

國立臺北科技大學 102 學年度碩士班招生考試

系所組別：2240 電腦與通訊研究所丁組

第二節 電子學 試題

第一頁 共二頁

注意事項：

1. 本試題共六題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. Figure 1 shows a common-source MOSFET amplifier. The transistor has $V_t = 1.5\text{V}$, $\mu_n C_{ox}(W/L) = 0.25\text{mA/V}^2$, $V_A = 50\text{V}$. Assume the coupling capacitors to be sufficiently large so as to act as short circuits at the signal frequencies of interest. Please analyze this amplifier circuit to determine its small-signal voltage gain v_o/v_i . (15%)

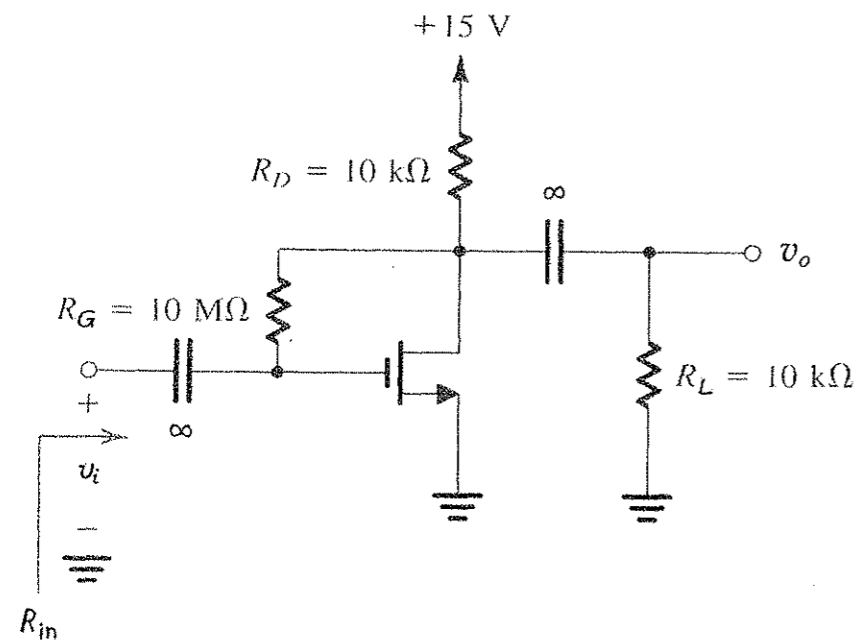


Figure 1

2. Please synthesize and plot the CMOS circuit of the logic function $Y = \overline{A(B + CD)}$. (15%)

3. The astable multivibrator using the 555 IC is shown in figure 3, please find its period T , which is equal to $T_H + T_L$. (15%)

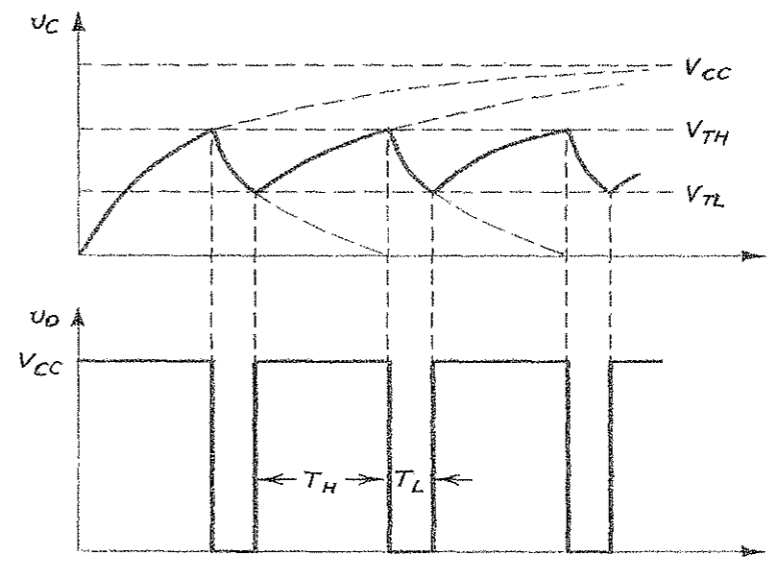
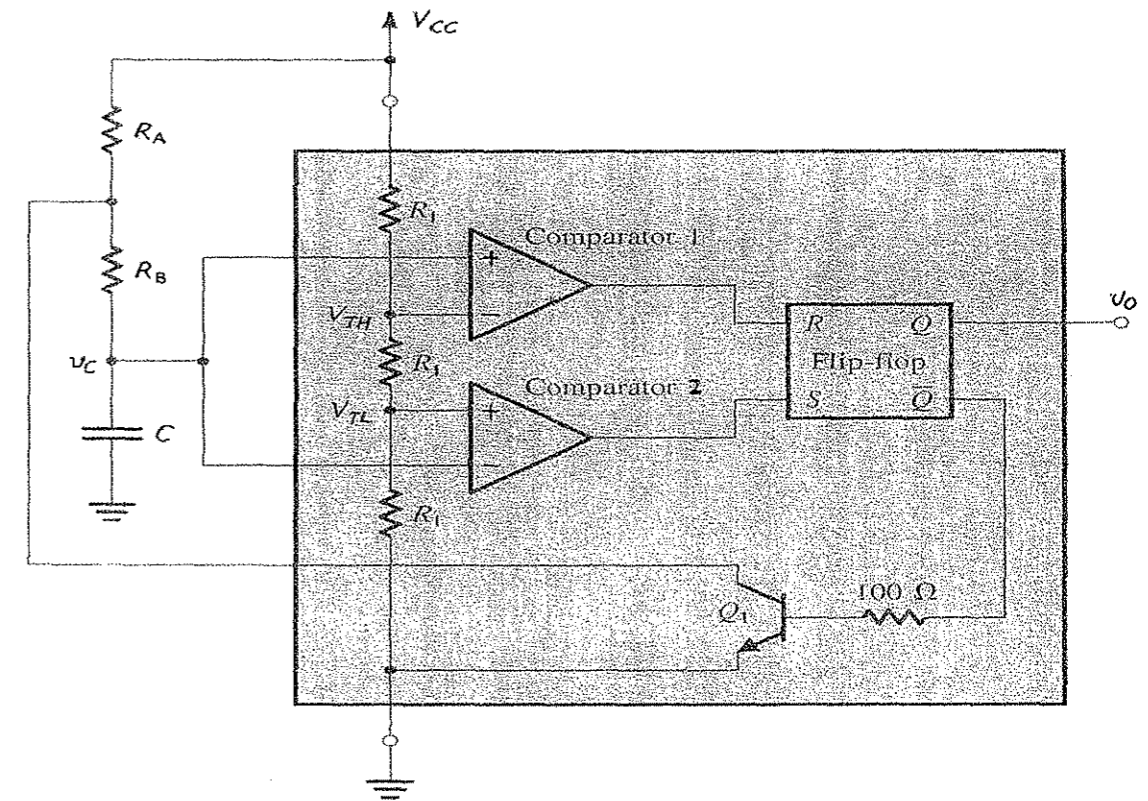


Figure 3

注意：背面尚有試題

4. For the circuit of figure 4, assume that the β of the BJT transistors is equal to 100, please find

- (1). the voltage gain $v_{od}/v_{sig} = ?$ (10%)
- (2). the input resistance $R_{id} = ?$ (5%)

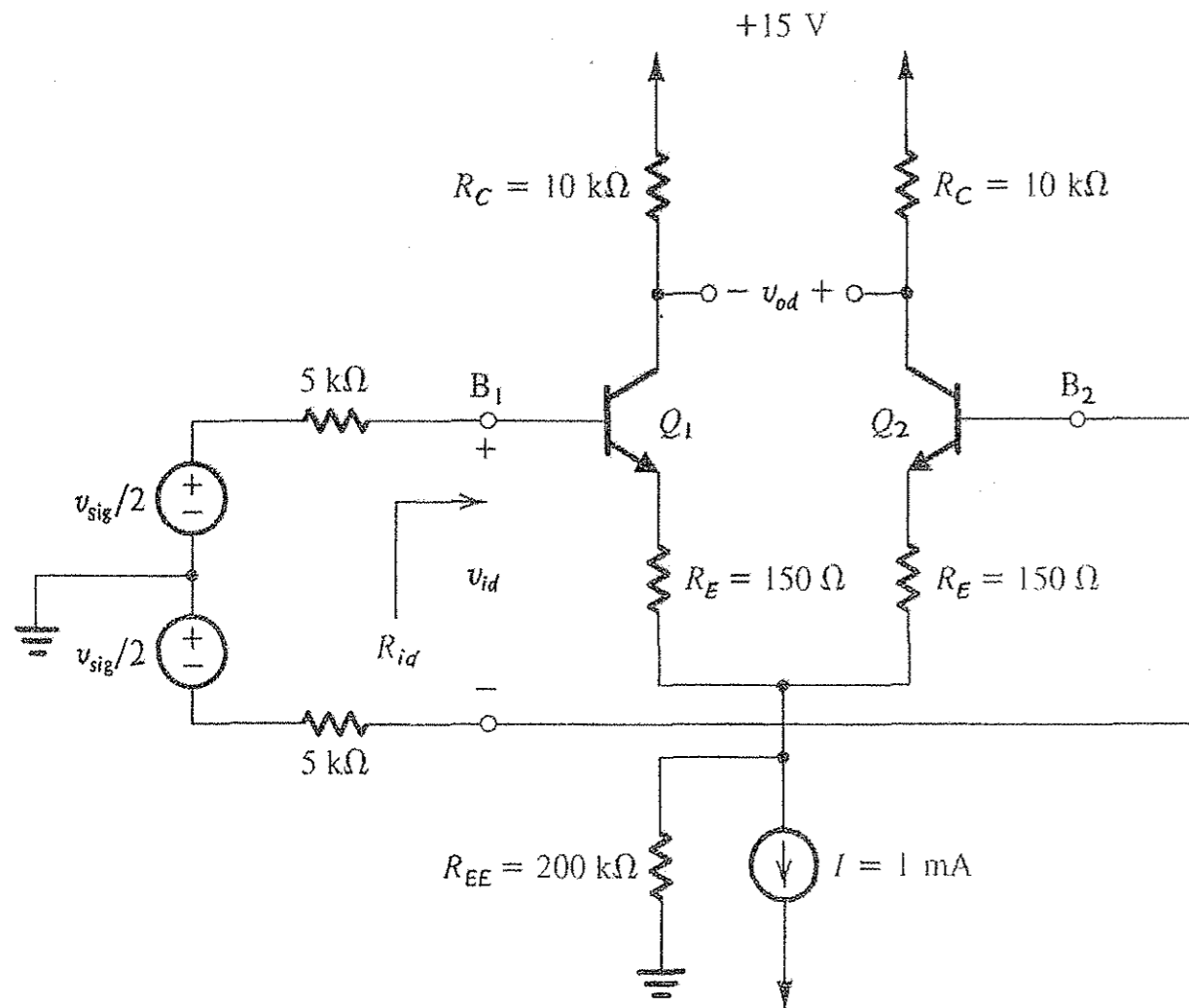


Figure 4

5. As shown in figure 5, the circuit is a CMOS inverter, the relationship of Q_N and Q_P can be described as $\mu_n C_{ox} \left(\frac{W_N}{L_N} \right) = \mu_p C_{ox} \left(\frac{W_P}{L_P} \right)$, $V_{tn} = |V_{tp}| = V_t$. Please find the noise margins NM_H and NM_L . (20%)

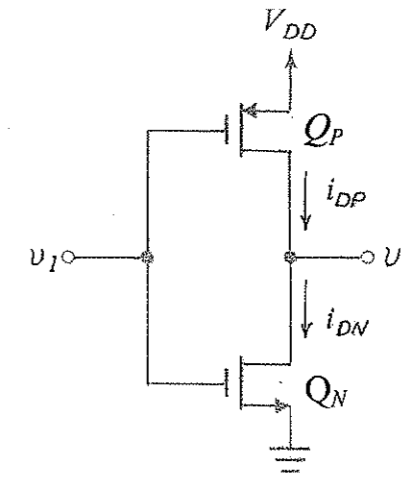


Figure 5

6. For the circuit shown in figure 6, if the parameters $\beta = 100$, $V_{BE} = 0.7V$, small-signal output resistance $r_o = \infty$, please find:

- (1) the voltage gain $\frac{V_o}{V_s} = ?$ (10%)
- (2) the input resistance $R_{in} = ?$ (5%)
- (3) the output resistance $R_{out} = ?$ (5%)

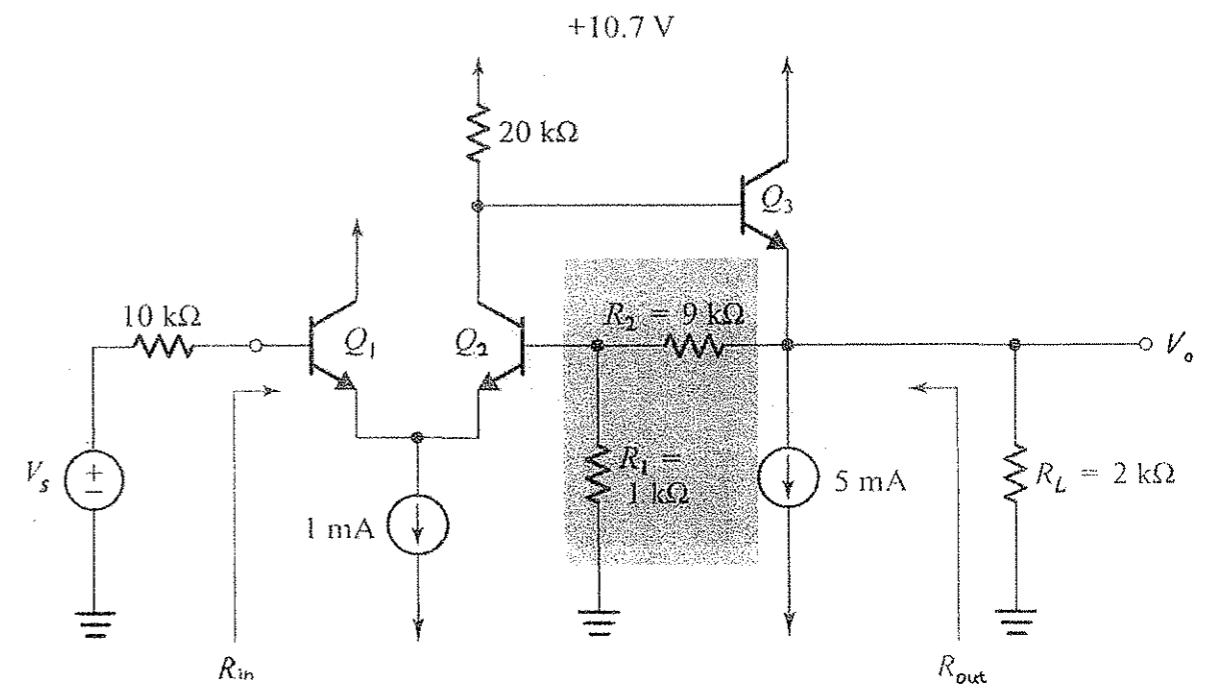


Figure 6