大同大學 九十二 學年度 轉學考試 試題

考試科目:電子學　　系別:電機工程學系　　共 1/1 頁

註:本次考試 不可以參考自己的書籍及筆記； 不可以使用字典； 可以使用計算器。

BJT: $|V_{BE}|$(active)=0.7V, $|V_{BE}|$(sat)=0.8V, $|V_{CE}|$(sat)=0.2V; MOSFET: $|V_t|$ threshold voltage.

1. For the circuit in Fig. p1, R_1=10 $K\Omega$, R_2=1 $K\Omega$, calculate V_B and V_E for V_I=3V, and –5V. Both BJTs have β=100.(20%)

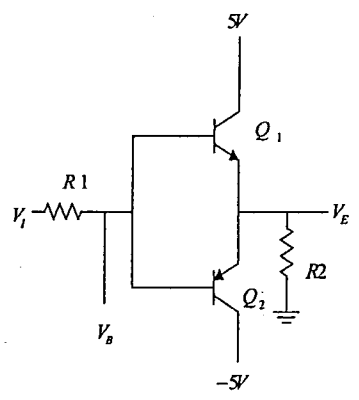

Fig. p1

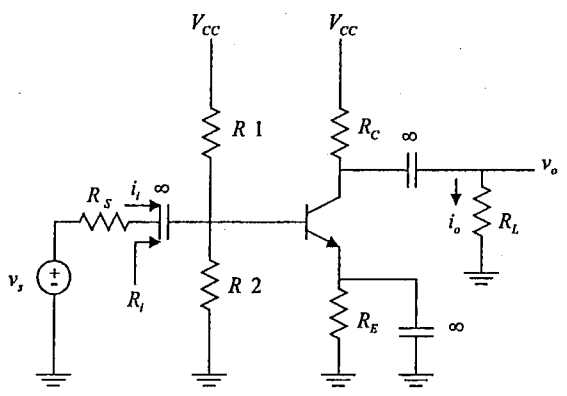

Fig. p2,

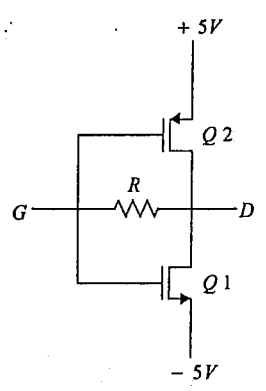

Fig. p3

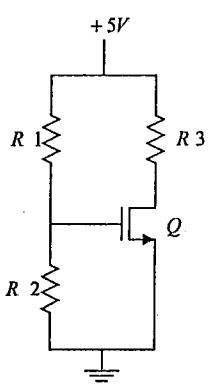

Fig. p4

2. For the circuit shown in Fig. p2, let V_{CC}=9V, R_1=27 $K\Omega$, R_2=15 $K\Omega$, R_E=1.2 $K\Omega$, R_C=2.2 $K\Omega$. The BJT has β=100 and Early voltage V_A=100V. (in part(a), neglect Early effect)
   (a). Calculate the dc bias current I_E. (10%)
   (b). If the amplifier operates between a source for which R_s=10 $K\Omega$ and load R_L=2 $K\Omega$, calculate the input resistance R_i, the voltage gain v_o/v_s, and the current gain i_o/i_i. (15%)

3. The MOSFETs in the circuit of Fig. p3 are matched, with $\mu_n C_{ox}(\frac{W}{L})_1 = \mu_p C_{ox}(\frac{W}{L})_2 = 50\,\mu A/V^2$ and $|V_t|$=2V, the resistance $R = 10M\Omega$
   (a). For G and D open, calculate the drain current I_{D1} and I_{D2}? (8%)
   (b). Through a large coupling capacitor, G is driven from a source v_i having a resistance of 1 $M\Omega$, calculate the voltage gain v_d/v_i, assuming both MOSFETs with $\frac{1}{|\lambda|} = |V_A| = 180V$. (12%)

4. For the circuit in Fig. p4, nMOS with V_t=1V and $\mu_n C_{ox}\frac{W}{L} = 0.2\,mA/V^2$; R_1=30 $K\Omega$, R_2=20 $K\Omega$, R_3=20 $K\Omega$, determine the transition point parameters $V_{GS,t}$ and $I_{D,t}$. (Here, transition point means : $V_{GS} < V_{GS,t}$, Q in the saturation region; $V_{GS} > V_{GS,t}$, Q in linear region.) (13%)

5. (a). Draw the CMOS inverter circuit and indicate the pMOS and nMOS. (4%)
   (b). Sketch the CMOS inverter VTC, i.e. V_O vs V_I plot and indicate V_{IL}, V_{IH}, V_{OH}, V_{OL}. Define the noise margin NM_H and NM_L. (12%)
   (c) Draw the two inputs CMOS NAND and NOR circuits and indicate pMOS and nMOS clearly. (8%)