

國立臺北科技大學 102 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 6 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。

1. The OP amplifier in Fig. 1 is ideal with output saturation levels of ± 15 V. Assume that the diode has a constant voltage drop of 0.7 V when conducting. Find V_o and V_A for (a) $V_i = 2$ V and (b) $V_i = -1$ V. (10%; each 5%)

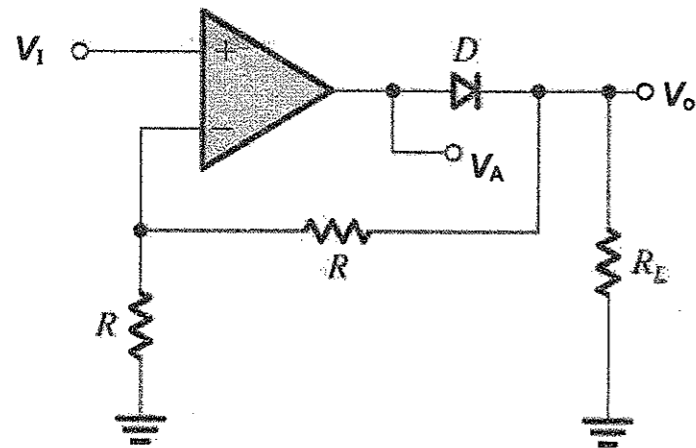


Fig. 1

2. The amplifier in Fig. 2 is biased to operated at the drain current $I_D = 1$ mA and transconductance $g_m = 1$ mA/V. Neglecting the resistance r_o between drain and source, find (a) the midband voltage gain $A_v = V_o/V_i$ and (b) the capacitance C_S that makes the lower 3-dB frequency f_L at 5 Hz. (10%; each 5%)

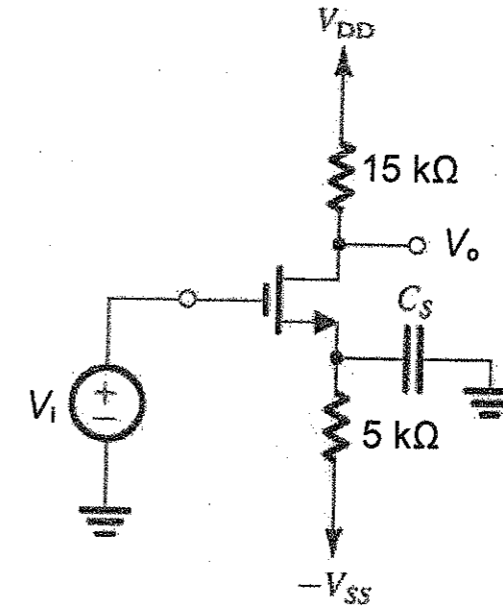


Fig. 2

3. For the amplifier in Fig.3, consider that the signal source has an internal resistance $R_{sig} = 1$ K Ω . Let the transistor has common-emitter current gain $\beta = 100$, unit-gain bandwidth $f_T = 400$ MHz, and collector-base capacitance $C_{\mu} = 2$ pF. Please find (a) the low-frequency gain $A_v = V_o/V_{sig}$ and (b) the upper 3-dB frequency f_H . (20%; each 10%)

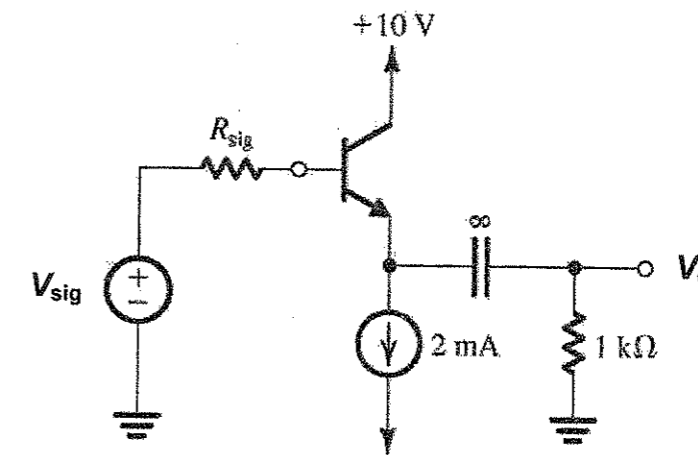


Fig. 3

注意：背面尚有試題

4. Consider the circuit in Fig.4 for the case: $I = 200 \mu\text{A}$, $R_{\text{sig}} = 200 \text{ k}\Omega$, $R_D = 50 \text{ k}\Omega$. The transistors have the overdrive voltage $V_{\text{OV}} = 0.25 \text{ V}$, the gate-source capacitance $C_{\text{gs}} = 1 \text{ pF}$ and gate-drain capacitance $C_{\text{gd}} = 1 \text{ pF}$. Please find (a) the dc voltage gain V_o/V_{sig} (b) the high-frequency poles and (c) an estimate of upper-3dB frequency f_H . (5%,10%,5%)

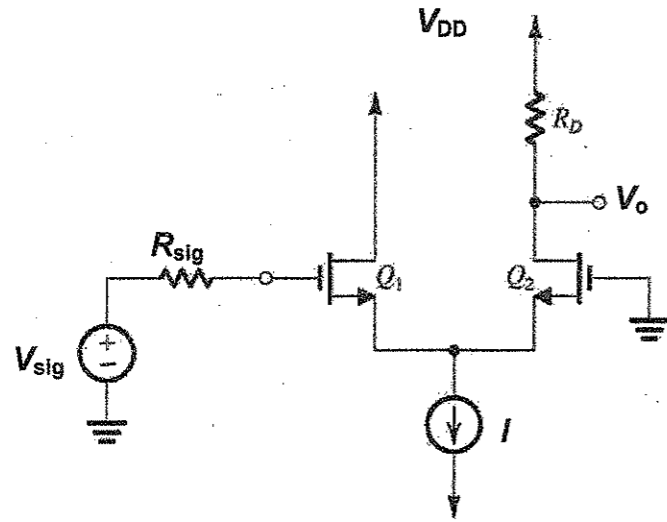


Fig. 4

5. For the amplifier in Fig.5, assuming that the voltage source V_s has a zero dc component and the BJTs have common-emitter current gain $\beta = 100$, find (a) the dc emitter currents of Q_1 and Q_2 and use feedback analysis to find (b) voltage gain V_o/V_s and (c) input resistance R_{in} . (10%,5%,5%)

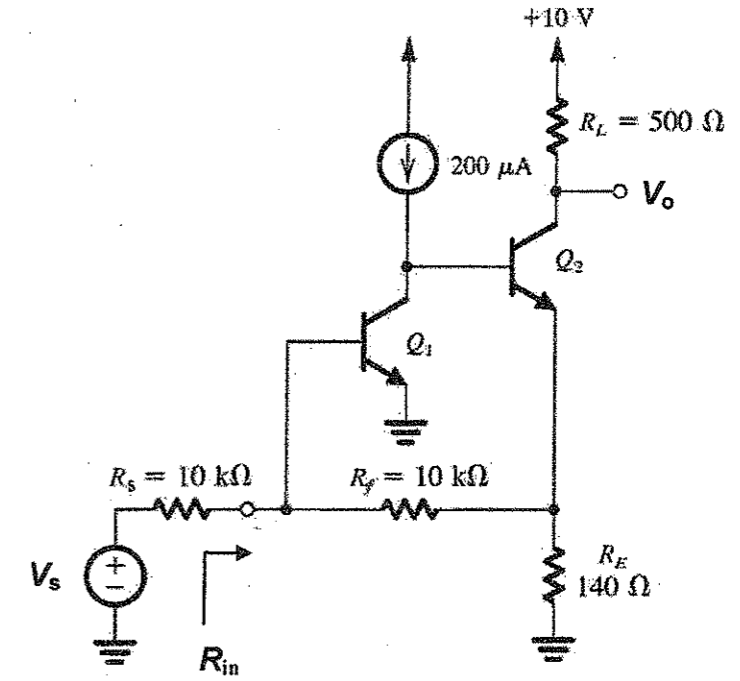


Fig. 5

6. For the oscillator circuit in Fig. 6, please find (a) the loop gain $L(j\omega) = V_o(j\omega)/V_x(j\omega)$ (b) the frequency of oscillation and (c) the condition R_2/R_1 for oscillation. (10%,5%,5%)

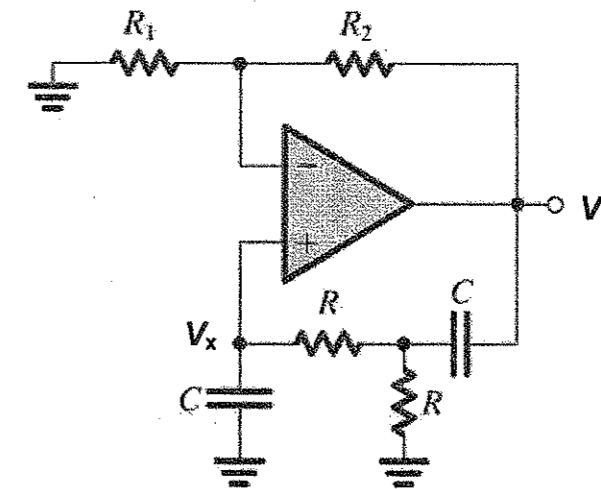


Fig. 6