BSS

Q.1. Find the time domain signal whose Fourier series coefficient is given by,

$$C_n = j\delta(n-1) - j\delta(n+1) + \delta(n-3) + \delta(n+3), \quad \omega_0 = \pi.$$

⇒ We have,

$$x(t) = \sum_{n=-\infty}^{\infty} C_n e^{jn\omega_0 t}$$

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⇒ We have,

$$x(t) = \sum_{n=-\infty}^{\infty} C_n e^{jn\omega_0 t}$$

$$\Rightarrow x(t) = \sum_{n=-\infty}^{\infty} C_n e^{jn\pi t}$$

$$= je^{j\pi t} - je^{-j\pi t} + e^{j3\pi t} + e^{-j3\pi t}$$

$$= 2\cos 3\pi t - 2\sin \pi t$$

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Q2. Find the time domain s/g corresponding to

$$C_n = \left(-\frac{1}{2}\right)^{|n|} \quad ; \quad \omega_0 = 1$$

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Sol^n:-

$$x(t) = \sum_{n=-\infty}^{\infty} C_n e^{jn\omega_0 t}$$

$$\therefore x(t) = \sum_{n=-\infty}^{\infty} \left(-\tfrac{1}{2}\right)^{|n|} e^{jnt}$$

$$= \sum_{n=-\infty}^{-1} \left(-\tfrac{1}{2}\right)^{-n} e^{jnt} + \sum_{n=0}^{\infty} \left(-\tfrac{1}{2}\right)^{n} e^{jnt}$$

$$= \sum_{n=1}^{\infty} \left(-\tfrac{1}{2}\right)^{n} e^{-jnt} + \sum_{n=0}^{\infty} \left(-\tfrac{1}{2}\right)^{n} e^{jnt}$$

$$= \sum_{n=0}^{\infty} \left(-\tfrac{1}{2}\right)^{n} e^{-jnt} - \left[\left(-\tfrac{1}{2}\right)^{n} e^{-jnt}\right]_{n=0} + \sum_{n=0}^{\infty} \left(-\tfrac{1}{2}\right)^{n} e^{jnt}$$

$$= \frac{-(1/2)e^{-jt}}{1+(1/2)e^{-jt}} + \frac{1}{1+(1/2)e^{jt}}$$

$$= \frac{3/4}{(5/4) + \cos t}$$

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Q3. Find the complex exponential Fourier Series representation of the following signals:-

ⓐ $x(t) = 4\cos 2\omega_0 t$

ⓑ $x(t) = \cos^2 t$

ⓒ $x(t) = \sin\left(2t + \frac{\pi}{4}\right)$

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