یالطیف

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#3

الف) $x(t) = 1 + \underbrace{2\sin\left(\frac{2\pi}{3}t + \frac{\pi}{4}\right)}_{(I)} + \underbrace{\cos\left(\frac{8\pi}{15}t\right)}_{(II)}$

$(I)\quad \sin\left(\frac{2\pi}{3}t + \frac{\pi}{4}\right) = \sin\left(\frac{2\pi}{3}(t+T_1) + \frac{\pi}{4}\right) \Rightarrow \frac{2\pi}{3}T_1 = 2k\pi \Rightarrow T_1 = \frac{2k_1}{\frac{2}{3}} = 3k_1$

$(II):\quad \cos\left(\frac{8\pi}{15}t\right) = \cos\left(\frac{8\pi}{15}(t+T_2)\right) \Rightarrow \frac{8\pi}{15}T_2 = 2k\pi \Rightarrow T_2 = \frac{15}{4}k_2$

$\Rightarrow \text{Kmm}\left\{3, \frac{15}{4}\right\} = 60 = T \Rightarrow \omega_0 = \frac{2\pi}{60} = \frac{\pi}{30}$

$\Rightarrow \quad \sin\left(\frac{2\pi}{3}t + \frac{\pi}{4}\right) = \frac{1}{2j}\left(e^{j\frac{2\pi}{3}t} - e^{-j\frac{2\pi}{3}t}\right)$

$\cos\left(\frac{8\pi}{15}t\right) = \frac{1}{2}\left(e^{j\frac{8\pi}{15}} + e^{-j\frac{8\pi}{15}}\right) \Rightarrow \begin{cases} a_0 = 1 \\ a_1 = \frac{1}{2} = a_{-1} \end{cases}$