

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_-

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

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

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

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

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

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

7.6.2

(1) 由图 a 易得 $V_- = V_+ = V_{GND} = 0$

$$\therefore I_i = 0 \quad I_f = I_{IB} = I_{BN} = 100 \text{nA}$$

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

(2) 设运放反向输入端电压为 V_- , 正向输入端电压为 V_+

$$\begin{cases} V_+ = V_- \\ I_{op} = I_{BN} \\ V_- = -(R_2 // R_f) \cdot I_{BN} \\ V_+ = -I_{op} R_2 \end{cases} \quad \text{解得 } R_2 = 90 \text{k}\Omega$$

$$(3) \text{ 已知 } I_{BQ} - I_{BN} = I_o = 20\text{nA}$$

$$\begin{cases} I_{BQ} = I_{BQ} - \frac{I_{Io}}{2} = 90\text{nA} & I_{BN} = I_{BQ} + \frac{I_{Io}}{2} = 110\text{nA} \\ V_+ = -I_{BQ} R_2 & V_- = V_o \frac{R_1}{R_1 + R_f} - I_{BN} R_1 // R_f \\ V_+ = V_- \end{cases}$$

解得 $V_o = -I_{Io} R_f = -20\text{mV}$

$$(4) \text{ 已知 } V_{IO} = 5\text{mV}$$

$$\begin{cases} I_{BQ} = I_{BN} = 100\text{nA} \\ V_+ = -I_{BQ} R_2 \\ V_- = V_o \frac{R_1}{R_1 + R_f} - I_{BN} R_1 // R_f - V_{IO} \end{cases}$$

解得 $V_o = \pm 55\text{mV}$

(3)(4)

(5) 由叠加定理可知所述情况为上述两种情况的叠加

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