2) $F_s = 5 \text{ KHz}$ $X(t) = 3\cos(1000\pi t) + 5\sin(3000\pi$
$T = 1/f_s = \dfrac{1}{5000}$ $+ 10\cos(11000\pi t)$

$\omega_1 = 1000\pi$ $()$; $T_1 = 2\pi/\omega_1 = \dfrac{2\pi}{1000\pi} = 1/500$

$\omega_2 = 3000\pi$; $T_2 = 2\pi/\omega_2 = \dfrac{2\pi}{3000\pi} = 1/1500$

$\omega_3 = 11000\pi$; $T_3 = 2\pi/\omega_3 = \dfrac{2\pi}{11000\pi} = 1/5500$

$\dfrac{\omega_1}{\omega_2} = \dfrac{\frac{1}{500}}{\frac{1}{1500}} = \dfrac{1500}{500} = 1500 \in Q$

$\dfrac{\omega_1}{\omega_3} = \dfrac{5500}{500} \in Q$ $\dfrac{\omega_2}{\omega_3} = \dfrac{1500}{5500} \in Q$

$F_1 = 1/T_1 = \dfrac{1}{\frac{1}{500}} = 500 \text{ Hz}$ $F_2 = 1500 \text{ Hz}$

$F_3 = 5500 \text{ Hz}$

$F_s \geq 2 \max (f_1, f_2, f_3)$ $F_s \geq 2, 5500$

$\boxed{F_s \geq 11000 \text{ Hz}}$ alliasing

$$T = r\, T_1 = l\, T_2 = m\, T_3 = M\, CM\, (T_1, T_2, T_3)$$

$$T = r\, \tfrac{1}{500} = l\, \tfrac{1}{1500} = M = \tfrac{1}{5500}$$

$$5500\, T = r\, \frac{5500}{500} = l\, \frac{5500}{1500} = m\, r$$

$$5500\, T = r\, 11 = 0\, 11/3 = m,$$

$$16\, 500\, T = r\, 33 = l\, 11 = m\, 3$$

$$MCM\, (33, 11, 3) = 33 \quad r = 1 \quad m = 11 \quad l = 3$$

$$16\, 500\, T = 33$$

$$\boxed{T = \frac{33}{16500} = \frac{1}{500}\ (S)}$$