

## QUESTION : 1.4.2

ROLL NO:EE22BTECH11027

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1.4.2. Find the intersection **O** of perpendicular bisectors of **AB** and **AC**.

**Solution:** let us first write the equation of perpendicular bisectors:

from equation 1.4.1.1 we have the equation of perpendicular bisector of a line **BC** as,

$$\left(\mathbf{x} - \frac{\mathbf{B} + \mathbf{C}}{2}\right)(\mathbf{B} - \mathbf{C}) = 0 \quad (1)$$

From equation 1 we have:

1) Equation of perpendicular bisector of **AB**:

$$\mathbf{x} \begin{pmatrix} 5 & -7 \end{pmatrix} = -25 \quad (2)$$

2) Equation of perpendicular bisector of **AC**:

$$\mathbf{x} \begin{pmatrix} 4 & 4 \end{pmatrix} = -16 \quad (3)$$

let us write equations 2 and 3 in augmented matrix form:

Coefficient matrix,

$$\mathbf{A} = \begin{pmatrix} 5 & -7 \\ 4 & 4 \end{pmatrix} \quad (4)$$

Constant matrix,

$$\mathbf{D} = \begin{pmatrix} -25 \\ -16 \end{pmatrix} \quad (5)$$

$$\mathbf{AD} = \begin{pmatrix} 5 & -7 & -25 \\ 4 & 4 & -16 \end{pmatrix} \quad (6)$$

$$R_2 \leftrightarrow R_2 - \frac{1}{5}R_1$$

$$\mathbf{AD} = \begin{pmatrix} 5 & -7 & -25 \\ 0 & \frac{12}{5} & 1 \end{pmatrix} \quad (7)$$

$$R_1 \leftrightarrow R_1 + \frac{35}{12}R_2$$

$$\mathbf{AD} = \begin{pmatrix} 5 & 0 & \frac{-265}{12} \\ 0 & 7 & \frac{35}{12} \end{pmatrix} \quad (8)$$

Therefore, we get:

$$\mathbf{O} = \begin{pmatrix} \frac{-53}{12} \\ \frac{5}{12} \end{pmatrix} \quad (9)$$