

國立高雄應用科技大學
100 學年度研究所碩士班招生考試
光電與通訊工程研究所碩士班

准考證號碼 (考生必須填寫)

電子學

試題 共 4 頁第 1 頁

- 注意：a. 本試題共 5 題、每題 20 分，共 100 分。
 b. 作答時不必抄題，但必須書寫計算過程否則不予計分。
 c. 考生作答前請詳閱答案卷之考生注意事項，各試題答案必須依題號順序寫在試卷指定的答案欄；寫錯位置不予計分。

1. For the circuit in Fig. 1, calculate the values: (a) dc gain (V_o/V_s), (b) 3-dB frequency, (c) frequency at which the gain becomes 0 dB (i.e. unity) for the case $R_s = 20 \text{ k}\Omega$, $R_i = 100 \text{ k}\Omega$, $R_o = 200 \Omega$, $R_L = 1 \text{ k}\Omega$, $C_i = 60 \text{ pF}$, and $\mu = 144 \text{ V/V}$. (20%)

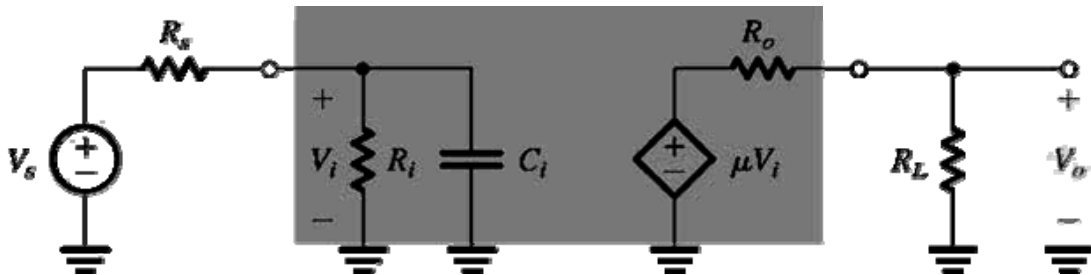


Fig.1

2. For the circuit shown in Fig. 2, express v_o as a function of v_1 and v_2 . (a) What is the input resistance seen by v_1 alone? (b) What is the input resistance seen by v_2 alone? (c) By a source connected between the two input terminals? (d) By a source connected to both input terminals simultaneously? (20%)

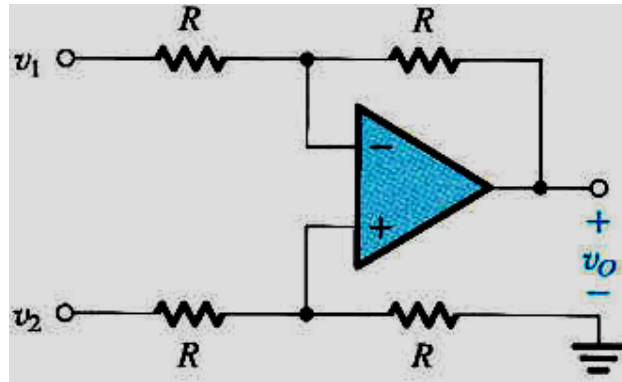


Fig. 2

3. For the circuit shown in Fig. 3, both diodes are identical, conducting 10 mA at 0.7 V and 100 mA at 0.8 V. Find the value of R for which $V = 80$ V. (20%)

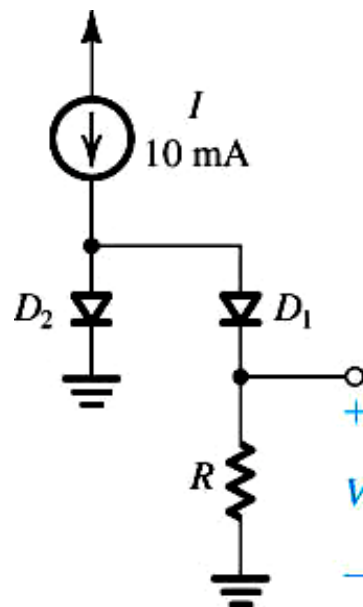


Fig. 3

4. Fig. 4 shows a discrete common-source MOSFET amplifier utilizing the drain-to-gate feedback biasing arrangement. The input signal v_i is coupled to the gate via a large capacitor, and the output signal at the drain is coupled to the load resistance R_L via another large capacitor. The transistor has $V_t = 1.5$ V, $k_n' (W/L) = 0.25$ mA/V², and $V_A = 50$ V. Assume the coupling capacitor to be sufficiently large so as to act as short circuits at the signal frequencies of interest. Find: (a) small-signal voltage gain, (b) input resistance, (c) the maximum allowable input signal peak. (20%)

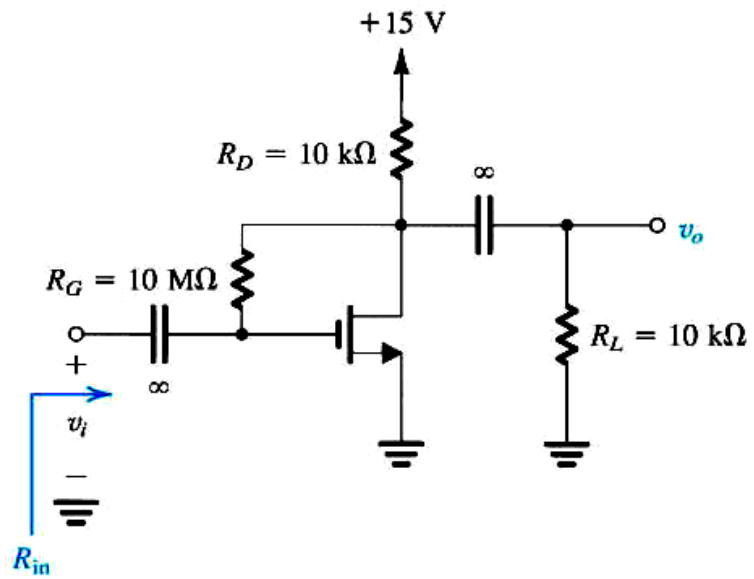


Fig. 4

5. For the emitter-follower circuit shown in Fig.5, the BJT used is specified to have β values in the range of 40 to 200. For the two extreme values of β , $\beta = 40$ and $\beta = 200$, find: (a) I_E , V_E , and V_B , (b) the input resistance R_{in} , (c) the voltage gain v_o/v_{sig} . (20%)

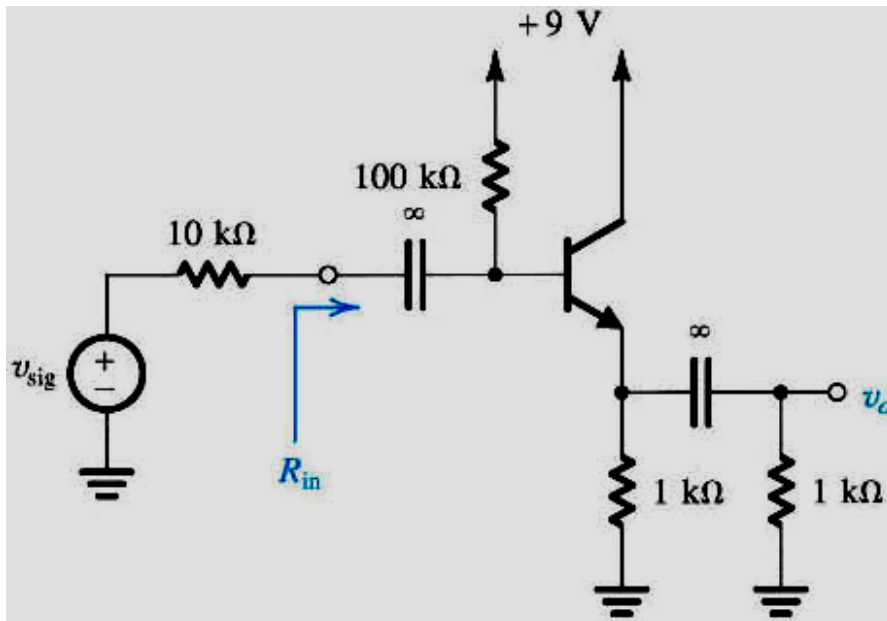


Fig. 5