GATE 2023 EC

EE23BTECH11023-ABHIGNYA GOGULA

Question28:
The Fourier transform $X(\omega)$ of $x(t) = e^{-t^2}$ is
Note: $\int_{-\infty}^{\infty} e^{-y^2}\, dy = \sqrt{\pi}$
A) $\sqrt{\pi} e^{\frac{\omega^2}{2}}$
B) $\frac{e^{\frac{-\omega^2}{4}}}{2\sqrt{\pi}}$
C) $\sqrt{\pi} e^{\frac{-\omega^2}{4}}$
D) $\sqrt{\pi} e^{\frac{-\omega^2}{2}}$
Gate 2023 EC Question 28
Solution

$$x'(t) = -2te^{-t^2} \tag{1}$$
$$x'(t) = -2tx(t) \tag{2}$$

doing fourier transform

$$j\omega X(\omega) = -2j\frac{dX(\omega)}{d\omega} \tag{3}$$
$$\int_0^{\omega} \frac{dX(\omega)}{X(\omega)} = \int_0^{\omega} \frac{\omega d\omega}{-2} \tag{4}$$
$$\frac{X(\omega)}{X(0)} = e^{\frac{-\omega^2}{4}} \tag{5}$$
$$X(0) = \int_{-\infty}^{\infty} x(t)\, dt = \sqrt{\pi} \tag{6}$$
$$X(\omega) = \sqrt{\pi} e^{\frac{-\omega^2}{4}} \tag{7}$$