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so many fake sites. this is the first one which worked! Many thanks

Chapter 2

2.1-1 Let us denote the signal in question by $x(t)$ and its energy by E_x . For parts (a) and (b)

$$E_x = \int_{-\infty}^{\infty} \cos^2 t \, dt = \frac{1}{2} \int_{-\infty}^{\infty} (1 + \cos 2t) \, dt = \frac{1}{2} \int_{-\infty}^{\infty} 1 \, dt + \frac{1}{2} \int_{-\infty}^{\infty} \cos 2t \, dt = \infty + 0 = \infty$$

(a) $E_x = \int_{-\infty}^{\infty} \cos^2 t \, dt = \frac{1}{2} \int_{-\infty}^{\infty} (1 + \cos 2t) \, dt = \frac{1}{2} \int_{-\infty}^{\infty} 1 \, dt + \frac{1}{2} \int_{-\infty}^{\infty} \cos 2t \, dt = \infty + 0 = \infty$

(b) $E_x = \int_{-\infty}^{\infty} (2 \cos^2 t - 1) \, dt = \int_{-\infty}^{\infty} (2 \cos^2 t - 1) \, dt = \int_{-\infty}^{\infty} (1 + \cos 2t - 1) \, dt = \int_{-\infty}^{\infty} \cos 2t \, dt = 0$

This change will also allow us to see when the signal energy is finite. Doubling the signal quadruples its energy. In the case we can show that the energy of $2x(t)$ is $4E_x$.

2.1-2 (a) $E_x = \int_{-\infty}^{\infty} (1/2)^{2t} \, dt = 2$ $E_y = \int_{-\infty}^{\infty} (1/2)^{4t} \, dt = 1$

Therefore $E_{2x} = E_x = 2$.

(b) If $x = \int_{-\infty}^{\infty} (1/2)^{2t} \, dt = 2$ $E_x = \int_{-\infty}^{\infty} (1/2)^{2t} \, dt = \int_{-\infty}^{\infty} (1/2)^{2t} \, dt = \int_{-\infty}^{\infty} (1/2)^{2t} \, dt = 2$

$E_{2x} = \int_{-\infty}^{\infty} (1/2)^{4t} \, dt = \int_{-\infty}^{\infty} (1/2)^{4t} \, dt = \int_{-\infty}^{\infty} (1/2)^{4t} \, dt = 1$

Similarly, we can show that $E_{x/2} = 4E_x$. Therefore $E_{2x} = E_x = 2$. We are tempted to conclude that $E_{2x} = E_x = 2$, in general. Let us see:

(c) $E_x = \int_{-\infty}^{\infty} (1/2)^{2t} \, dt = \int_{-\infty}^{\infty} (1/2)^{2t} \, dt = \int_{-\infty}^{\infty} (1/2)^{2t} \, dt = 2$

$E_{2x} = \int_{-\infty}^{\infty} (1/2)^{4t} \, dt = \int_{-\infty}^{\infty} (1/2)^{4t} \, dt = \int_{-\infty}^{\infty} (1/2)^{4t} \, dt = 1$

Therefore, in general, $E_{2x} \neq E_x = E_x$.

2.1-3 $E_x = \frac{1}{2} \int_{-\infty}^{\infty} \cos^2(\omega t + \phi) \, dt = \frac{1}{2} \int_{-\infty}^{\infty} (1 + \cos(2\omega t + 2\phi)) \, dt$

$$= \frac{1}{2} \int_{-\infty}^{\infty} 1 \, dt + \frac{1}{2} \int_{-\infty}^{\infty} \cos(2\omega t + 2\phi) \, dt = \frac{1}{2} \int_{-\infty}^{\infty} 1 \, dt + 0 = \frac{1}{2} \int_{-\infty}^{\infty} 1 \, dt = \infty$$

2.1-4 This problem is identical to Example 2.2b, except that $\omega_1 \neq \omega_2$. In this case the third integral in P_3 (see p. 19) is not zero. That integral is given by

$$I_3 = \int_{-\infty}^{\infty} \frac{\cos(\omega_1 t) \cos(\omega_2 t)}{2} \, dt = \frac{1}{2} \int_{-\infty}^{\infty} (\cos((\omega_1 + \omega_2)t) + \cos((\omega_1 - \omega_2)t)) \, dt$$
$$= \frac{1}{2} \int_{-\infty}^{\infty} \cos((\omega_1 + \omega_2)t) \, dt + \frac{1}{2} \int_{-\infty}^{\infty} \cos((\omega_1 - \omega_2)t) \, dt = 0 + \frac{1}{2} \int_{-\infty}^{\infty} \cos((\omega_1 - \omega_2)t) \, dt$$
$$= \frac{1}{2} \int_{-\infty}^{\infty} \cos((\omega_1 - \omega_2)t) \, dt = 0 \text{ if } \omega_1 \neq \omega_2$$

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