

# 模拟电子技术 CH06 作业

## 7.6.1 原图略

设运放反向输入端电位大小为  $V_-$

$$\therefore \begin{cases} V_{or} - V_- = R_f \cdot I_f = I_1 R_1 \\ I_f + I_1 = 100 \text{ nA} \end{cases}$$

$$\therefore \text{解得 } I_f = 25 \text{ nA} \quad I_1 = 75 \text{ nA} \quad V_- = -7.5 \text{ mV}$$

$$\therefore V_{or} = 0$$

$$\therefore \text{由运放特性可知 } V_+ = V_- = -7.5 \text{ mV}$$

$$\therefore 0 - V_- = I_{bp} R_2$$

$$\therefore R_2 = 93.75 \text{ k}\Omega$$

## 7.6.2

(1) 由图 a 易得  $V_- = V_+ = V_{GND} = 0$

$$\therefore I_1 = 0 \quad I_f = I_{Ib} = I_{bN} = 100 \text{ nA}$$

$$\therefore V_o = -I_f R_f = -100 \times 10^{-9} \times 10^6 = -0.1 \text{ V}$$

(2) 设运放反向输入端电压为  $V_-$ , 正向输入端电压为  $V_+$

$$\begin{cases} V_+ = V_- \\ I_{bp} = I_{bN} \\ V_- = -(R_1 // R_f) \cdot I_{bN} \\ V_+ = -I_{bp} R_2 \end{cases}$$

$$\text{解得 } R_2 = 90.9 \text{ k}\Omega$$

(3) 已知  $I_{BP} - I_{BN} = I_0 = 20\text{nA}$

$$I_{BP} = I_{B0} - \frac{I_0}{2} = 90\text{nA} \quad I_{BN} = I_{B0} + \frac{I_0}{2} = 110\text{nA}$$

$$\begin{cases} V_+ = -I_{BP} R_2 \\ V_- = V_0 \frac{R_1}{R_1 + R_f} - I_{BN} R_1 // R_f \end{cases}$$

$$V_+ = V_-$$

解得  $V_0 = -I_{B0} R_f = -20\text{mV}$

(4) 已知  $V_{I0} = 5\text{mV}$

$$\begin{cases} I_{BP} = I_{BN} = 100\text{nA} \end{cases}$$

$$V_+ = -I_{BP} R_2$$

$$V_- = V_0 \frac{R_1}{R_1 + R_f} - I_{BN} R_1 // R_f - V_{I0}$$

解得  $V_0 = \pm 55\text{mV}$

(5) 由叠加定理可知所述情况为上述两种情况的叠加

$$\therefore V_{I0} = V_{0(3)} + V_{0(4)} = (-20 \pm 55)\text{mV}$$