

系所類別	科目	節次	准考證號碼 (考生請填入)	考試日期
電機工程系碩士班 (電機組)	電子學	第一節		103/4/27

※答案須寫在答案卷內，否則不予計分。

1. Considering circuit in Fig. 1, diodes D1, D2, D3, and resistor R are in series with supplying voltage 15V. Assume that three diodes have I-V characteristics as shown in Fig. 2. Determine R to make  $I_D=0.4A$ . (10%)
2. Considering circuit shown in Fig. 3, the diode has the piecewise linear model of  $V_{D0}=0.65V$  and  $r_D=20\Omega$ . Determine  $V_D$  and  $I_D$ .(10%)

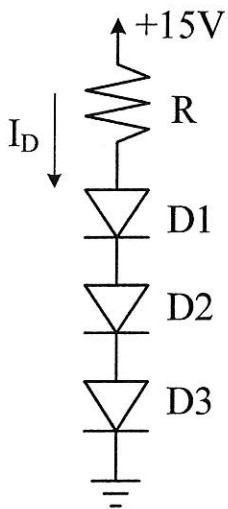


Fig. 1

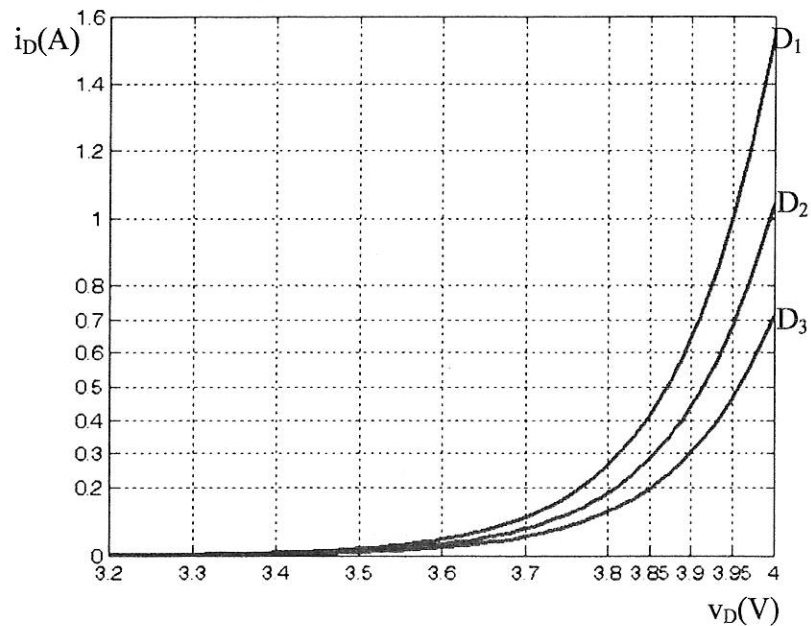


Fig. 2

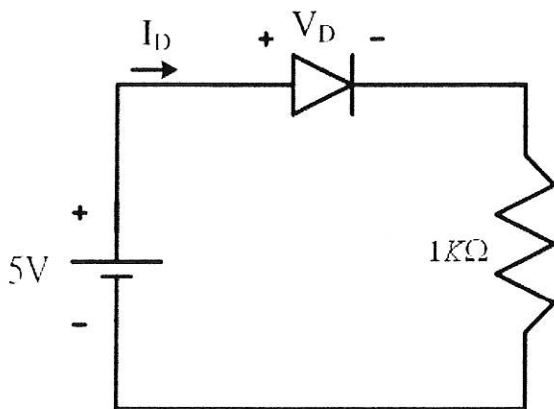


Fig. 3

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3. Considering the ideal operational amplifier circuit shown in Fig. 4, assume the OPamp is operating in the linear region. Determine R to make  $V_o=5V$ . (10%)

4. In Fig. 5, assume that the OPamp is ideal. Derive the relationship between  $v_o$  and  $v_1, v_2, v_3$ . (10%)

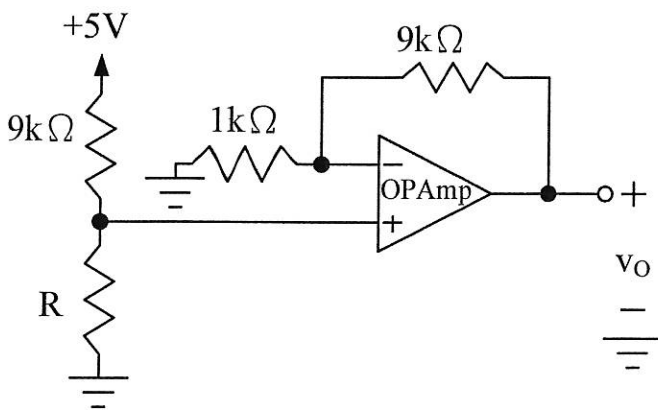


Fig. 4

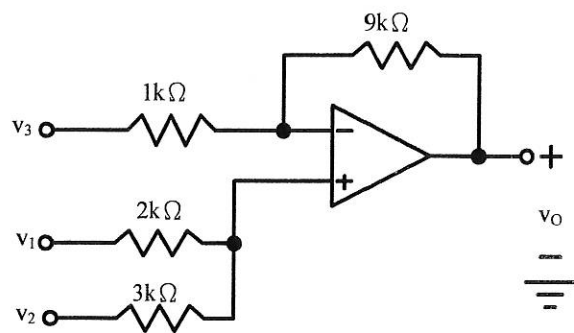


Fig. 5

5. For the circuit shown in Fig. 6 is a RC single time constant circuit.

(A) Derive the transfer function  $T(S)=V_o(S)/V_i(S)$ . (5%)

(B) If  $R=10k\Omega$  and  $C=10\mu F$ , determine the bandwidth of this circuit. (5%)

6. For the circuit shown in Fig. 7, derive the expression for the transfer function  $T(S)=V_o(S)/V_i(S)$ . (10%)

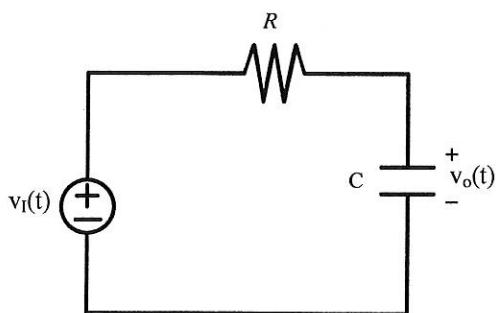


Fig. 6

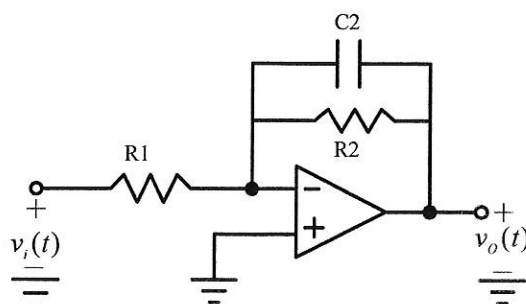


Fig. 7

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7. For the circuit shown in Fig. 8, the NMOSFET has  $V_{th}=1V$  and  $(\mu_n C_{ox})(W/L)=1mA/V^2$ . Calculate  $V_D$  and  $I_D$ . (10%)

8. The Common Source amplifier shown in Fig. 9 is connected to a signal source  $v_{sig}$  with  $R_{sig}=100k\Omega$  and a load resistance  $R_L=10k\Omega$ . Assume that the NMOSFET is properly biased in the saturation region and has the following small signal parameters  $g_m=2mA/V$  and  $r_o=100k\Omega$ . Find its small signal voltage gain  $A_v=v_o/v_{sig}$ . (10%)

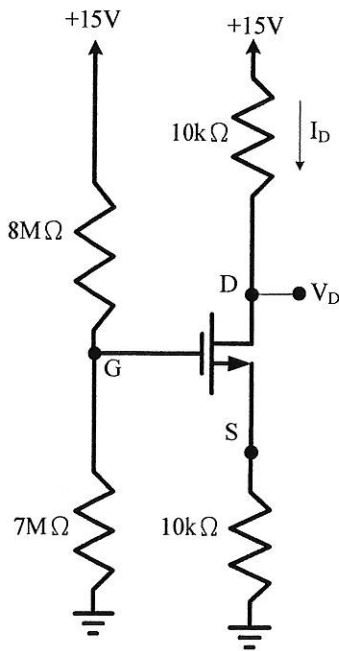


Fig. 8

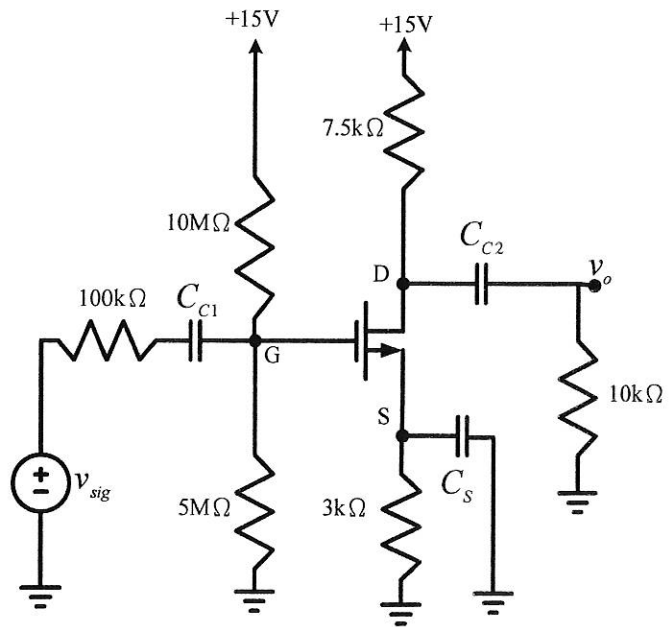


Fig. 9

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9. For the circuit shown in Fig. 10, assume the NPN transistor has  $\beta=100$  and BE forward bias voltage  $V_{BE}=0.7V$ . Find  $I_B$ ,  $I_C$ ,  $I_E$ , and  $V_{CE}$ .(10%)

10. For the circuit shown in Fig. 11, assume the NPN transistor has  $\beta=100$  and BE forward bias voltage  $V_{BE}=0.7V$ . Find  $I_B$ ,  $I_C$ ,  $I_E$ , and  $V_{CE}$ .(10%)

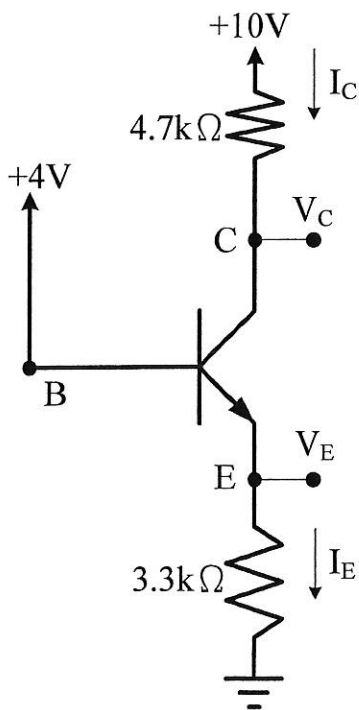


Fig. 10

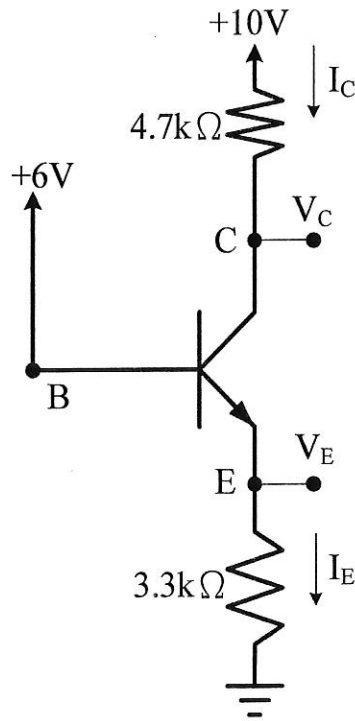


Fig. 11