

$$1. f_s = 10000 \text{ Hz}, \Delta f \leq 10 \text{ Hz} \quad \therefore L \geq \frac{f_s}{\Delta f} = 1000$$

$$t = \frac{L}{f_s} = 0.1 \text{ s} \quad f \leq \frac{f_s}{2} = 5000 \text{ Hz}$$

$$2. (a) t = \frac{L}{f_s} = 3.2 \text{ ms}$$

$$(b) \text{采样后数字频率为 } \omega_0 = \frac{5 \text{ kHz}}{40 \text{ kHz}} \cdot 2\pi = \frac{\pi}{4}$$

$$\therefore \text{在 } \frac{\pi}{4} \text{ 与 } 2\pi - \frac{\pi}{4} = \frac{7\pi}{4} \text{ 处有局部峰值}$$

$$\text{换算成数字信号为 } \frac{\pi/4}{2\pi} \times 128 = 16 \text{ 与 } \frac{7\pi/4}{2\pi} \times 128 = 112$$

$$3. L = 10 \text{ kHz} \cdot 10 \text{ ms} = 100, \Delta \omega = \frac{2\pi}{L} = \frac{\pi}{50}$$

$$\Delta f = \Delta \omega \cdot \frac{f_s}{2\pi} = 100 \text{ Hz}$$

$$\therefore f_{\min}(f_2) = f_1 + \Delta f = 1100 \text{ Hz}$$

$$\max(f_2) = f_3 - \Delta f = 1900 \text{ Hz}$$