

4.2. $x_a(t) = \cos(2\pi f_1 t + \varphi_1) + \cos(2\pi f_2 t + \varphi_2)$, $f_1 = 2 \text{ kHz}$, $f_2 = 3 \text{ kHz}$.

(1) ~~$T_{s \min}$~~ $T_s \geq 2f = 2f_2 = 6 \text{ kHz}$.

$\therefore T_{s \min} = 6 \text{ kHz}$.

(2). $T_s = 10 \text{ kHz}$.

$w_{\text{hex}} = \frac{2\pi f_2}{T_s} = 0.6\pi \text{ rad}$

(3). $x(n) = x_a(t) \big|_{t=nT} = \cos(2\pi f_1 nT + \varphi_1) + \cos(2\pi f_2 nT + \varphi_2)$

$\therefore x(n) = \cos(0.4\pi n + \varphi_1) + \cos(0.6\pi n + \varphi_2)$

4.6

$f_r = 1 \text{ kHz}$, $F = 100 \text{ Hz}$.

(1). $T_{p \min} = \frac{1}{F} = \frac{1}{100} = 0.01 \text{ s}$.

(2) $T_{\text{hex}} = \frac{1}{2f_r} = \frac{1}{2000} = 0.0005 \text{ s}$

(3) $N_{\min} = \frac{T_{p \min}}{T_{\text{hex}}} = \frac{0.01}{0.0005} = 20$.