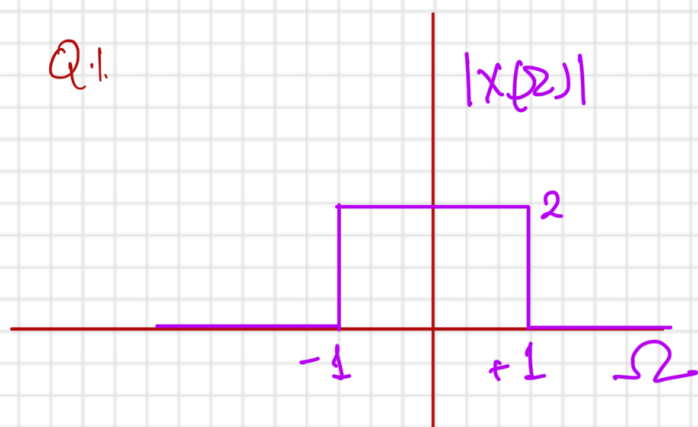


Q.1.



Magnitude Spectrum of a Fourier Transform is given in the figure.

Find $\int_{-\infty}^{\infty} |x(t)|^2 dt$

Hint: Use Parseval's relationship.

Solution

From Parseval's relation:

$$\frac{1}{2\pi} \int_{-\infty}^{\infty} |X(\Omega)|^2 d\Omega = \int_{-\infty}^{\infty} |x(t)|^2 dt$$

$$\Rightarrow \text{L.H.S} = \frac{1}{2\pi} \int_{-\infty}^{\infty} |2|^2 d\Omega$$

$$= \frac{1}{2\pi} \int_{-1}^1 4 \cdot d\Omega$$

$$= \frac{1}{2\pi} 4 \cdot \Omega \Big|_{-1}^1$$

$$= \frac{1}{2\pi} 4(1 - (-1)) = \frac{1}{2\pi} \times 4 \times 2$$

$$= \frac{4}{\pi} = \int_{-\infty}^{\infty} |x(t)|^2 dt$$

Hence $\int_{-\infty}^{\infty} |x(t)|^2 dt = \frac{4}{\pi}$