CHAPTER – 10

VECTORS

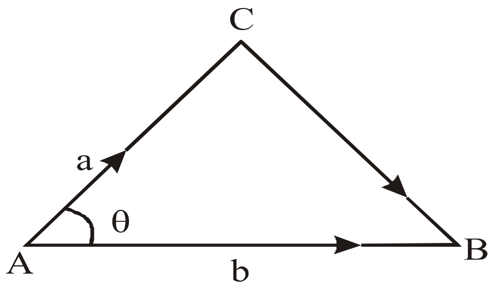
ASSERTION & REASONING QUESTIONS

SL NO	QUESTIONS
	Assertion (A):…………………………………………… Reason (R) : …………………………………………… (a) Both Assertion and reason are true and reason is correct explanation of assertion. (b) Assertion and reason both are true but reason is not the correct explanation of assertion. (c) Assertion is true, reason is false. (d) Assertion is false, reason is true.
1	Assertion: $\vec{a} \times \vec{b}$ is perpendicular to both $\vec{a}+\vec{b}$ and $\vec{a}-\vec{b}$. Reason: Both $\vec{a}+\vec{b}$ and $\vec{a}-\vec{b}$ lie in the plane containing $\vec{a}$ and $\vec{b}$ But $\vec{a} \times \vec{b}$ is perpendicular to plane containing $\vec{a}$ and $\vec{b}$.
2	Assertion: If $\vec{a}+\vec{b} = \vec{a}-\vec{b}$ then angle between $\vec{a}$ and $\vec{b}$ is 90^0. Reason: $\vec{a}+\vec{b} = \vec{b}+\vec{a}$
3	Assertion: Negative acceleration of a body is associated with slowing down of a body. Reason: Acceleration is a vector quantity.
4	Assertion: If θ is the angle between $\vec{a}$ and $\vec{b}$ then $\tan\theta = \frac{\vec{a}\times\vec{b}}{\vec{a}.\vec{b}}$ Reason: $\vec{a} \times \vec{b}$ is perpendicular to $\vec{a}$ and $\vec{b}$
5	Assertion: Angle between $\hat{i}+\hat{j}$ and $\hat{i}$ is 45^0. Reason: $\hat{i}+\hat{j}$ is equally inclined to both $\hat{i}$ and $\hat{j}$.
6	Assertion: Two vectors are said to be like vectors if they have the same direction but different magnitude. Reason: Vector quantities do not have a specific direction.
7	Assertion: $\vec{A}\times\vec{B}$ is perpendicular to both $\vec{A}+\vec{B}$ as well as $\vec{A}-\vec{B}$. Reason : $\vec{A}+\vec{B}$ as well as $\vec{A}-\vec{B}$ lie in the plane containing $\vec{A}$ and $\vec{B}$, but $\vec{A}\times\vec{B}$ lies perpendicular to the plane containing $\vec{A}$ and $\vec{B}$.

8	Assertion :The position of a particle in a rectangular coordinate system is(3,2,5).then its position vector be $2\hat{i}+5\hat{j}+3\hat{k}$ Reason : The displacement vector of the particle that moves from point P(2,3,5) to the point Q(3,4,5) is $\hat{i}+\hat{j}$
9	Assertion: The sum of two vectors can be zero. Reason: The vector cancel each other, when they are equal and opposite.
10	Assertion: The minimum number of non-coplanar vectors whose sum can be zero, is four. Reason: The resultant of two vectors of unequal magnitude can be zero.
11	Assertion: $20 m/s^2$ is a vector quantity Reason : A quantity that has magnitude as well as direction is called a vector.
12	Assertion:Work Done is Scalar quantity. Reason: A quantity that has direction only is called a scalar.
13	Assertion : The vector $\vec{a}=\hat{\imath}+\hat{\jmath}-\hat{k}$ and $\vec{b}=\hat{\imath}-\hat{\jmath}+\hat{k}$are perpendicular to each other. Reason :Two nonzero vectors$\vec{a}$and $\vec{b}$,are perpendicular to each other if and only if $\vec{a}.\vec{b}=0$
14	Assertion :If θ = π then$\vec{a}.\vec{b}=-\|\vec{a}\|\ \|\vec{b}\|$ Reason : If θ = 0 then$\vec{a}.\vec{b}=\|\vec{a}\|\ \|\vec{b}\|$
15	Assertion : Area of a parallelogram whose adjacent sides are given by the vectors $\vec{a}=\widehat{3\imath}+\hat{\jmath}+4\hat{k}$ and$\vec{b}=\hat{\imath}-\hat{\jmath}+\hat{k}$ is $\sqrt{42}$. Reason : If$\vec{a}$and $\vec{b}$ represent the adjacent sides of a parallelogram, then its area is $\left\|\vec{a}\times\vec{b}\right\|$
16	Assertion : Two vectors $\hat{\imath}+\hat{\jmath}$ and $\hat{\imath}-\hat{\jmath}$are perpendicular. Reason: Two vectors are perpendicular if their scaler product is zero.
17	Assertion : Projection of the vector $\hat{\imath}-\hat{\jmath}$ on the vector $\hat{\imath}+\hat{\jmath}$is zero. Reason : If two vectors are parallel then the projection of one on other is zero.
18	Assertion: For any two vectors $\vec{a}$ and $\vec{b}$, $\|\vec{a}+\vec{b}\| \leq \|\vec{a}\|+\|\vec{b}\|$. Reason : In a triangle sum of any two sides is always greater than or equal to third side.
19	Assertion : The area of parallelogram with diagonals $\hat{\imath}$ and $\hat{\jmath}$ is zero.

	Reason : The area of parallelogram with diagonals $\vec{a}$ and $\vec{b}$ is $\frac{1}{2}$ $\lvert \vec{a} \times \vec{b} \rvert$.
20	Assertion : For unit vectors $\hat{i}$, $\hat{j}$ and $\hat{k}$, $\hat{i} \times \hat{j} = \hat{k}$. Reason : For unit vectors $\hat{i}$, $\hat{j}$ and $\hat{k}$, $\hat{i} \cdot \hat{j} = 0$.
21	Assertion the direction of cosines of vector A= 2i + 4j -5k are $\frac{2}{\sqrt{45}}, \frac{4}{\sqrt{45}}, \frac{-5}{\sqrt{45}}$. Reason: A vector having zero magnitude and arbitrary direction is called zero vector or null vector
22	Assertion: the vectors which can undergo parallel displacement without changing its magnitude and direction are called free vectors Reason: $\vec{a}.(\vec{b}+\vec{c})=\vec{a}.\vec{b}+\vec{a}.\vec{c}$
23	Assertion: The area of parallelogram with diagonals $\vec{a}$ and $\vec{b}$ is $\frac{1}{2}\lvert\vec{a}x\vec{b}\rvert$ Reason: If $\vec{a}$ and $\vec{b}$ represent the adjacent sides of a triangle, then the area of triangle can be obtained by evaluating $\frac{1}{2}\lvert\vec{a}x\vec{b}\rvert$
24	Assertion: For any two vectors $\vec{a}$ and $\vec{b}$ we always have $\lvert\vec{a}+\vec{b}\rvert \le \lvert\vec{a}\rvert + \lvert\vec{b}\rvert$ Reason: For the given inequality holds trivially when either $\vec{a}$=0 or $\vec{b}=0$ that is in such a case $\lvert\vec{a}+\vec{b}\rvert=0=\lvert\vec{a}\rvert+\lvert\vec{b}\rvert$
25	Assertion: The angle between two vectors $\vec{a}$and$\vec{b}$ with magnitude 1 and 2 respectively and when $\lvert\vec{a}X\vec{b}\rvert=\sqrt{3}$ is $\frac{\pi}{3}$. Reason: $\vec{a}X\vec{b}$ is a vector quantity, whose magnitude is $\lvert\vec{a}X\vec{b}\rvert=\lvert\vec{a}\rvert\lvert\vec{b}\rvert\sin\theta$.
26	Assertion: If for three non-zero vectors $\vec{a}, \vec{b}$,and$\vec{c}$, $\vec{a}.\vec{b}=\vec{a}.\ \vec{c}$ and $\vec{a}X\vec{b}=\vec{a}X\vec{c}$,then$\vec{b}=\vec{c}$. Reason: $\vec{a}$ can not be parallel and perpendicular to $(\vec{b}-\vec{c})$ simultaneously.
27	Assertion: The area of parallelogram having diagonals $3\hat{i}+\hat{j}-2\hat{k}$ and $\hat{i}-3\hat{j}+4\hat{k}$ is 10 sq. units. Reason: If d1 and d2 are diagonals of parallelogram then area of parallelogram is $\frac{1}{2}\lvert\widehat{d_1}X\widehat{d_2}\rvert$.
28	Assertion: If $\vec{a}, \vec{b}, \vec{c}$ are mutually perpendicular vectors of equal magnitudes, then vector $\vec{a}+\vec{b}+\vec{c}$ is equally inclined to $\vec{a}, \vec{b}, \overrightarrow{\text{and} c}$. Reason: $\vec{a}, \vec{b}, \vec{c}$can be taken along sides of a cube then $\vec{a}+\vec{b}+\vec{c}$ is along diagonals of the cube.
29	Assertion: If vectors $\vec{a}= 2\hat{i}+2\hat{j}+3\hat{k}$ and $\vec{b}=-\hat{i}+2\hat{j}+\hat{k}$ and $\vec{c}= 3\hat{i}+\hat{j}$ are such that $\vec{a}X\lambda\vec{b} \perp$ to$\vec{c}$

	Reason: If $\vec{a} \perp \vec{b}$, then $\vec{a}.\vec{b} =$ a 1a2+b1b2+c1c2. =0.
30	**Assertion :** The projection of the vector $a = 2\hat{i} + 3\hat{j} + 2\hat{k}$ on the vector $\vec{b} = \hat{i} + 2\hat{j} + \hat{k}$ is $\frac{5}{3}\sqrt{6}$. **Reason** The projection of vector a on vector b is $\frac{1}{\lvert a \rvert}(a.b)$.
31	**Assertion :** If $\left(\vec{a} \times \vec{b}\right)^2 + \left(\vec{a}.\vec{b}\right)^2 = 144$ and $\left\lvert\vec{a}\right\rvert = 4$,then $\left\lvert\vec{b}\right\rvert = 9$. **Reason :** If $\vec{a}$ and $\vec{b}$ are any two vectors, then $\left(\vec{a} \times \vec{b}\right)^2$ is equal to $\left(\vec{a}\right)^2\left(\vec{b}\right)^2 - \left(\vec{a}.\vec{b}\right)^2$
32	**Assertion :** The adjacent sides of a parallelogram are along $\vec{a} = \hat{i} + 2\hat{j}$ and $\vec{b} = 2\hat{i} + \hat{j}$. The angle between the diagonal is 150°. **Reason :** Two vectors are perpendicular to each other if their dot product is zero.
33	**Assertion :** $\bar{a} = i + pj + 2k$ and $\bar{b} = 2i + 3j + qk$ are parallel vectors if $p = \frac{3}{2}, q = 4$ **Reason:** If $\vec{a} = a_1\hat{i} + a_2\hat{j} + a_3\hat{k}$ and $\vec{b} = b_1\hat{i} + b_2\hat{j} + b_3\hat{k}$ are parallel $\frac{a_1}{b_1} = \frac{a_2}{b_2} = \frac{a_3}{b_3}$

34	Consider the shown figure.  **Assertion :** If a and b represent the adjacent sides of a triangle as shown, then its area is $\frac{1}{2}\lvert a \times b \rvert$ **Reason :** Area of $\Delta ABC = \frac{1}{2}\lvert b \rvert \lvert a \rvert \sin\theta$ where, θ is the angle between the adjacent sides a and b (as shown).
35	Assertion(A) The position vector of a point say P(x,y,z) is $\overrightarrow{OP} = \vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$ and its magnitude is $\lvert\vec{r}\rvert = \sqrt{x^2 + y^2 + z^2}$. Reason (R) if $\vec{r} = x\hat{\mathbf{i}} + \mathbf{y}\hat{\mathbf{j}} + \mathbf{z}\hat{\mathbf{k}}$, then coefficient of $\hat{\mathbf{i}}, \hat{\mathbf{j}}, \hat{\mathbf{k}}$ in $\vec{\mathbf{r}}$i.e. x,y,z are called the direction ratios of vector $\vec{\mathbf{r}}$.

ANSWERS	
Q.No.	Answer
1	A
2	B
3	B
4	D
5	A
6	C
7	A
8	D
9	A
10	C
11	A
12	C
13	D
14	B
15	A
16	A

17	C
18	A
19	D
20	B
21	B
22	B
23	C
24	A
25	A
26	A
27	D
28	A
29	B
30	C
31	D
32	D
33	B
34	A
35	B

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