

## 國立臺北科技大學九十五學年度碩士班招生考試

系所組別：1901 光電工程系碩士班不分組

## 第三節 電子學（選考）試題

填准考證號碼

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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. 請分析並判斷 Fig.1, Fig. 2 及 Fig. 3 各為何種邏輯閘? (30 分)

[ $v_i$  為輸入信號,  $v_o$  為輸出信號]

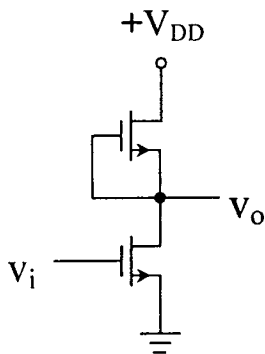


Fig. 1

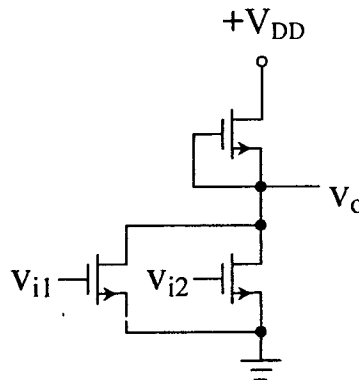


Fig. 2

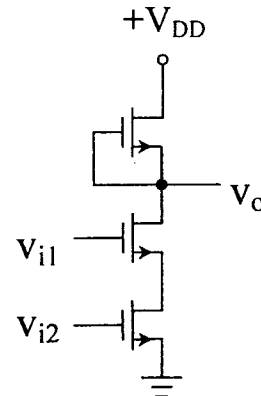


Fig. 3

2. 如 Fig. 4, 請問理想 Op-amp 之條件有那些? (10 分)

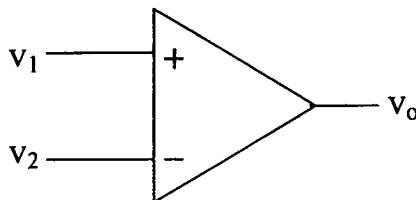


Fig. 4

3. 如 Fig. 5，若  $v_R$  為定值，Op-amp 在正常操作下， $v_o$  之輸出波形為何？(10 分)

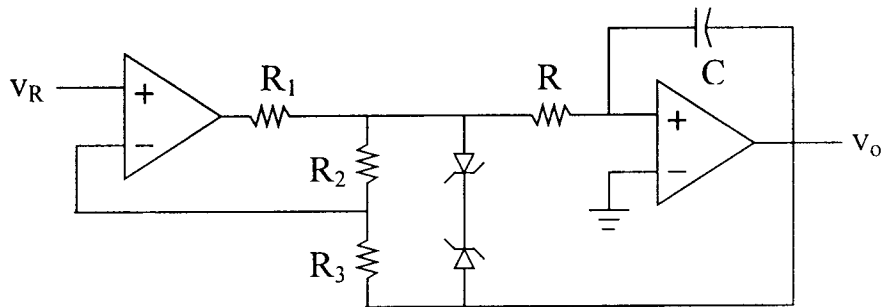


Fig. 5

4. Consider the phase-shift oscillator shown in Fig. 6.
- Find the frequency  $\omega$  for zero loop phase and  $R_f/R$  for oscillation. (10%)
  - For  $R=10\text{ k}\Omega$ , find  $C$  and  $R_f$  to obtain sinusoidal oscillations at 50 kHz. (10%)

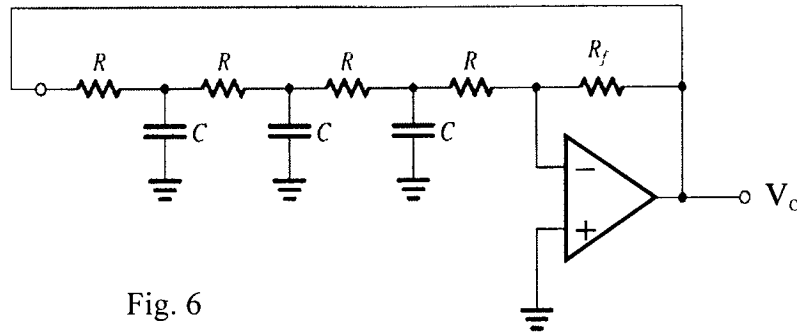


Fig. 6

5. For the circuit shown in Fig. 7, the transistor has a  $\beta$  of 100 and  $V_s$  is a small sine-wave signal.
- Find the dc voltage at the collector. (5%)
  - Find  $R_{in}$  (5%)
  - Find voltage gain  $V_o/V_s$  (5%)

注意：背面尚有試題

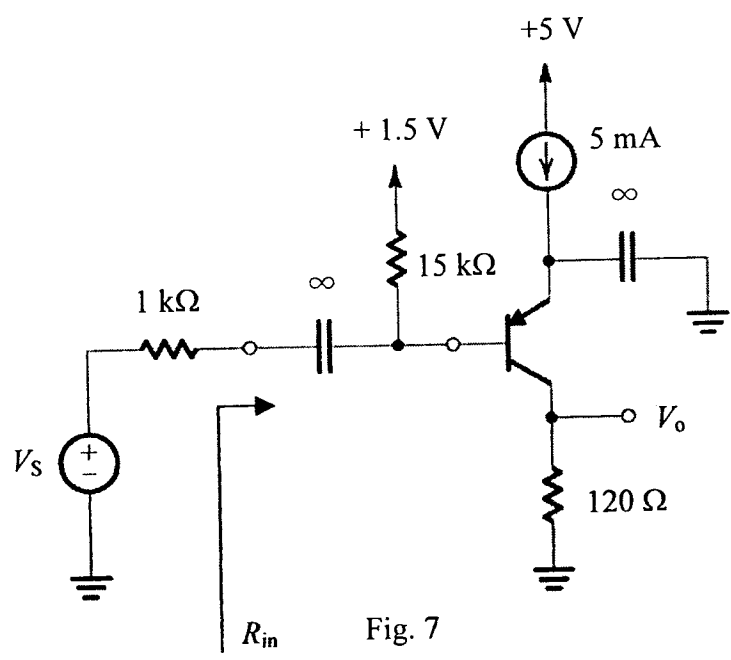


Fig. 7

6. A MOSFET amplifier, as shown in Fig.8, has  $R_G = 1 \text{ M}\Omega$ ,  $R_D = 20 \text{ k}\Omega$ ,  $g_m = 5 \text{ mA/V}$ ,  $r_o = 100 \text{ k}\Omega$ ,  $C_{gs} = 2 \text{ pF}$ ,  $C_{gd} = 0.4 \text{ pF}$ . The amplifier is fed from a voltage source with an internal resistance  $R_S = 250 \text{ k}\Omega$  and is connected to a load with  $R_L = 10 \text{ k}\Omega$ .
- Consider high-frequency MOSFET model and draw the AC equivalent circuit of the amplifier. (5%)
  - Find the overall midband gain  $A_M$ . (5%)
  - Find the upper 3-dB frequency  $f_H$ . (5%)

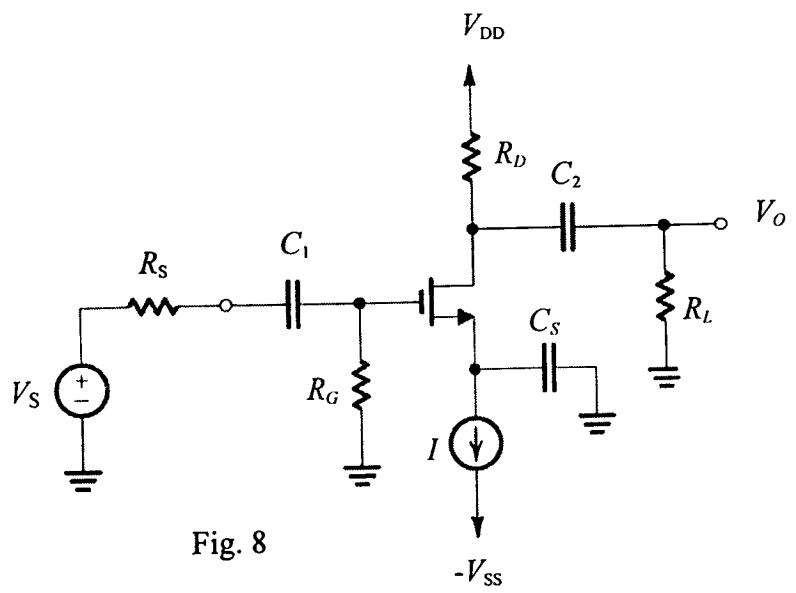


Fig. 8