# 1.11.3

## AI25BTECH11001 - ABHISEK MOHAPATRA

**Question**:
If a line makes 60° and 45° angles with the positive directions of the X axis and Z axis respectively, then find the angle that it makes with the positive direction of the Y-axis. Hence, write the direction cosines of the lines.

**Solution:** From the given information,angles made with positive direction of X and Z axis are 45° and 60° respectively.

So, as we know,

$$cos^2(\alpha) + cos^2(\beta) + cos^2(\gamma) = 1 \tag{1}$$

Where $\alpha, \beta, \gamma$ are angles with the positive direction of X,Y,Z axes respectively.

Putting the values,

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

$$\Rightarrow (\frac{1}{\sqrt{2}})^2 + (\frac{1}{2})^2 + cos^2(\gamma) = 1 \tag{3}$$

$$\Rightarrow (\frac{1}{2}) + (\frac{1}{4}) + cos^2(\gamma) = 1 \tag{4}$$

$$\Rightarrow cos^2(\gamma) = \frac{1}{4} \tag{5}$$

Rejecting the negative vales as we want the smaller angle,

$$\Rightarrow cos(\gamma) = \frac{1}{2} \tag{6}$$

$$\Rightarrow \gamma = 60° \tag{7}$$

Therefore the angle with Y axis is 60°. And the direction cosines of the line is

$$\frac{1}{2} : \frac{1}{2} : \frac{1}{\sqrt{2}} \tag{8}$$