Question1

The distance between the foci of a hyperbola is 16 and its eccentricity is $\sqrt{2}$. Its equation is

KCET 2023

Options:

A. $\frac{x^2}{4} - \frac{y^2}{9} = 1$

B. $2x^2 - 3y^2 = 7$

C. $y^2 - x^2 = 32$

D. $x^2 - y^2 = 32$

Answer: D

Solution:

Given, distance between the foci $= 16$ and

$$e = \sqrt{2}$$
$$2ae = 16$$
$$ae = 8$$
$$\Rightarrow \quad a = \frac{8}{\sqrt{2}} = 4\sqrt{2}$$

So,

$$b^2 = a^2 \left(e^2 - 1\right)$$
$$b^2 = 32(2-1) = 32$$

Equation of hyperbola is

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$$

$$\frac{x^2}{32} - \frac{y^2}{32} = 1$$

$$\Rightarrow \quad x^2 - y^2 = 32$$

Question2

The distance between the foci of a hyperbola is 16 and its eccentricity is $\sqrt{2}$. Its equation is

KCET 2018

Options:

A. $x^2 - y^2 = 32$

B. $2x^2 - 3y^2 = 7$

C. $\frac{x^2}{4} - \frac{y^2}{9} = 1$

D. $y^2 - x^2 = 32$

Answer: A

Solution:

Given, distance between the foci of hyperbola is 16.

$\therefore \quad 2ae = 16$

and eccentricity $(e) = \sqrt{2}$

From Eqs. (i) and (ii), we get

$a = 4\sqrt{2}$

We know that in hyperbola,

$$(ae)^2 = a^2 + b^2$$
$$\Rightarrow \quad (8)^2 = 32 + b^2$$
$$\Rightarrow \quad b^2 = 32$$

$\therefore$ Equation of hyperbola is

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$$

$$\Rightarrow \quad \frac{x^2}{32} - \frac{y^2}{32} = 1$$

$$\Rightarrow \quad x^2 - y^2 = 32$$