

國立臺北科技大學 111 學年度碩士班招生考試

系所組別：2401 光電工程系碩士班

第二節 電子學 試題 (選考)

第 1 頁 共 2 頁

注意事項：

1. 本試題共六題，共 100 分。
2. 不必抄題，作答時請將試題題號及答案依照順序寫在答案卷上。
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. (15%) The circuit in Figure 1 is an instrumentation amplifier. Derive the expression of (1) v_m/v_i (6%); (2) v_o/v_m (6%); (3) v_o/v_i (3%).

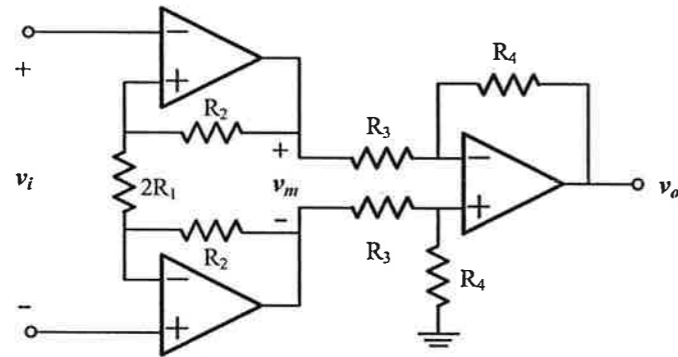


Figure 1

2. (15%) The amplifier circuit in Figure 2 consists of two bipolar junction transistors with $V_{BE}=0.7$ volt and $\beta=100$. Please determine the voltage V_{B1} (3%), V_{C1} (2%), V_{E2} (2%), V_{C2} (2%) and the current I_{B1} (3%), I_{B2} (3%).

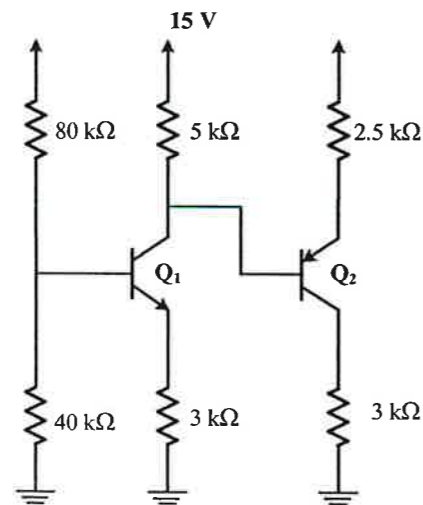


Figure 2

3. (15%) Figure 3 shows the MOS cascode amplifier circuit. Consider the effect of r_{o1} and r_{o2} . Please find (1) the transconductance (6%); (2) output resistance (6%); (3) open-circuit voltage gain (3%).

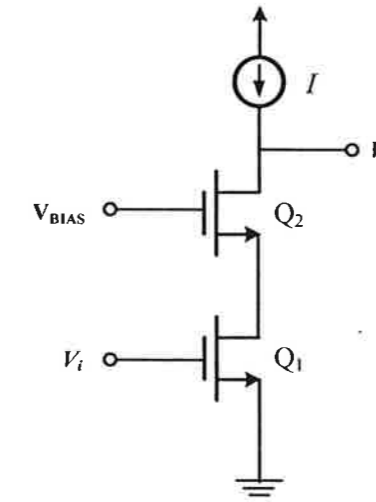


Figure 3

4. (15%) The amplifier circuit in Figure 4 consists of two transistors with $\beta=100$. Ignore the r_o effect. Find the simplified small-signal equivalent circuit (3%), the input resistance R_{in} (6%), and the overall voltage gain G_v (6%).

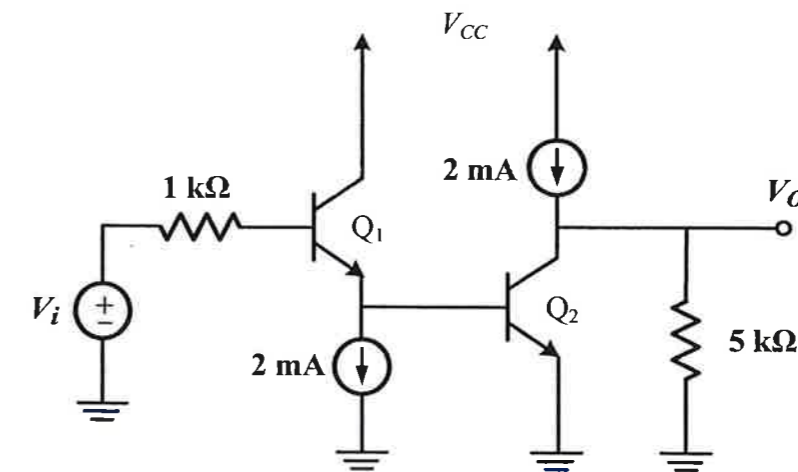


Figure 4

注意：背面尚有試題

5. (20%) The differential amplifier shown in Fig. 5 has the transistors with $\beta=100$ and $V_A=100$ V. Find the differential gain (5%), the input resistance (5%), the common-mode gain (5%), and the common-mode input resistance (5%).

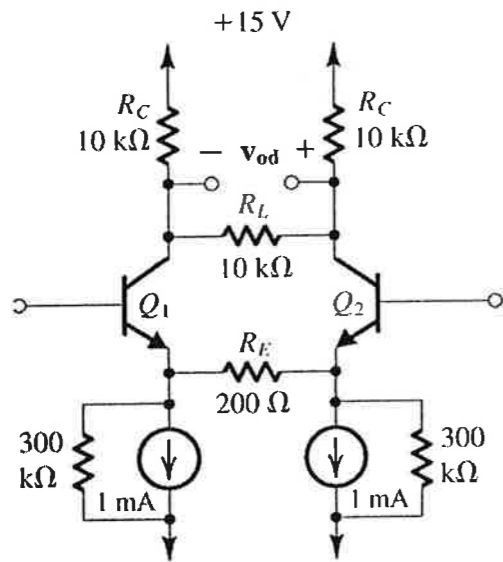


Figure 5

6. (20%) Consider the source follower shown in Figure 6. Consider the r_o effect.

- (1) Find the two transmission zeros. (6%)
- (2) Derive the resistances seen by C_{gs} , C_{gd} , and C_L . (12%)
- (3) Find the upper 3-dB frequency using open-circuit time-constant method. (2%)

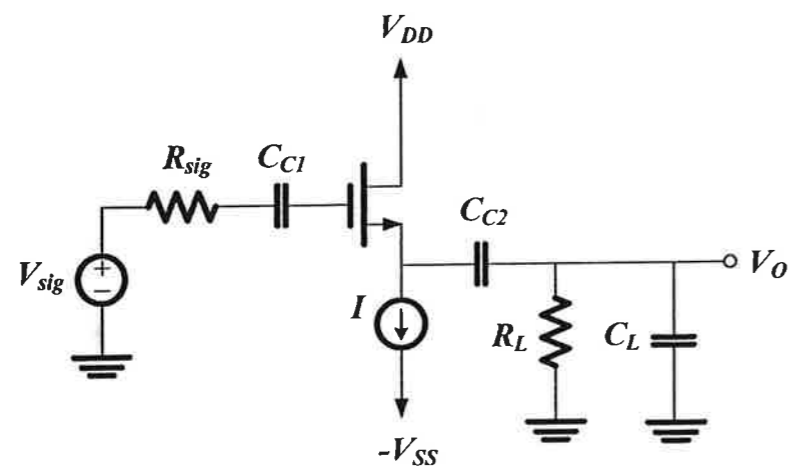


Figure 6