k})=\vec{0}$ , is			
	a) $\frac{27}{6}$ b) $\frac{81}{2}$ c) $\frac{27}{2}$ d)0			
	iii) The area of a parallelogram having diagonals $3\hat{i}+\hat{j}-2\hat{k}$ and $\hat{i}-3\hat{j}+4\hat{k}$ is			
	a) $\sqrt{3}$ sq. units b) 5 sq. units c) $5\sqrt{3}$ sq. units d) $\sqrt{300}$ sq. units			
	iv) The unit vector perpendicular to the vectors $\hat{i}+\hat{j}$ and $\hat{i}-\hat{j}$ forming a right-handed system is			
	a) $\hat{\mathbf{k}}$ b) $\hat{\mathbf{k}}$ c) $\frac{\hat{\mathbf{l}}-\hat{\mathbf{j}}}{\sqrt{2}}$			
	v) Given $ \vec{a} =3$ , $ \vec{b} =\frac{\sqrt{2}}{3}$ , then $\vec{a}X\vec{b}$ is a unit vector, if the angle between $\vec{a}$ and $\vec{b}$ is			
	a) $\frac{\pi}{c}$ b) $\frac{\pi}{c}$ c) $\frac{\pi}{c}$ d) $\frac{\pi}{c}$			
12	A quantity that has magnitude as well as direction is called a Vector. The quantities like velocity and displacement are the vector quantities.			
	A girl, at a point Walks 6 km towards East to reach at a point A.She then walks 4 km in a direction 30 <sup>0</sup>			
	west of north and stop at a point B. Thus, the vector $\overrightarrow{OB}$ represents the displacement of the girl from			
	the initial point A to the terminal point B.			
	Let the direction towards East is represented by positive X-axis and the direction towards North is represented by positive Y-axis, with O as origin Based on this information , answer the following questions:			
	<ul> <li>(i) Vector OA given by</li> <li>(a) 6î +4 ĵ</li> <li>(b) 6î - 4 ĵ</li> <li>(c) 6î</li> <li>(d) -6î</li> </ul>			
	(ii) Vector $\overrightarrow{AB}$ given by (a) -4cos cos60 <sup>0</sup> $\hat{i}$ + 60 <sup>0</sup> $\hat{j}$ (b) 4cos cos60 <sup>0</sup> $\hat{i}$ + 60 <sup>0</sup> $\hat{j}$ (c) -4cos cos30 <sup>0</sup> $\hat{i}$ + 30 <sup>0</sup> $\hat{j}$ (d) 4cos cos30 <sup>0</sup> $\hat{i}$ + 30 <sup>0</sup> $\hat{j}$			
	(iii) Vector $\overrightarrow{OB}$ given by (a) $\overrightarrow{OA} + \overrightarrow{AB}$ (b) $\overrightarrow{OA} + \overrightarrow{BA}$ (c) $\overrightarrow{AB} + \overrightarrow{AO}$ (d) $\overrightarrow{BA} + \overrightarrow{AO}$			
	(iv) The displacement $\overrightarrow{OB}$ , in terms of its components is			

	(a) $-4\hat{i} + 2\sqrt{3}\hat{j}$			
	(b)) $4\hat{i} + 2\sqrt{3}\hat{j}$			
	(c)) $8\hat{i} + 2\sqrt{3}\hat{j}$			
	(d) $8\hat{i} - 2\sqrt{3}\hat{i}$			
	(u) 51 2 V 5 j			
	(v) The distance OB (in km) is			
	(a) $2\sqrt{7}$			
	(b) $2\sqrt{19}$			
	$(0) 2 \sqrt{17}$			
	(d) 2			
13	In the figure, an electric circuit is shown:			
	B A			
	▲			
	E			
	F G			
	D			
	Using the circuit, answer the following questions:			
	(i) Which two vectors are equal vectors?			
	(a) ABand CD			
	(b) BCand DE			
	(c) EFand FG			
	(d) None			
	(ii) Which two vectors are like vectors?			
	(a) ABand DC			
	(b) ABand EF			
	(c) $\overrightarrow{\text{EF}}$ and $\overrightarrow{\text{FG}}$			
	(d) $\overrightarrow{BC}$ and $\overrightarrow{CD}$			
	(d) Beand CD			
	(iii) Which of the following is a negative sector of $\overrightarrow{FF}$ ?			
	(iii) which of the following is a negative sector of EF?			
	(c)EG			
	(d)DC			
	(iv)Which two vectors are parallel vectors?			
	(a)BC and ED			
	(b)AB and BC			
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## **ANSWERS**

Case Study Questions			
1	(i)	a	
	(ii)	C	
	(iii)	C	
	(iv)	d	
2	(i)	(c)	
	(ii)	(c)	
	(iii)	(b)	
	(iv)	(d)	
	(v)	(b)	
3	(i)	(b)	
	(11)	(a)	
	(111)	(b)	
	(IV)	(a) (b)	
1	(V)	( b)	
4	1-C, 2 h		
	2-0, 3-b		
	3-b, 4-d		
	5		
5	1-a,		
	2-a,		
	3-b,		
	4-c.		
6	(i)	(c)	
	(ii)	(b)	
	(11)		
	(iii)	(d)	
	(iv)	(b)	
	(v)	(b)	

7	(i) (a)
	(ii) (a)
	(iv) (b)
	(v) (d)
8	(i) (b)
	(ii) (a)
	(iii) (b)
	(iv) (c)
	(v) (d)
9	(i) (a)
	(ii) (c)
	(iii) (c)
	(iv) (d)
	(v) (b)
10	(i) b
	(ii) a
	(iii) a
	(iv) a
	(v) b
11	(i) b
	(ii) c
	(iii) c
	(iv) a
	(v) b
12	(i) c
	(ii) a (iii) a
	(iv) a
	(v) c
13	(i) d (ii) b
	(iii) C
	(iv) a

	(v)		
14	(i)		
	(ii)		
	(iii)		
	(iv)		
	(v)		
15	(i)		
	(ii)		
	(iii)		
	(iv)		
	(v)		
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