Parcial 1

1.

$$x(t) = 20\,\text{sen}(7t - \pi/2) - 3\cos(5t) + 2\cos(10t)$$
$$= 20(\text{Sen}(7t)\cos(\pi/2) - \text{Sen}(\pi/2)\cos(7t)) - 3\cos(5t) + 2\cos(10t)$$
$$= -20\cos(7t) - 3\cos(5t) + 2\cos(10t)$$

$$T_1 = \frac{2\pi}{\omega_1} = \frac{2\pi}{7} \qquad T_2 = \frac{2\pi}{\omega_2} = \frac{2\pi}{5} \qquad T_3 = \frac{2\pi}{\omega_3} = \frac{2\pi}{10}$$

Se debe hallar el mcm de los periodos T_1, T_2 y T_3 para hallar T_0

$$T_0 = kT_1 = lT_2 = mT_3$$

$$MCM\left(\frac{a}{b}, \frac{a}{c}, \frac{a}{d}\right) = \frac{a}{MCD(b,c,d)} =$$

$$MCM\left(\frac{2\pi}{7}, \frac{2\pi}{5}, \frac{2\pi}{10}\right) = \frac{2\pi}{MCD(7,5,10)} = \frac{2\pi}{1} = T_0$$

$$2\pi = k \cdot \frac{2\pi}{7} = l \cdot \frac{2\pi}{5} = m \cdot \frac{2\pi}{10} \rightarrow k \rightarrow, \; l = 5, \; m = 10$$

$$F_1 = \frac{1}{T_1} = \frac{7}{2\pi} = 1{,}11\,Hz \qquad F_2 = \frac{1}{T_2} = \frac{5}{2\pi} = 0{,}795\,Hz \qquad F_3 = \frac{1}{T_3} = \frac{10}{2\pi} = 1{,}59\,Hz$$

Para asegurar nyquist

$$F_s \geq 2F_{max} = 2 \cdot 1{,}59 = 3{,}18\,Hz$$