

國立臺北科技大學 105 學年度碩士班招生考試

系所組別：2401 光電工程系碩士班

第三節 電子學 試題 (選考)

第一頁 共二頁

注意事項：

1. 本試題共六題，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. 5%

Please find the output voltage of the circuit shown in Fig. 1

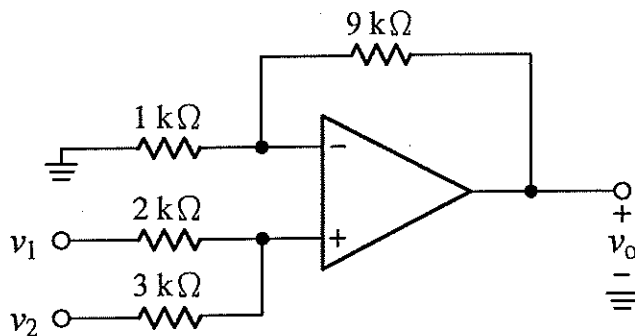


Fig. 1

二. 20%

For the circuit of Figure 2, the OP-Amp has open-loop gain $A_d = 10^4$ V/V, differential input resistance $R_{id} = 100\text{K}\Omega$, and incremental output resistance $r_o = 1\text{K}\Omega$. Please use the feedback method to find:

- (1) The voltage gain v_o/v_s . (5%)
- (2) The input resistance R_{in} . (5%)
- (3) The output resistance R_{out} . (5%)
- (4) What is the configuration of the feedback amplifier? (5%)

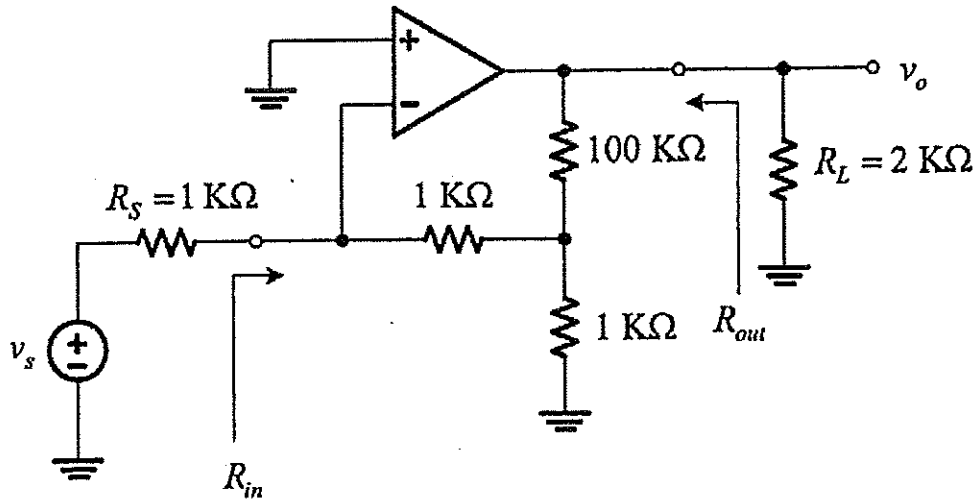


Fig. 2

三. 25%

For the circuit in Fig. 3, $|V_T| = 1\text{ V}$, $k'W/L = 1\text{ mA/V}^2$, $h_{fe} = 100$, and the Early voltage magnitude for all devices (including those that implement the current sources) is 100 V . The signal source V_s has a zero dc component. Find the values of open-loop gain A , feedback factor β , closed-loop gain A_f , input resistance R_{in} , and output resistance R_{out} . [5% for each question]

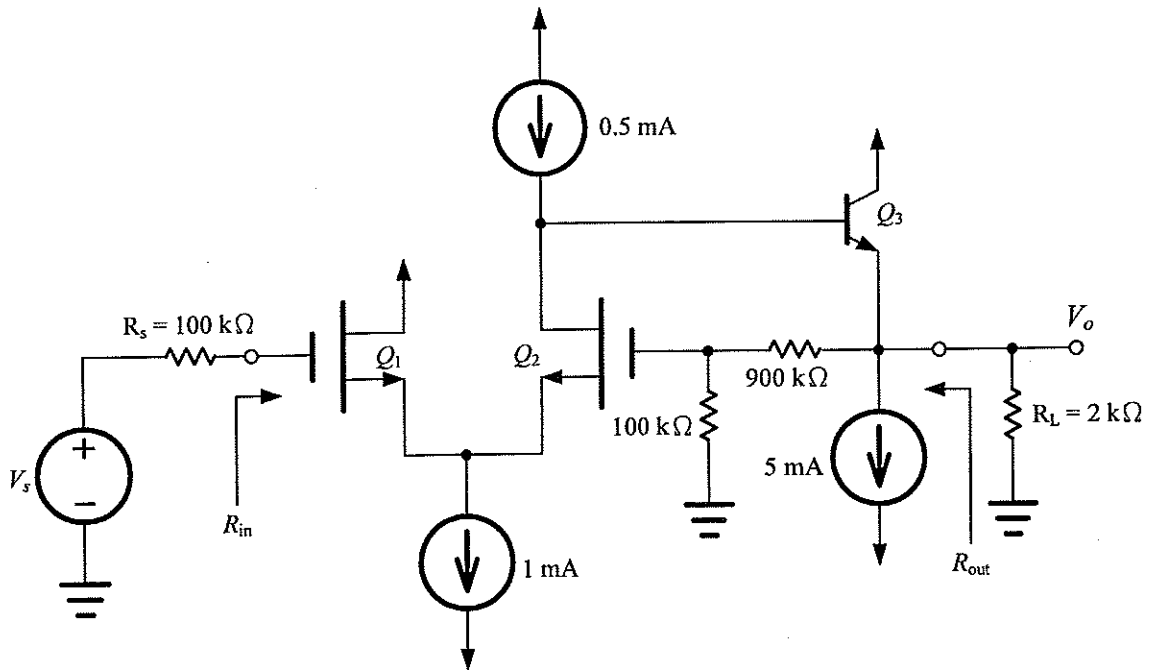


Fig. 3

注意:背面尚有試題

四. 20%

As shown in Fig. 4, assume $C_{gs}=100\text{pF}$, $C_{gd}=2\text{pF}$, $g_m = 5\text{mA/V}$, please find midband voltage gain A_M (10%), lower 3dB frequency f_L (5%), and upper 3dB frequency f_H (5%).

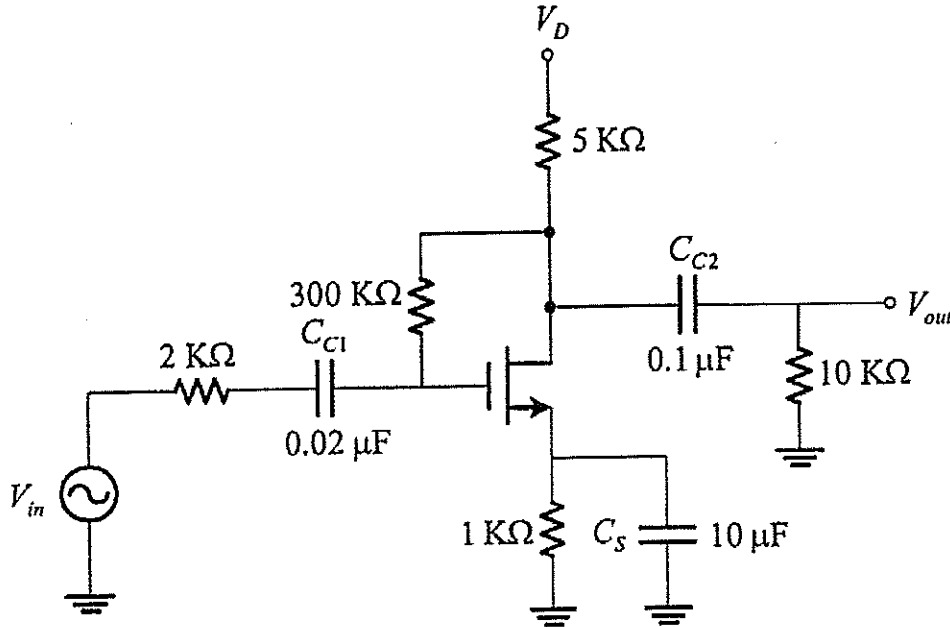


Fig. 4

五. 20%

As shown in Figure 5, the schematic of a state-variable filter as shown contains passive elements and ideal operational amplifiers. Assume $R_1=R_2=R_3=R_4=R_5=R$, $C_1=C_2=C$, please derive the transfer functions of $V_o(s)/V_i(s)$.

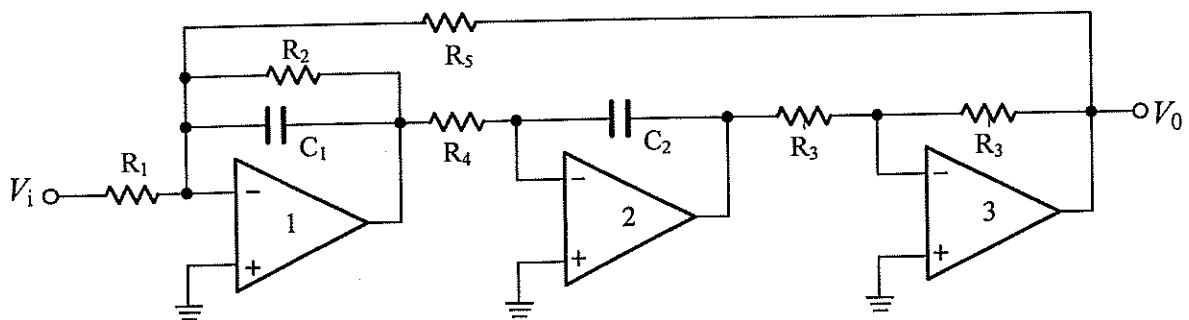


Fig. 5

六. 10%

For the PMOS differential amplifier shown in Fig. 6, let $V_{tp} = -0.8\text{V}$ and $k_p'W/L = 3.5\text{mA/V}^2$. Neglect channel-length modulation. If the current source requires a minimum voltage of 0.5V , find the input common-mode range.

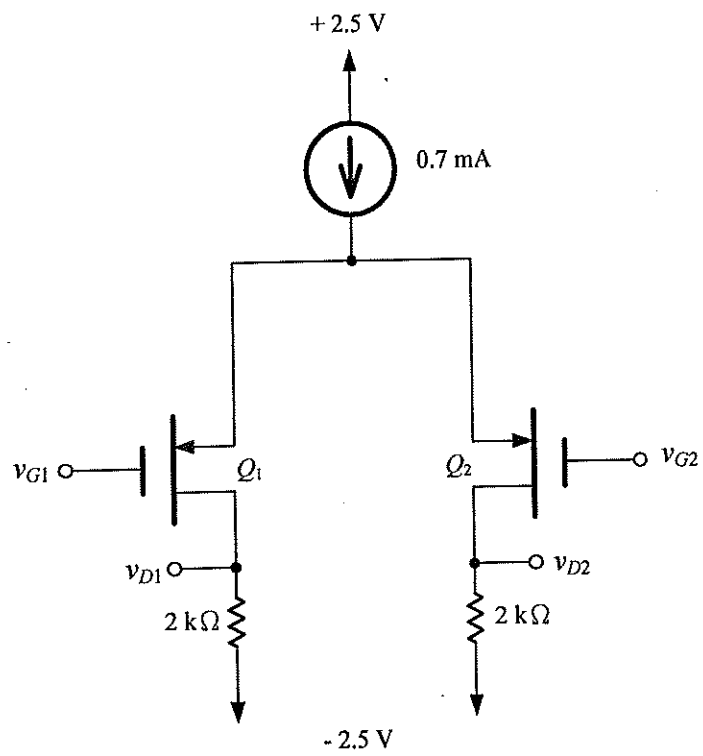


Fig. 6