

# 國立彰化師範大學 100 學年度碩士班招生考試試題

系所：機電工程學系

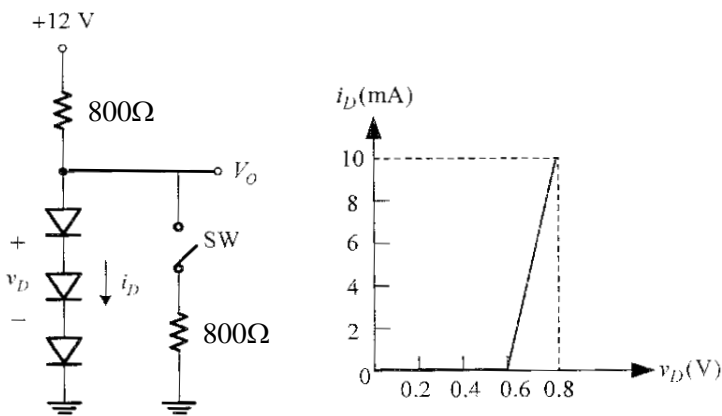
組別：乙組

科目：電子學

☆☆請在答案紙上作答☆☆

共 2 頁，第 1 頁

1. For the circuit in Fig. 1(a), find the output voltage  $V_o$  when (1) switch off, and (2) switch on. Assume that all diodes have the same terminal characteristics ( $i_D-v_D$ ) as shown in Fig. 1(b). (10%)
2. In the circuit of Fig. 2, the diodes are ideal. Find the steady-state voltage  $v_{AB}$ . (10%)
3. For the circuit in Fig. 3, find (1) the drain current  $I_D$ , (2) the input resistance  $R_{in}$  and the output resistance  $R_{out}$ , and (3) voltage gain  $v_o/v_s$ . Assume  $V_t=1V$ ,  $k'_n(W/L)=0.5 \text{ mA/V}^2$ , and  $V_A=\infty$ . (20%)
4. For the circuit of Fig. 4, the transistors have the parameters of  $\beta=50$  and  $V_A=\infty$ , please find (1)  $I_1$ ,  $I_{B1}$ ,  $I_{C1}$ , (2)  $g_{m1}$ ,  $r_{\pi 1}$ ,  $r_{e2}$ , and (3) the voltage gain  $v_o/v_i$ . Suppose that  $V_{BE(\text{active})}=0.7V$ . (35%)
5. For the circuit of Fig. 5 with an ideal op amp, if the closed-loop voltage gain  $v_o/v_i = -20V/V$ , and input resistance  $R_{in} = 10k\Omega$ , estimate  $R_1$  and  $R_2$ . (10%)
6. The circuit in Fig. 6 utilizes an ideal op amp. Derive (1) the voltage gain  $v_o/v_i$ , and (2) input resistance  $R_i$ . (15%)



(a) (b)

Fig. 1

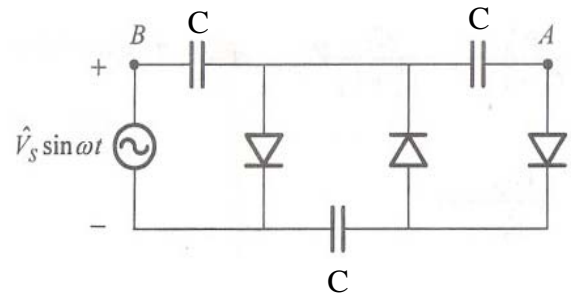


Fig. 2

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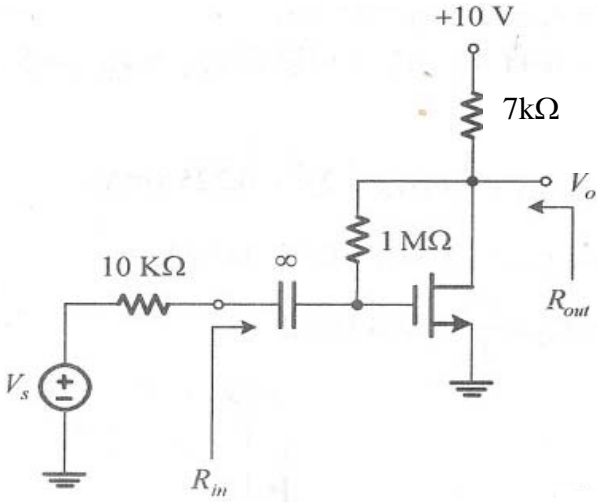


Fig. 3

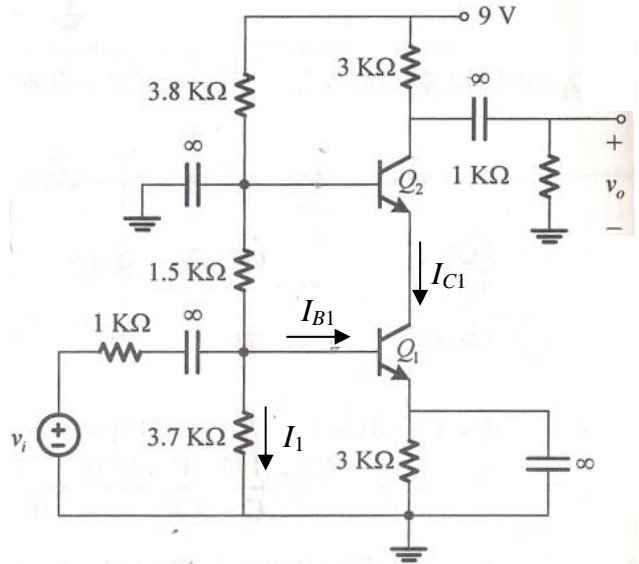


Fig. 4

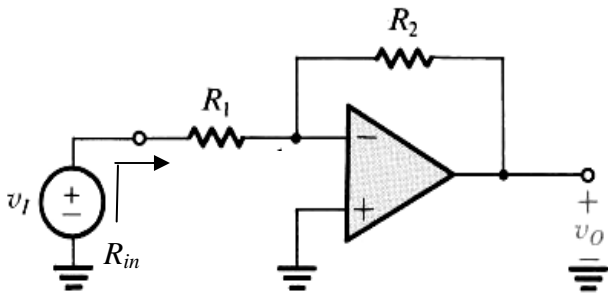


Fig. 5

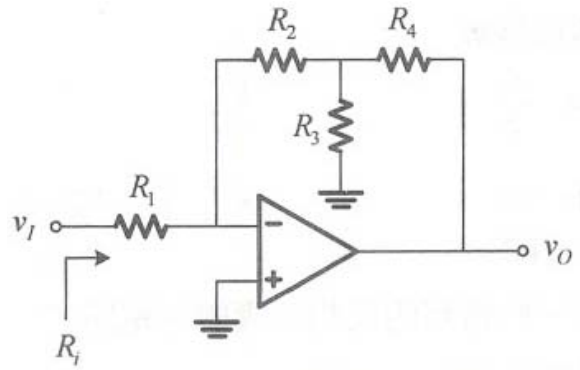


Fig. 6