逢甲大學108學年度碩士班考試入學試題

編號：24　　科目代碼：308

科目	電子學	適用系所	電機工程學系	時間	90分鐘

※請務必在答案卷作答區內作答。　　共 2 頁 第 1頁

1. **For the circuits shown in Figure 1 using ideal diodes, find the values of the labeled voltages and currents. (20%)**
2. **For the circuit in Figure 2, find the V_B, V_E, and V_C for R_B = 100 kΩ and 1 kΩ. Let β = 100. (15%)**

3. **For the common-emitter amplifier shown in Figure 3, let V_{cc} = 15V, R_1 = 27 kΩ, R_2 =15 kΩ, R_E = 2.4 kΩ, R_C = 3.9 kΩ. The transistor has β = 100 and V_A = 100V. Calculate the dc bias current I_C. If the amplifier operates between a source for which R_{sig} = 2 kΩ and a load of 2 kΩ, replace the transistor with its hybrid-π model, and find the value of R_{in}, and the overall gain v_o/v_{sig}.**

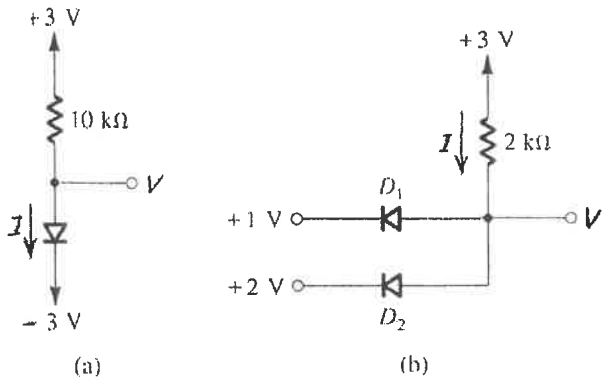

Figure 1

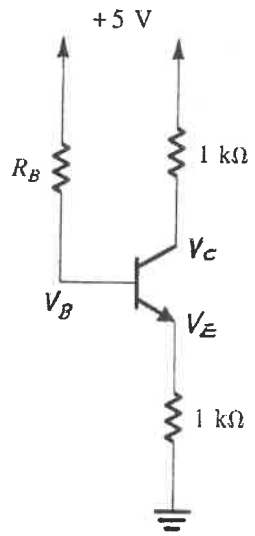

Figure 2

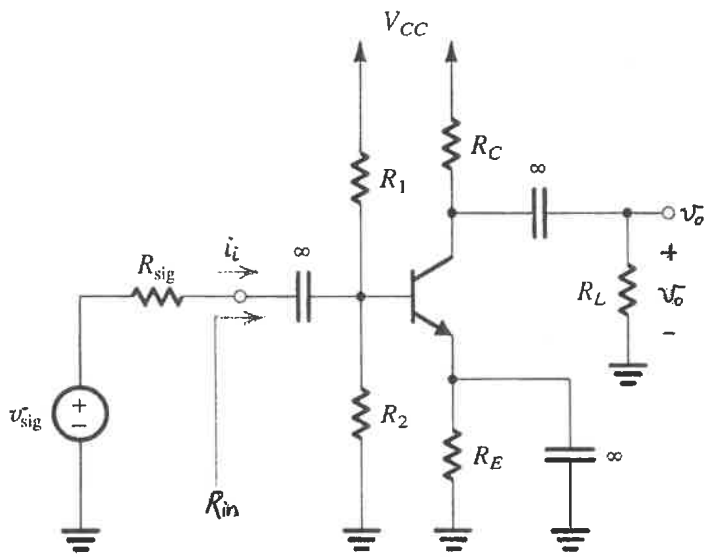

Figure 3

4. Figure 4 shows a current mirror, (a) what the operation region of Q1 and Q2 should be ? (Cutoff, Triode or Saturation region?) (5%) (b) Find the I_o, if Q1 and Q2 are matched with channel length L = 0.4 μm, channel width W = 4 μm, $\mu_n C_{ox}$ = 100 μA/V^2, V_{DD} = 12 V, V_{GS} = 2 V, V_t = 1 V and R = 20 kΩ. (10%) [Hint: $I_D = 0.5\mu_n C_{ox} (V_{GS}-V_t)^2 W/L$].
5. (a) Find voltage gain A_v = Vo/Vi, for an ideal op amp shown in Figure 5. (10%) (b) Assume that the op amp is not ideal and has an open-voltage gain A_o, derive the expression for Av = Vo/Vi. (5%)
6. Figure 6 shows a single stage MOSFET amplifier with V_{DD} = 15 V, R_{G1} = 10 MΩ, R_{G2} = 5 MΩ, R_D = 7.5 kΩ, R_S = 6 kΩ, R_1 = 50 kΩ, and R_L = 10 kΩ. Also C_s = 5.8 μF, C_{C1} = 90 nF, C_{C2} = 2.56 μF. Let V_t = 1 V, $\mu_n C_{ox} W/L$ = 2 mA/V^2 and V_{GS} = 2 V. (a) Draw the dc equivalent circuit. (5%) (b) Find the dc current I_D, and dc voltage V_G, V_D. (5%) (c) Draw the small-signal equivalent circuit. (5%) (d) Find the voltage gain, Av = Vo/Vs. (5%)

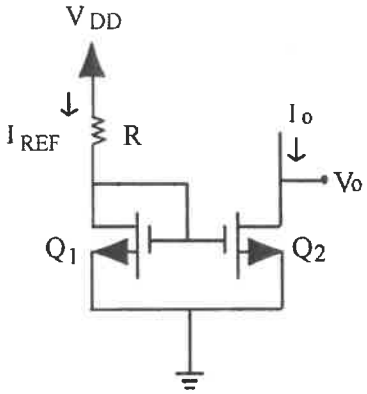

Figure 4

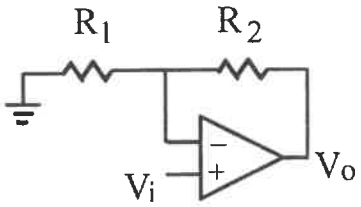

Figure 5

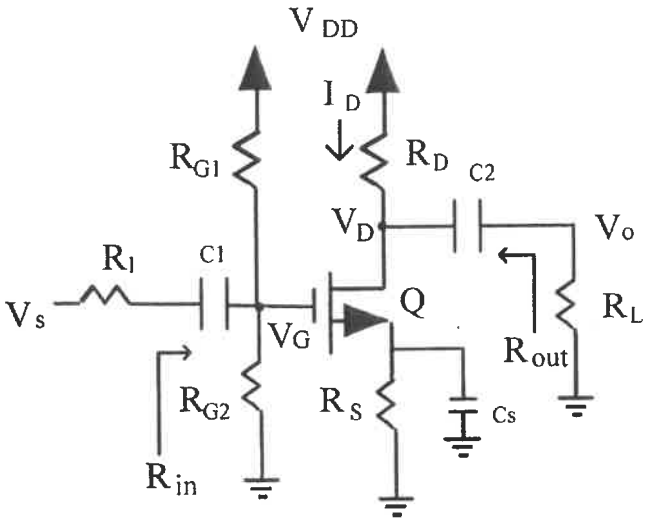

Figure 6