Answers for Case Study Questions :

$x(t)$
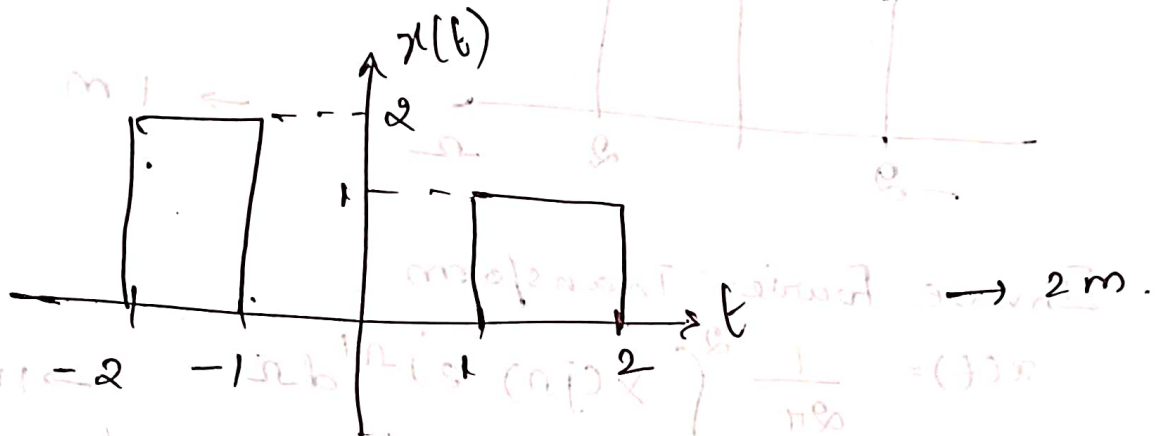
$$x(t) = 2\Pi\left(t + \frac{3}{2}\right) + \Pi\left(t - \frac{3}{2}\right)$$

$$F[\Pi(t)] = \text{sinc}\frac{\Omega}{2}$$

Using time - shifting pty

$$F\left[\Pi\left(t + \frac{3}{2}\right)\right] = e^{j(\frac{3}{2})\Omega} \cdot \text{sinc}\frac{\Omega}{2}$$

Similarly

$$F\left[\Pi\left(t - \frac{3}{2}\right)\right] = e^{-j\frac{3\Omega}{2}} \text{sinc}\frac{\Omega}{2}$$

$$F[x(t)] = X(j\Omega) = 2e^{j\frac{3}{2}\Omega}\text{sinc}\frac{\Omega}{2} + e^{-j\frac{3}{2}\Omega}\text{sinc}\frac{\Omega}{2}$$

$$\boxed{X(j\Omega) = 2e^{j\frac{3}{2}\Omega}\text{sinc}\frac{\Omega}{2} + e^{-j\frac{3}{2}\Omega}\text{sinc}\frac{\Omega}{2}}$$

→ 2 m.

→ 2 m.

→ 6 m

$|X(j\Omega)|$

-2 2 Ω
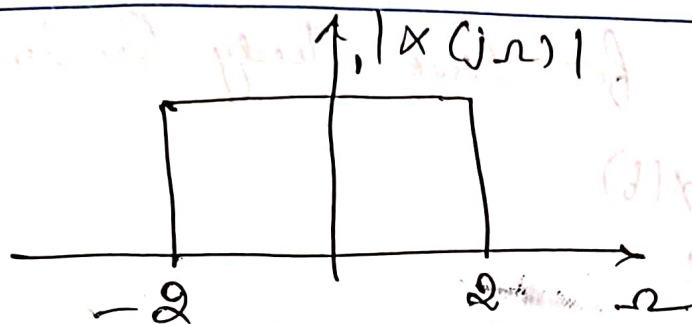
$\rightarrow 1m$

Inverse Fourier Transform.

$$x(t) = \frac{1}{2\pi} \int_{-2}^{2} X(j\Omega)\, e^{j\Omega t}\, d\Omega \qquad \rightarrow 1m$$

$$\Rightarrow \frac{1}{2\pi j t}\left[1 e^{j\Omega t}\right]_{-2}^{2} = \frac{1}{2\pi j t}\left[e^{j2t} - e^{-j2t}\right. \qquad$$

$$= \frac{1}{\pi t}\,\sin 2t \qquad \left[\frac{e^{j\theta} - e^{-j\theta}}{2j} = \sin\theta \right]$$

$$\boxed{x(t) = \frac{1}{\pi t}\,(\sin 2t)}$$

$\rightarrow 3m$