

Let  $a = 3i + 2j + 2k$  and  $b = i + 2j - 2k$  be two vectors. If a vector perpendicular to both the vectors  $\vec{a} + \vec{b}$  and  $\vec{a} - \vec{b}$  has the magnitude 12 then one such vector is :

(1)  $4(2\hat{i} + 2\hat{j} + 2\hat{k})$

(2)  $4(2\hat{i} - 2\hat{j} - \hat{k})$

(3)  $4(2\hat{i} + 2\hat{j} - \hat{k})$

(4)  $4(-2\hat{i} - 2\hat{j} + \hat{k})$

Ans  $\vec{a} = 3\hat{i} + 2\hat{j} + 2\hat{k}$  ,  $\vec{b} = \hat{i} + 2\hat{j} - 2\hat{k}$

$$\vec{a} + \vec{b} = 4\hat{i} + 4\hat{j}$$

$$\vec{a} - \vec{b} = 2\hat{i} + 4\hat{k}$$

Vector  $\perp$  to both vectors are  $(\vec{a} + \vec{b}) \times (\vec{a} - \vec{b})$

$$= (4\hat{i} + 4\hat{j}) \times (2\hat{i} + 4\hat{k})$$

$$= -8\hat{j} - 8\hat{k} + 16\hat{i}$$

$$= 4 [ 4\hat{i} - 2\hat{j} - 2\hat{k} ]$$