Question: 12.10.5.11

Nikam Pratik Balasaheb (EE21BTECH11037)

1 Problem

Show that direction cosines of a vector equally inclined to axes **OX**, **OY** and **OZ** are $\pm\begin{pmatrix}\frac{1}{\sqrt{3}}\\ \frac{1}{\sqrt{3}}\\ \frac{1}{\sqrt{3}}\end{pmatrix}$

2 Solution

The vector is equally inclined to the axes **OX**, **OY** and **OZ**. Let the angle be θ.

Direction cosines,

$$\mathbf{m} = \begin{pmatrix}\cos\theta_1\\ \cos\theta_2\\ \cos\theta_3\end{pmatrix} = \begin{pmatrix}\cos\theta\\ \cos\theta\\ \cos\theta\end{pmatrix} \tag{2.0.1}$$

we know that

$$\|\mathbf{m}\| = 1 \tag{2.0.2}$$

$$\left|\sqrt{3}\cos\theta\right| = 1 \tag{2.0.3}$$

$$\cos\theta = \pm\frac{1}{\sqrt{3}} \tag{2.0.4}$$

$$\mathbf{m} = \pm\begin{pmatrix}\frac{1}{\sqrt{3}}\\ \frac{1}{\sqrt{3}}\\ \frac{1}{\sqrt{3}}\end{pmatrix} \tag{2.0.5}$$