4. ADDITION OF VECTORS

(2 x 2) + (1 x 4) = 8 Marks

IMP FORMULAS, KEY CONCEPTS

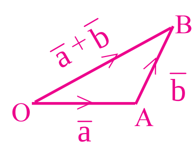
1) **Position vector of a point:** If P(x, y, z) is a point in space then the PV of P w.r.t O in the component form is $\overline{OP}=\overline{r}=x\overline{i}+y\overline{j}+z\overline{k}$. Its length is $|\overline{OP}|=|\overline{r}|=\sqrt{x^2+y^2+z^2}$

2) **Direction Cosines:** If α,β,γ are the angles made by the vector $\overline{OP}=\overline{r}=x\overline{i}+y\overline{j}+z\overline{k}$ then the direction cosines of the vector $\overline{r}$ are $l=\cos\alpha=\frac{x}{|\overline{r}|}, m=\cos\beta=\frac{y}{|\overline{r}|}, n=\cos\gamma=\frac{z}{|\overline{r}|}$

3) The unit vector in the direction of the non-zero vector $\overline{a}$ is $\hat{a}=\frac{\overline{a}}{|\overline{a}|}$

4.1) **Section formula:** The PV of C collinear with A,B dividing the line segment joining $A(\overline{a}), B(\overline{b})$ in the ratio m : n is $\overline{OC}=\frac{m\overline{b}+n\overline{a}}{m+n}$

4.2) The P.V of the mid point of line segment joining $A(\overline{a}), B(\overline{b})$ is $\frac{\overline{a}+\overline{b}}{2}$



5) **Triangle Law:** In ΔOAB, $\overline{OA}+\overline{AB}=\overline{OB}\Rightarrow\overline{AB}=\overline{OB}-\overline{OA}$

6.1) If $\overline{a}=t\overline{b}, t\in R$ then $\overline{a}, \overline{b}$ are collinear vectors.

6.2) The points $A(\overline{a}), B(\overline{b}), C(\overline{c})$ are collinear $\Leftrightarrow$ the vectors $\overline{AB}, \overline{AC}$, are collinear.

7.1) The points $A(\overline{a}), B(\overline{b}), C(\overline{c}), D(\overline{d})$ are coplanar $\Leftrightarrow$ the vectors $\overline{AB}, \overline{AC}, \overline{AD}$ are coplanar.

7.2) If $\overline{a}=a_1\overline{i}+a_2\overline{j}+a_3\overline{k}, \overline{b}=b_1\overline{i}+b_2\overline{j}+b_3\overline{k}, \overline{c}=c_1\overline{i}+c_2\overline{j}+c_3\overline{k}$ are coplanar then $\begin{vmatrix}a_1 & a_2 & a_3\\ b_1 & b_2 & b_3\\ c_1 & c_2 & c_3\end{vmatrix}=0$

8.1) The vector equation of the line passing through the point $A(\overline{a})$ and parallel to the vector $\overline{b}$ is $\overline{r}=\overline{a}+t\overline{b}, t\in R$.

8.2) The vector equation of the line passing through the points $A(\overline{a}), B(\overline{b})$ is $\overline{r}=(1-t)\overline{a}+t\overline{b}; t\in R$

9.1) The vector equation of the plane passing through the points $A(\overline{a}), B(\overline{b}), C(\overline{c})$ is $\overline{r}=(1-s-t)\overline{a}+t\overline{b}+s\overline{c};\quad t,s\in R$

9.2) The vector equation of the plane passing through the points $A(\overline{a}), B(\overline{b})$ and parallel to the vector $\overline{c}$ is $\overline{r}=(1-t)\overline{a}+t\overline{b}+s\overline{c};\quad t,s\in R$

9.3) The vector equation of the plane passing through the point $A(\overline{a})$ and parallel to the vectors $\overline{b}, \overline{c}$ is $\overline{r}=\overline{a}+t\overline{b}+s\overline{c};\quad t,s\in R$

BULLET MASTER'S

MATH BEATS!

Vector ⇒ రామబాణం

Vectors ⇒ $\bar{a}, \bar{b}, \bar{c}, \bar{r}, \ldots . \bar{i}, \bar{j}, \bar{k}, \ldots . \overline{OA}, \overline{OB}, \overline{OC}, \overline{OR}, \ldots . \overline{AB}, \overline{PQ}, \ldots ., \bar{s}, \bar{v}, \bar{a}, \bar{F}$ (in Physics),....

Vectors ⇒ Should satisfy Triangle Law of Addition of Vectors.

Light Rays and **Electric Current** have both Magnitude and Direction

but they don't obey Triangle Law. So, they are not Vectors but are Tensors.