

$$m(t) = \begin{cases} \frac{1}{\varepsilon} & |t| \leq 1 \\ 0 & |t| > 1 \end{cases}$$

سوال 1

2.  $x(j\omega)$  (الف)

①  $m_1(t) = \begin{cases} 1 & |t| < T_1 \\ 0 & |t| > T_1 \end{cases} \xrightarrow{F} X_1(j\omega) = \frac{\sin \omega T_1}{\omega}$

②  $m_2(t) \xrightarrow{F} j \frac{d}{d\omega} X_1(j\omega)$   $T_1 = 1$  ب. (ب)

$$m(t) = \underbrace{\begin{cases} \frac{1}{\varepsilon} & |t| \leq 1 \\ 0 & |t| > 1 \end{cases}}_{\frac{1}{\varepsilon} m_1(t)} + \underbrace{\begin{cases} \frac{1}{\tau} & |t| \leq 1 \\ 0 & |t| > 1 \end{cases}}_{\frac{1}{\tau} m_2(t)}$$

$$\rightarrow m(t) = \frac{1}{\varepsilon} m_1(t) + \frac{1}{\tau} m_2(t) \rightarrow$$

$$X(j\omega) = \frac{1}{\varepsilon} \int_{-\infty}^{\infty} \frac{d}{d\omega} \left( \frac{\sin \omega T_1}{\omega} \right) + \frac{1}{\tau} \frac{\sin \omega T_1}{\omega}$$

$$T_1 = 1 \rightarrow X(j\omega) = \frac{j}{\varepsilon} \frac{d}{d\omega} \left( \frac{\sin \omega}{\omega} \right) + \frac{\sin \omega}{\omega}$$

$$\frac{d}{d\omega} \left( \frac{\sin \omega}{\omega} \right) = \frac{\omega \cos \omega - \sin \omega}{\omega^2}$$

$$\rightarrow X(j\omega) = \frac{j}{\varepsilon} \left( \frac{\omega \cos \omega - \sin \omega}{\omega^2} \right) + \frac{\sin \omega}{\omega} \quad \text{جواب الف}$$

$$\text{Re}\{X(j\omega)\} = \frac{\sin \omega}{\omega}$$

2.  $x(j\omega)$  (ب. (ب))

$$m_e(t) = \frac{m(t) + m(-t)}{2} \rightarrow F\{m_e(t)\} = \frac{1}{2} F\{m(t)\} + \frac{1}{2} F\{m(-t)\}$$

$$F\{m(t)\} = \frac{\sin \omega}{\omega} + \frac{j}{\varepsilon} \left( \frac{\omega \cos \omega - \sin \omega}{\omega^2} \right)$$

$$F\{m(-t)\} = X(-j\omega) \quad \text{ب. time reversal}$$

→  $F\{m(-t)\} = \frac{\sin(-\omega)}{-\omega} + \frac{j}{\gamma} \frac{(-\omega \cos(-\omega) - \sin(-\omega))}{(-\omega)^2}$  ارادہ ہوا 7-ب

$\frac{-\sin \omega}{-\omega} + \frac{j}{\gamma} \frac{(-\omega \cos(\omega) + \sin(\omega))}{\omega^2} = \frac{\sin \omega}{\omega} + \frac{j}{\gamma} \frac{(-\omega \cos \omega + \sin \omega)}{\omega^2}$

→  $F\{m_e(t)\} = \frac{F\{m(t)\} + F\{m(-t)\}}{\gamma} =$

بند ہوا 7-ب  
سینال  $m(t)$

$\frac{\sin \omega}{\omega} + \frac{j}{\gamma} \frac{(\omega \cos \omega - \sin \omega)}{\omega^2} + \frac{\sin \omega}{\omega} + \frac{j}{\gamma} \frac{(-\omega \cos \omega + \sin \omega)}{\omega^2}$

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$\frac{\gamma \sin \omega}{\gamma} = \boxed{\frac{\sin \omega}{\omega}} \rightarrow \boxed{F\{m_e(t)\} = \text{Re}\{x(j\omega)\}}$

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$F\{m_o(t)\} = \text{Im}\{x(j\omega)\}$

(20) چون سینال حقیقی است ←  
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$\text{Im}\{x(j\omega)\} = \frac{1}{\gamma} \left( \frac{\omega \cos \omega - \sin \omega}{\omega^2} \right)$

جواب