Past Year JEE Questions

Questions

Quetion: 01

A hyperbola having the transverse axis of length $\sqrt{2}$ has the same foci as that of the ellipse $3x^2 + 4y^2 = 12$, then this hyperbola does not pass through which of the following points ?

A. $\left(1, -\frac{1}{\sqrt{2}}\right)$

B. $\left(\sqrt{\frac{3}{2}}, \frac{1}{\sqrt{2}}\right)$

C. $\left(-\sqrt{\frac{3}{2}}, 1\right)$

D. $\left(\frac{1}{\sqrt{2}}, 0\right)$

Solutions

Solution: 01

Explanation

Ellipse : $\frac{x^2}{4} + \frac{y^2}{3} = 1$

eccentricity = $\sqrt{1 - \frac{3}{4}} = \frac{1}{2}$

∴ foci = $(\pm 1, 0)$

for hyperbola, given $2a = \sqrt{2} \Rightarrow a = \frac{1}{\sqrt{2}}$

∴ hyperbola will be

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

eccentricity = $\sqrt{1 + 2b^2}$

∴ foci = $\left(\pm\sqrt{\frac{1+2b^2}{2}}, 0\right)$

∵ Ellipse and hyperbola have same foci

$\Rightarrow \sqrt{\frac{1+2b^2}{2}} = 1$

$\Rightarrow b^2 = \frac{1}{2}$

∴ Equation of hyperbola : $\frac{x^2}{1/2} - \frac{y^2}{1/2} = 1$

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

Clearly $\left(\sqrt{\frac{3}{2}}, \frac{1}{\sqrt{2}}\right)$ does not lie on it.