

國立臺北科技大學九十九學年度碩士班招生考試

系所組別：1111 機電整合研究所甲組

第二節 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. Sketch v_o versus time for the circuit in Figure P1 with the input shown. Assume $V_f = 0$ (Diodes are idea). (20%)

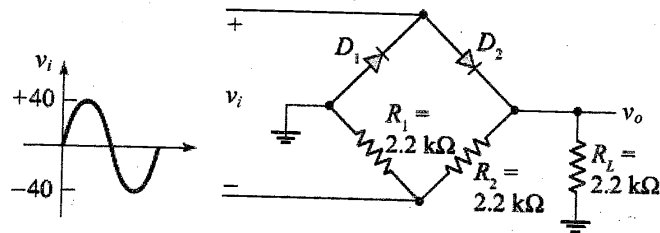


Figure P1

2. Consider the source-follower circuit in Figure P2 with transistor parameters $V_{TN} = 1.2 \text{ V}$, $K_n = 1 \text{ mA/V}^2$ and $\lambda = 0.01 \text{ V}^{-1}$. If $I_Q = 1 \text{ mA}$, determine the small-signal voltage gain $A_v = v_o/v_i$ and the output resistance R_o . (20%)

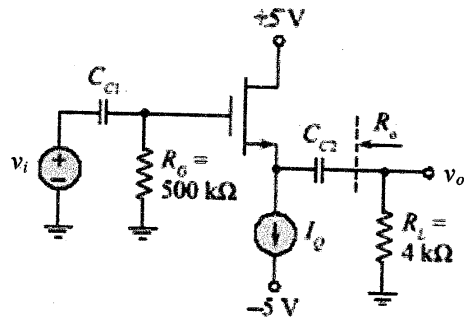


Figure P2

3. Figure P3 shows a composite pnp Darlington emitter follower that sinks current from a load. Parameter I_Q is the equivalent bias current and $Z (=25 \text{ k}\Omega)$ is the equivalent impedance in the base of Q_1 . Assume the transistor parameters are: $\beta(\text{pnp}) = 10$, $\beta(\text{nnp}) = 50$, $V_{AP} = V_{AN} = 10^5 \text{ V}$, where V_{AP} and V_{AN} are the early voltages of the pnp and npn devices, respectively. Calculate the output resistance R_o . (20%)

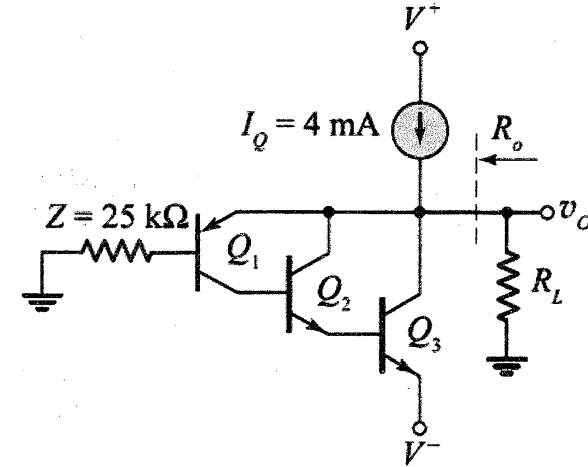


Figure P3

4. Consider the circuit in Figure P4. Assume idea op-amps are used. The input voltage is $v_i = 0.5 \sin \omega t$. Determine the voltages (a) v_{OB} , (b) v_{OC} and (c) v_o . (d) What is the voltage gain v_o/v_i ? (20%, each item 5%)

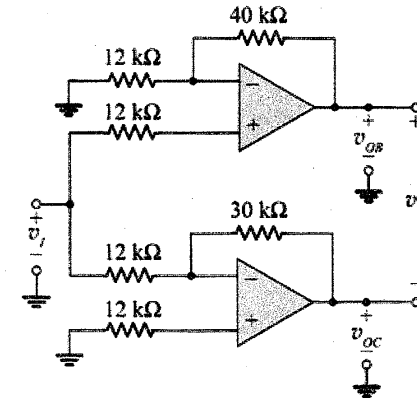


Figure P4

注意：背面尚有試題

5. Consider the Schmitt trigger in Figure P5. Assume the saturated output voltages are $\pm V_P$. (a) Derive the expression for the crossover voltages V_{TH} and V_{TL} . If $R_A = 10\text{ k}\Omega$, $R_B = 20\text{ k}\Omega$, $R_1 = 5\text{ k}\Omega$, $R_2 = 20\text{ k}\Omega$, $V_P = 10\text{ V}$, and $V_{REF} = 2\text{ V}$. (b) Sketch the voltage transfer characteristics. (20%, each item 10%)

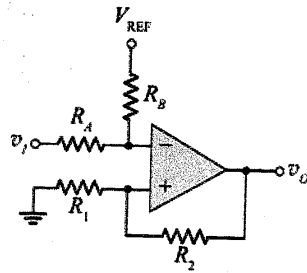


Figure P5