淡江大學 95 學年度轉學生招生考試試題

51-1

系別：電機工程學系三年級　　　　科目：電　子　學

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∨　簡單型計算機

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1. (20%) For an inverting amplifier, as shown in Fig. 1, with open loop gain $A=100$, $R_1=2k\Omega$, $R_2=1k\Omega$, and nominal gain $-R_2/R_1$, find the close loop gain in reality and the resulting gain error.

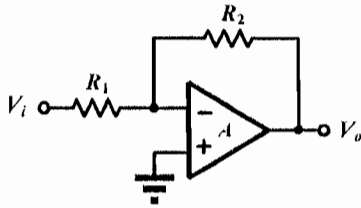   [hint: gain error = (real gain – nominal gain)/nominal gain]

   Fig. 1

2. (20%) For the devices in the circuit of Fig. 2, $V_{in} = 1V$, $\mu_n C_{ox}=50\mu A/V^2$, $L=1\mu m$, and $W=5\mu m$. Neglect the channel length modulation and body effect, find V_2 and I_1.

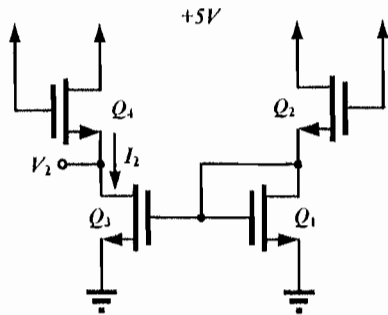   Fig. 2

3. (20%) As shown in Fig. 3, the BJT has a common-emitter current gain $\beta = 100$, $V_{BE}=0.7V$, and the thermal voltage $V_T= kT/q = 25mV$. Find the dc collect current and dc voltage V_C, and small-signal voltage gain V_o/V_i. [Hint: In the small signal analysis, the base current can be ignored.]
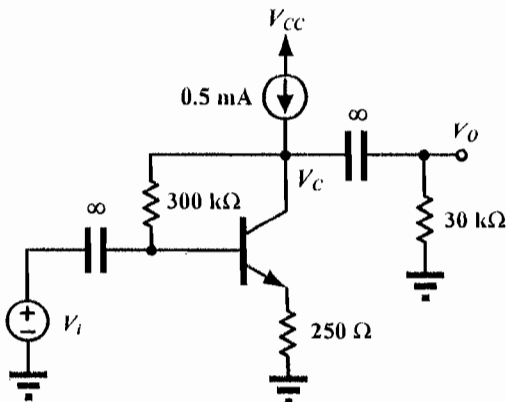

   Fig. 3

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51-2

系別：電機工程學系三年級　　　　科目：電　子　學

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.√	簡單型計算機

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4. (20%) The MOS version of the Wilson mirror is shown in Fig. 4. Show that the output resistance R_o of this circuit can be approximated to $g_{m3}r_{o3}r_{o2}$, where g_{m3} is the transconductance of transistor Q_3, r_{o3} and r_{o3} are the finite resistances between drain and source of transistor Q_3 and Q_2, respectively.
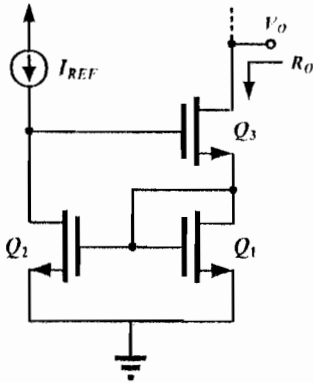

Fig. 4

5. (20%) The circuit of Fig. 5 utilizes two MOSFETs whose bias details are not shown and a 50Ω coaxial cable. Transistor Q_1 operates as a CS amplifier and Q_2 as a CG amplifier. For proper operation, transistor Q_2 is required to present a 50Ω resistance to the cable. That is, the input resistance of Q_2 is 50Ω. Assume the transistors are well biased here. What must g_{m2} be? What value of R_D is required to provide 1V pulses at the drain of Q_2?
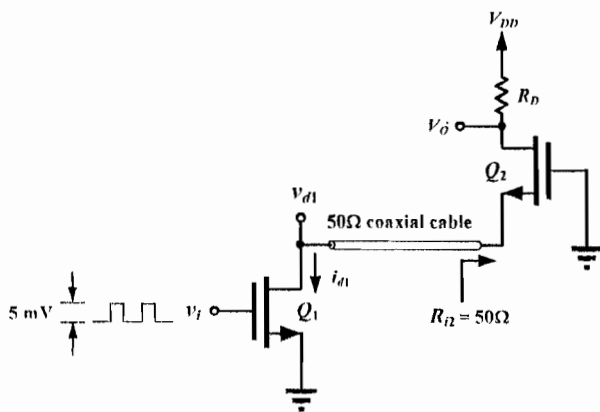

Fig. 5