

國立臺北科技大學 112 學年度碩士班招生考試

系所組別：2401 光電工程系碩士班

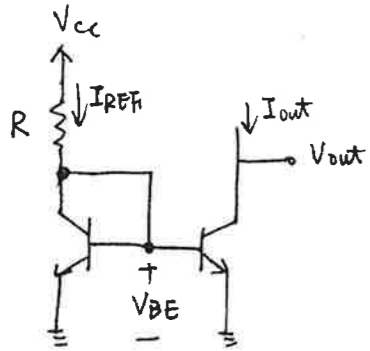
第二節 電子學 試題 (選考)

第 1 頁 共 2 頁

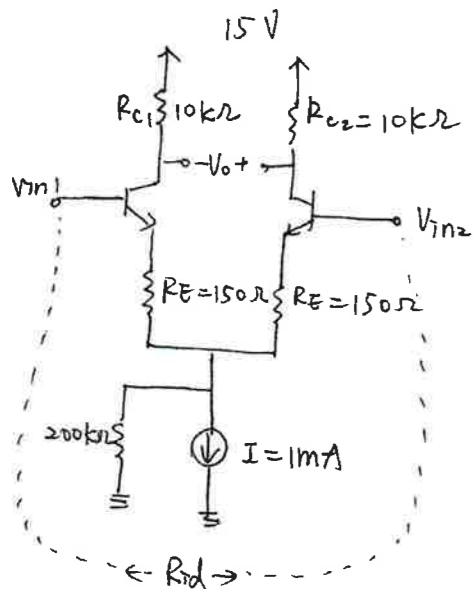
注意事項：

1. 本試題共 5 題，每題 20 分，共 100 分。
2. 不必抄題，作答時請將試題題號及答案依照順序寫在答案卷上。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

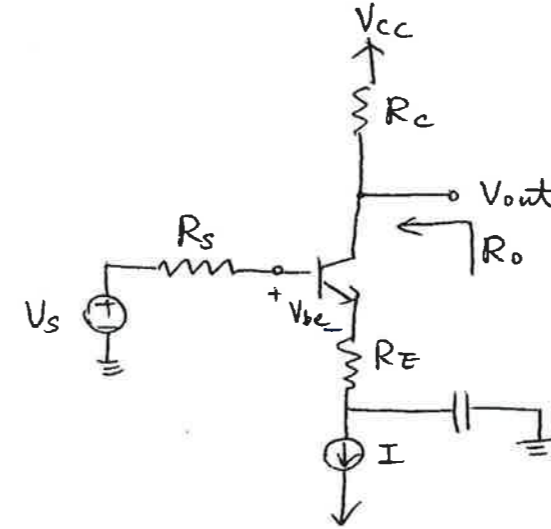
1. (a)(10%) For the circuit, find the value of R that results in $I_{out}=1\text{mA}$ with $V_{cc}=5\text{V}$. Assume that $V_{BE}=0.7\text{V}$ and neglect the effects of r_o and the finite β .
 (b)(10%) If $I_{REF}=10\text{mA}$, $\beta=100$ and $V_A=50\text{V}$, find the value of I_{out} resulting at $V_{out}=3\text{V}$.



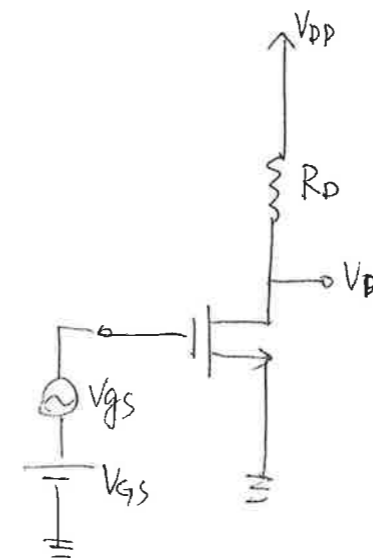
2. The differential amplifier uses transistors with $\beta=100$. Evaluate the following: (a)(10%) The input differential resistance R_{id} . (b)(10%) The overall voltage gain $V_o/(V_{in1}-V_{in2})$.



3. Consider the amplifier circuit with a bias current $I=1\text{mA}$ and a collector resistor $R_c=5\text{k}\Omega$. Let the BJT have $\beta=100$, and neglect the Early effect. The signal source has a resistance $R_s=5\text{k}\Omega$. Find the value of R_E that gives the amplifier an input resistance four times that of the source. For the resulting circuit, find (a)(10%) A_v . (b)(10%) R_o . ($V_T=26\text{mV}$)



4. For the MOSFET circuit of below, let $V_{DD}=5\text{V}$, $R_D=10\text{k}\Omega$, $\mu_n C_{ox}=40\mu\text{A/V}$, $|V_{th}|=1\text{V}$, $V_{GS}=2\text{V}$, channel-length modulation parameter $\lambda=0$, body-effect parameter $\gamma=0$, $W/L=20\mu\text{m}/10\mu\text{m}$. Find (a)(5%) The dc current I_D , (b)(5%) the dc voltage V_D , (c)(5%) the transconductance g_m , and (d)(5%) the voltage gain.



注意：背面尚有試題

5. (20%) Consider an OP-Amp with an open-loop gain of 10000 and a unity-gain bandwidth of 3 MHz. The input impedance of the OP-Amp is $5M\Omega$, and the output impedance of the OP-Amp is 50Ω . With $R_1=10k\Omega$ and $R_2=1.0 M\Omega$, Please determine the (a)(5%) input impedance, (b)(5%)output impedance, (c)(5%)close-loop voltage gain, and (d)(5%)bandwidth of the circuit.

