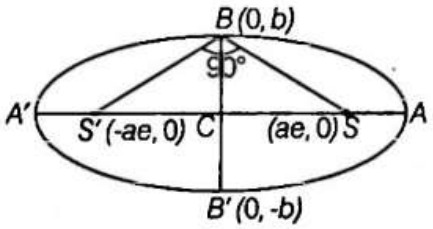
Question: - If the angle between the straight lines joining foci and the ends of the minor axis of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$, is 90°. Find its eccentricity.

Sol. The equation of the ellipse is $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$

Let $a > b$



$\therefore$ The ends of minor axis are $B(0, b)$ and $B'(0, -b)$. If the eccentricity of the ellipse is e, then the foci are $S(ae, 0)$ and $S'(-ae, 0)$

$$\therefore \quad \text{Slope of } BS \text{ is } m_1 = \frac{b-0}{0-ae} = -\frac{b}{ae}$$

$$\text{and slope of } BS' \text{ is } \quad m_2 = \frac{b-0}{0+ae} = \frac{b}{ae}$$

$\because$ The angle between BS and BS' is 90°,

$$\therefore \quad m_1 m_2 = -1$$

$$\Rightarrow \quad -\frac{b}{ae} \times \frac{b}{ae} = -1$$

$$\Rightarrow \quad b^2 = a^2 e^2$$

$$a^2(1-e^2) = a^2 e^2$$

$$\Rightarrow \quad 1 - e^2 = e^2$$

$$\Rightarrow \quad 2e^2 = 1$$

$$\therefore \quad e = \frac{1}{\sqrt{2}}$$