Ques: Find a unit vector that makes an angle of 90°,135°,45° with positive X,Y and Z axis respectively.

Soln: Given,
$\alpha = 90°$,
$\beta = 135°$,
$\gamma = 45°$

i.e l=cos90°=0, m=cos135°= $\frac{-1}{\sqrt{2}}$, $n = cos45° = \frac{1}{\sqrt{2}}$

$$\implies \begin{bmatrix} 0 \\ \frac{-1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} \end{bmatrix} \tag{1}$$

Also,we know that,

$\tilde{\mathbf{a}} = \frac{\tilde{\mathbf{a}}}{\|\mathbf{a}\|}$

$$\|\mathbf{a}\| = \sqrt{0^2 + (\tfrac{-1}{\sqrt{2}})^2 + (\tfrac{1}{\sqrt{2}})^2} \tag{2}$$

$$\implies \quad \|\mathbf{a}\| = 1$$

Hence,from equation(1)and(2) we have the unit vector: $\tilde{\mathbf{a}} = \begin{bmatrix} \mathbf{0} \\ \frac{\mathbf{-1}}{\sqrt{\mathbf{2}}} \\ \frac{\mathbf{1}}{\sqrt{\mathbf{2}}} \end{bmatrix}$