# 2.8.15

EE25BTECH11032 - Kartik Lahoti

*Question:*

Find the position vector of a point **A** in space such that **OA** is inclined at 60° with **OX** and 45° to **OY** and $\left|\mathbf{OA}\right|$ = 10units.

**Solution:**

*Given :* Let $\mathbf{A} - \mathbf{O}$ be represented as $\mathbf{R}$

$$\|\mathbf{R}\| = 10 \text{ , Angle with } x\text{-axis} = 60° \text{ and } y\text{-axis } = 45° \tag{0.1}$$

$$\mathbf{R} = \|\mathbf{R}\| \, \mathbf{m} \tag{0.2}$$

where, let $\mathbf{m}$ be the unit vector in direction of $\mathbf{R}$.

$$\mathbf{m} = \begin{pmatrix} \cos(60°) \\ \cos(45°) \\ m_3 \end{pmatrix} \tag{0.3}$$

$$\mathbf{m}^\top \mathbf{m} = 1 \tag{0.4}$$

$$\cos^2(60°) + \cos^2(45°) + m_3^2 = 1 \tag{0.5}$$

$$m_3 = \pm\frac{1}{2} \tag{0.6}$$

$$\therefore \mathbf{R} = 10 \begin{pmatrix} \frac{1}{2} \\ \frac{1}{\sqrt{2}} \\ \pm\frac{1}{2} \end{pmatrix} \tag{0.7}$$

Hence ,

$$\mathbf{A}_1 = \begin{pmatrix} 5 \\ 5\sqrt{2} \\ +5 \end{pmatrix} \text{ and } \mathbf{A}_2 = \begin{pmatrix} 5 \\ 5\sqrt{2} \\ -5 \end{pmatrix} \tag{0.8}$$

are the position vector for point **A**

Fig:2.8.15



- O : ORIGIN

$A_1$
(5.0, 7.1, 5.0)

$A_2$
(5.0, 7.1, -5.0)

O

z

y

x