

Date  
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Q.1) 1) Soln: Given, s/g is  $e^{-3t} \cos 4t u(t)$

$$\therefore X(\omega) = \int_{-\infty}^{\infty} [e^{-3t} \cos 4t u(t)] e^{-j\omega t} dt$$
$$= \int_0^{\infty} [e^{-3t} \cos 4t] e^{-j\omega t} dt$$

$$= \int_0^{\infty} e^{-3t} \cdot \frac{e^{j4t} + e^{-j4t}}{2} \cdot e^{-j\omega t} dt$$

$$= \frac{1}{2} \int_0^{\infty} e^{-3t} e^{j4t} \cdot e^{-j\omega t} dt + \frac{1}{2} \int_0^{\infty} e^{-3t} e^{-j4t} \cdot e^{-j\omega t} dt$$

$$= \frac{1}{2} \int_0^{\infty} e^{-3t+j4t-j\omega t} dt + \frac{1}{2} \int_0^{\infty} e^{-3t-j4t-j\omega t} dt$$
$$= \frac{1}{2} \left[ \frac{e^{-(3-j4+j\omega)t}}{-(3-j4+j\omega)} \right]_0^{\infty} + \frac{1}{2} \left[ \frac{e^{-(3+j4+j\omega)t}}{-(3+j4+j\omega)} \right]_0^{\infty}$$

$$= \frac{1}{2} \left[ \frac{1}{-(3-j4+j\omega)} + \frac{1}{-(3+j4+j\omega)} \right]$$

$$= \frac{1}{2} \left[ \frac{1}{3-j4+j\omega} + \frac{1}{3+j4+j\omega} \right]$$