

國立臺北科技大學 101 學年度碩士班招生考試

系所組別：2240 電腦與通訊研究所丁組

第二節 電子學 試題

注意事項：
 1. 本試題共三題，配分共 100 分。
 2. 請標明大題、子題編號作答，不必抄題。
 3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

- 一、(35%) Fig. 1 shows an amplifier composed of three gain stages with a feedback network.
- Determine the gain (V_{o1}/V_i) of the first stage as a function of r_{e1} , R_{E1} , R_{F1} , R_{C1} , r_{e2} , and α_1 . (10%)
 - Determine the gain (V_{o2}/V_{o1}) of the second stage as a function of r_{e3} , R_{E2} , R_{F2} , R_{C1} , R_{C2} , h_{fe} and g_{m2} . (10%)
 - Determine the gain (V_o/V_{o2}) of the third stage as a function of r_{e3} , R_{E2} , R_{F2} , R_{C1} , R_{C2} , h_{fe} and g_{m2} . (10%)
 - Determine the feedback factor as a function of R_{E2} , R_{F2} , R_{C1} , R_{C2} . (5%)

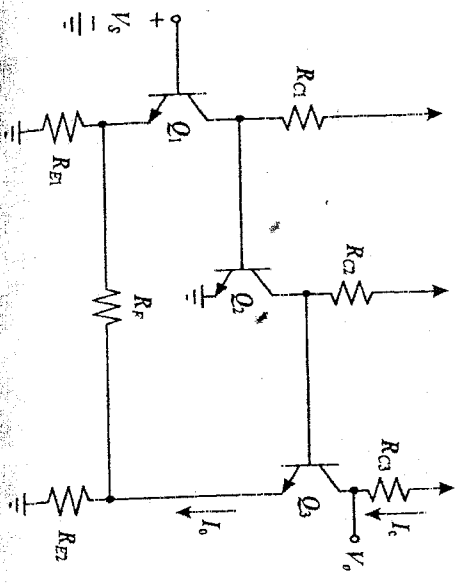


Fig. 1

- 二、(35%) Fig. 2 shows an active-loaded MOS differential amplifier. Assume the $(W/L)_1=100$, $(W/L)_2=200$, $\mu_n C_{ox}=2\mu\text{A/V}^2$, $V_{DS}=0.2\text{ mA/V}^2$, $V_{DS}=20\text{ V}$, $I=0.8\text{ mA}$. The output resistance of bias-current source I is $R_{SS}=25\text{ k}\Omega$.
- Calculate short-circuit transconductance G_m . (10%)
 - Calculate output resistance R_o . (5%)
 - Calculate differential gain A_d . (5%)
 - Calculate common-mode gain $|A_{cm}|$. (5%)
 - Calculate common-mode rejection ratio CMRR. (10%)

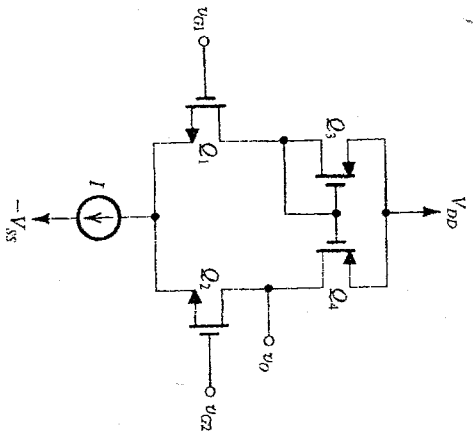


Fig. 2

- 三、(30%) A difference amplifier shown in Fig. 3 is with an input resistance of $20\text{ k}\Omega$ and a gain of 10.
- Calculate the value of $R_1 + R_3$. (15%)
 - Calculate the value of $R_2 + R_4$. (15%)

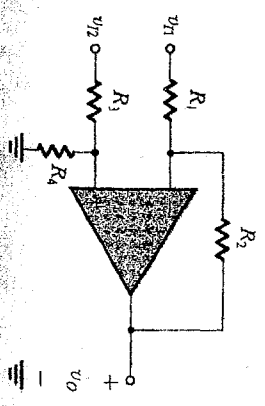


Fig. 3