

國立臺北科技大學 103 學年度碩士班招生考試

系所組別：1111、1132 機電整合研究所甲、丙組

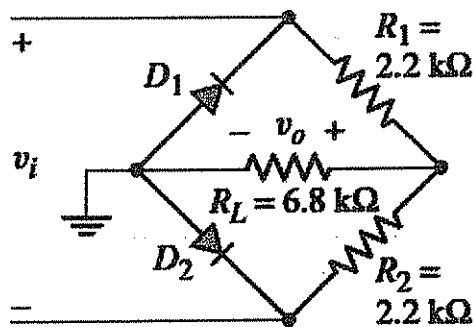
第三節 電子學 試題 (選考)

第一頁 共二頁

注意事項：

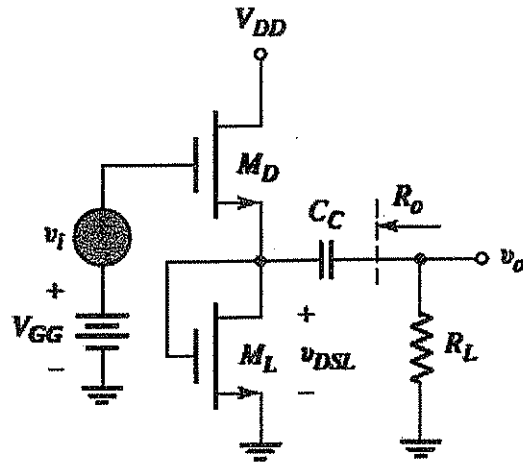
1. 本試題共 5 題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. (a) Sketch v_o versus time for the circuit in Figure P1. The input is a sine wave given by $v_i = 20 \sin \omega t$ V. Assume diode is idea ($V_r = 0$). (b) Determine the rms value of the output voltage. (10%, each item 5%)



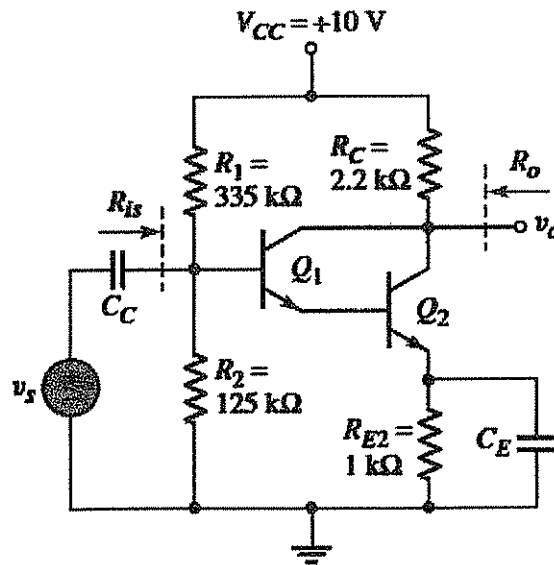
P1

2. A source-follower circuit with a saturated load is shown in Figure P2. The transistor parameters are $V_{TND} = 1$ V, $K_{nD} = 0.9 \text{ mA/V}^2$ for M_D , and $V_{TNL} = 1$ V, $K_{nL} = 0.1 \text{ mA/V}^2$ for M_L . Assume $\lambda = 0$ for both transistors. Let $V_{DD} = 10$ V. (a) Determine V_{GG} such that the quiescent value of v_{DSL} is 4 V. (b) Calculate the output resistance R_O . (c) Calculate the small-signal voltage gain for $R_L = 4 \text{ k}\Omega$. (30%, each item 10%)



P2

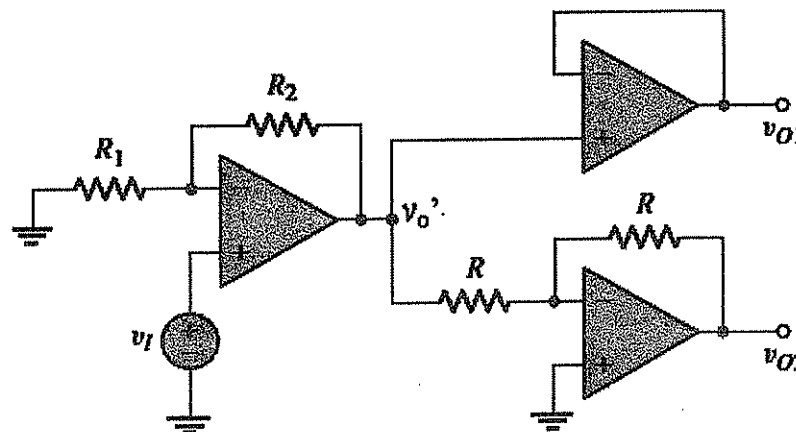
3. For each transistor in Figure P3, the parameters are $\beta = 100$ and $V_A = 10^5$ V. (a) Determine the Q -point values for both Q_1 and Q_2 . (b) Determine the overall small-signal voltage gain $A_v = v_o/v_s$. (c) Determine the input and output resistances R_{is} and R_o . (30%, each item 10%)



P3

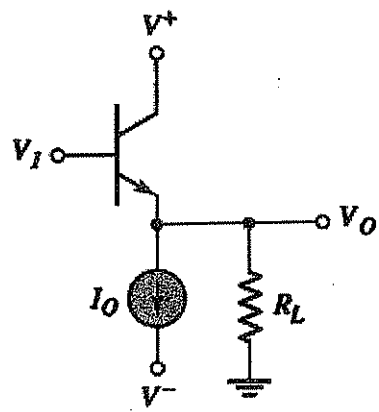
注意：背面尚有試題

4. (a) Consider the ideal op-amp circuit shown in Figure P4. Determine the voltage gains $A_{v1} = v_{O1}/v_I$ and $A_{v2} = v_{O2}/v_I$. What is the relationship between v_{O1} and v_{O2} ? (b) For $R_2 = 60 \text{ k}\Omega$, $R_1 = 20 \text{ k}\Omega$, and $R = 50 \text{ k}\Omega$, determine v_{O1} and v_{O2} for $v_I = -0.50 \text{ V}$. (c) Determine $(v_{O1} - v_{O2})$ for $v_I = +0.3 \text{ V}$. (15%, each item 5%)



P4

5. Consider the emitter-follower amplifier shown in Figure P5. An average power of 0.5 W is to be delivered to a load of $R_L = 8\Omega$. (a) What are the peak values of ac (sine wave) output voltage and ac load current? (b) The minimum collector current occurs when V_O reaches the maximum negative value. If the minimum collector current is to be 10 percent of I_O , determine I_O . (Use the results of part (a).) (c) Using the results of part (b), calculate the power conversion efficiency. (15%, each item 5%)



P5