

國立宜蘭大學

102 學年度研究所碩士班考試入學

電子學試題

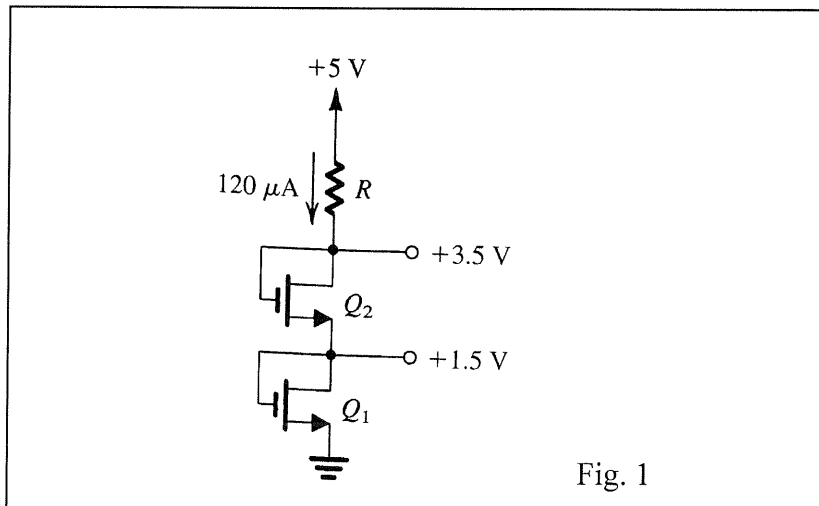
(電子工程學系碩士班)

准考證號碼：

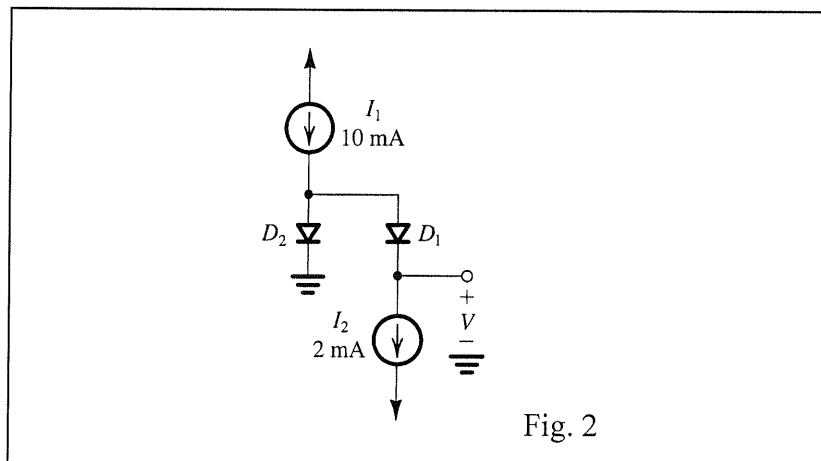
《作答注意事項》

1. 請先檢查准考證號碼、座位號碼及答案卷號碼是否相符。
2. 考試時間：100 分鐘。
3. 本試卷共有 7 題，共計 100 分。
4. 請將答案寫在答案卷上。
5. 考試中禁止使用大哥大或其他通信設備。
6. 考試後，請將試題卷及答案卷一併繳交。
7. 本試卷採雙面影印，請勿漏答。
8. 本考科可使用非程式型（不具備儲存程式功能）之電子計算機。

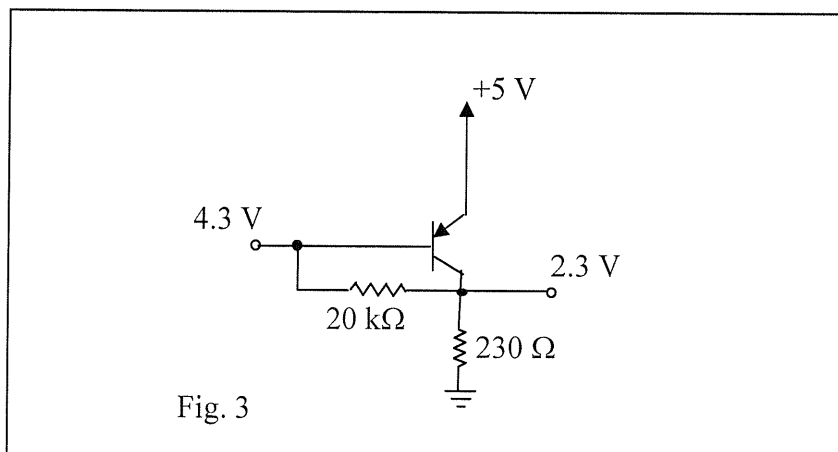
1. The NMOS transistors in the circuit of Fig. 1 have $V_t = 1\text{ V}$, $\mu C_{ox} = 120\ \mu\text{A}/\text{V}^2$, $\lambda = 0$, and $L_1 = L_2 = 1\ \mu\text{m}$. Find the required values of gate width for each of Q_1 and Q_2 . ($W_1 = ?\ \mu\text{m}$ (10%), $W_2 = ?\ \mu\text{m}$ (10%))



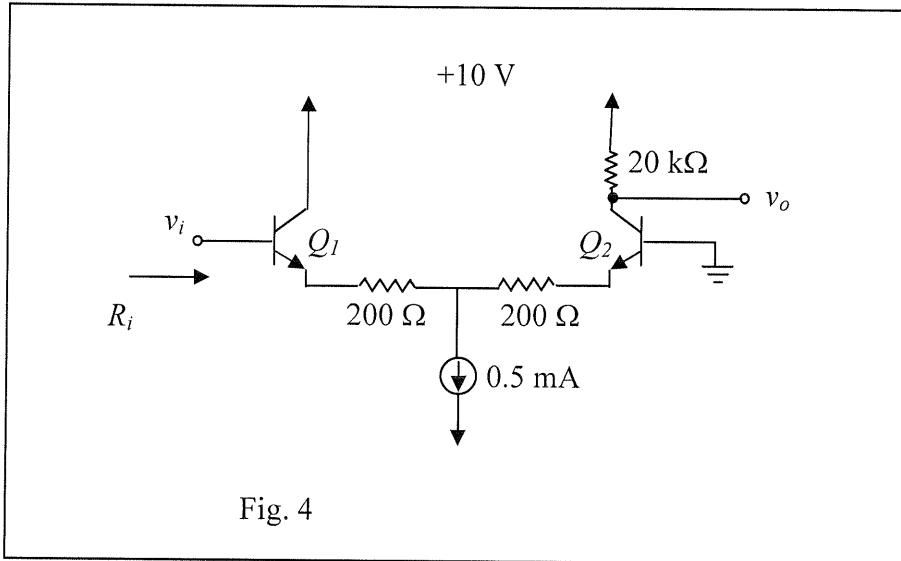
2. In the circuit shown in Fig. 2, both diodes have $n = 1$, but D_1 has 10 times the junction area of D_2 . What value of V results? (5%) To obtain a value of V of 50 mV, what current I_2 is needed? (5%)



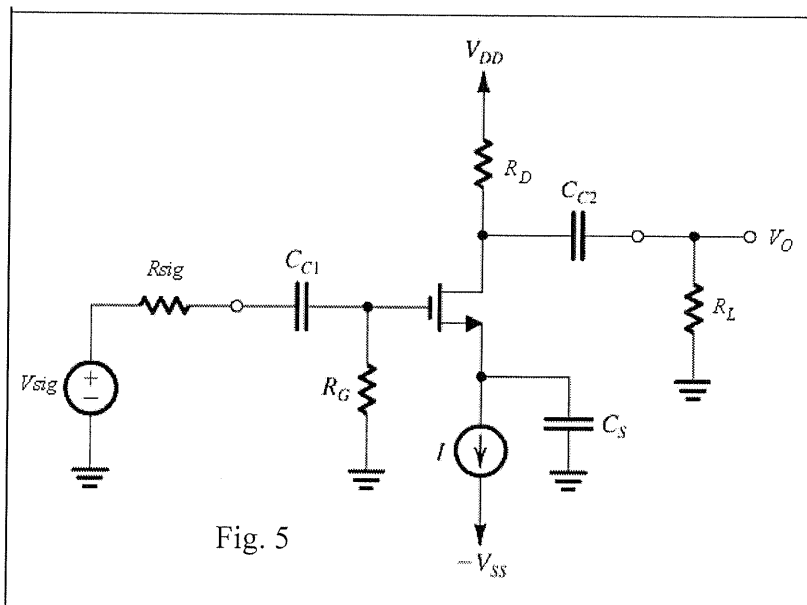
3. The measured voltages of the circuit are shown in Fig. 3. Find β . (10%)



4. Fig. 4 shows an amplifier with $r_e = 100 \Omega$ and $\beta = 100$.
- (a) voltage gain $v_o/v_i = ?$ (10%)
- (b) Input resistance $R_i = ? (\Omega)$ (10%)



5. Fig. 5 shows a common-source (CS) amplifier fed with a signal source having an internal resistance $R_{sig} = 100 \text{ k}\Omega$. The amplifier has $R_G = 4.7 \text{ M}\Omega$, $R_D = R_L = 15 \text{ k}\Omega$, $g_m = 1 \text{ mA/V}$, $r_o = 150 \text{ k}\Omega$, $C_{gs} = 1 \text{ pF}$ and $C_{gd} = 0.4 \text{ pF}$.
- (a) Midband gain $A_M = ?$ (10%)
- (b) Upper 3-dB frequency $f_H = ? (\text{Hz})$ (10%)



背面尚有試題

6. A series-shunt feedback amplifier employs a basic amplifier with input and output resistances each of $1\text{k}\Omega$ and gain $A = 2000\text{ V/V}$. The feedback factor $\beta = 0.1\text{ V/V}$. Find the input resistance R_{if} . (10%)
7. Fig. 6 shows a circuit for generating a constant current $I_o = 10\ \mu\text{A}$. Q_1 and Q_2 are matched devices. Given $I_{REF} = 1\text{ mA}$ and $V_{BE1} = 0.7\text{ V}$. You may neglect the base current. Find R_3 . (10%)

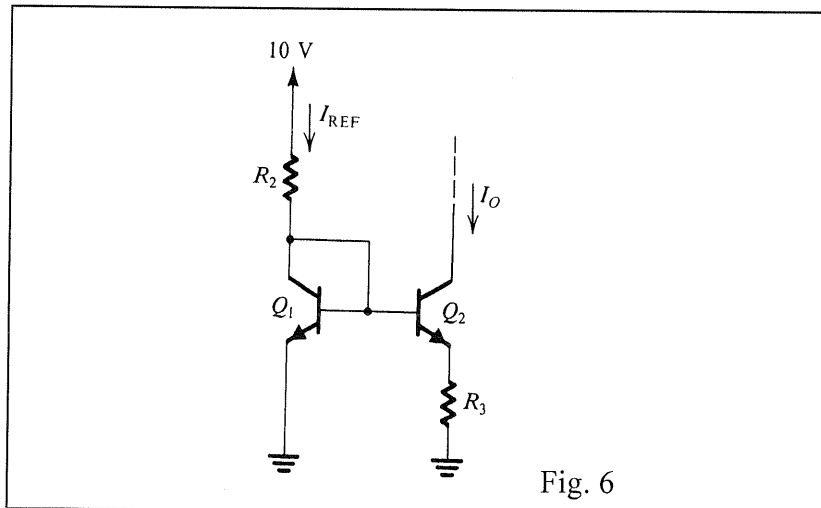


Fig. 6