明新科技大學 98 學年度研究所招生考試 試題卷

系所名稱	類別	科目	節次	准考證號碼 (考生請填入)	考試日期
電機工程研究所 (電機組)	碩士班	電子學	第二節		98/5/3

※答案須寫在答案卷內，否則不予計分。

1. According to Fig. 1, assume that the operational amplifier is ideal and R2/R1=R4/R3. Prove that $v_o=(R2/R1)(v_2-v_1)$. (10%)

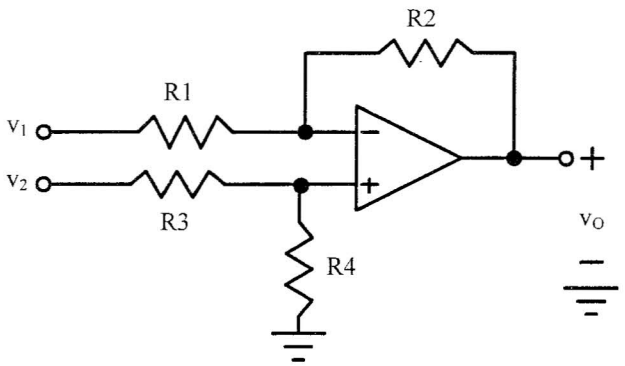

Fig. 1

2. Consider the circuit configuration shown in Fig. 2. Assume that the operational amplifier is ideal. Derive the voltage gain $A_v=v_o/v_I$. (10%)

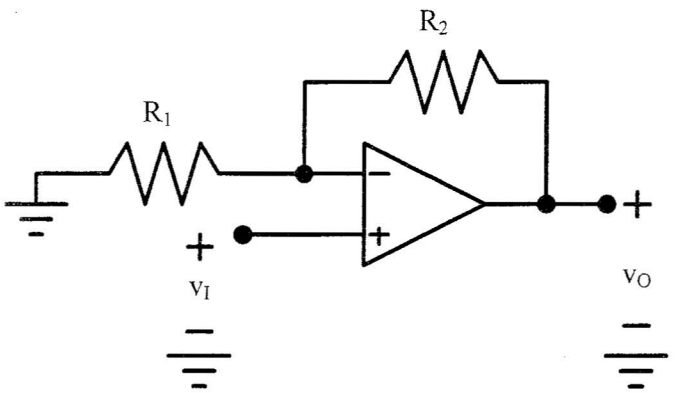

Fig. 2

3. Determine the current I_D and the diode voltage V_D for the circuit shown in Fig. 3 with $V_{DD}=5V$ and $R=1k\Omega$. Assume that the diode piecewise-linear model parameters are $V_{D0}=0.65V$ and $r_D=20\Omega$. (10%)

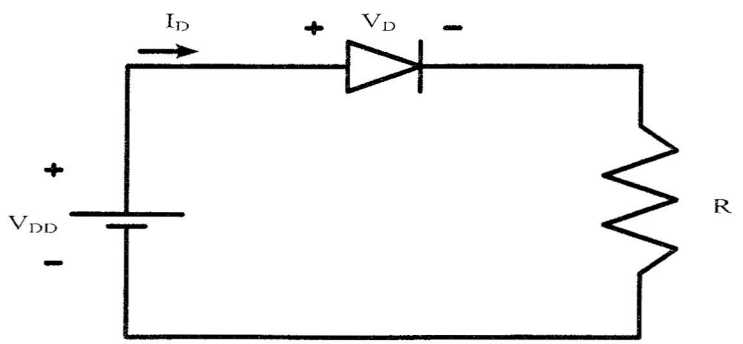

Fig. 3

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4.For the current mirror circuit in Fig. 4 with $V_{CC}=V_{EE}=10V$, assume that the forward voltage drop of $V_{BE}=0.7V$. Find the required value of R to implement the constant current source $I_{REF}=1mA$. (10%)

5. Analyze the circuit of Fig. 5 to determine I_C and V_C. Assume that $\beta=100$. (10%)

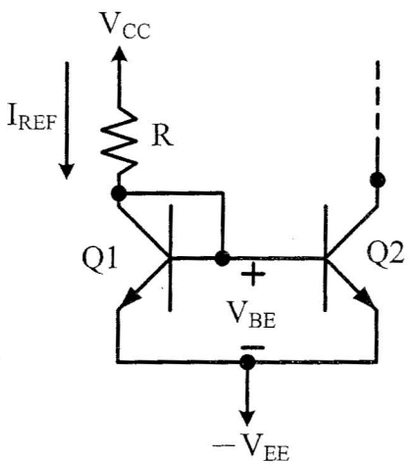


Fig. 4

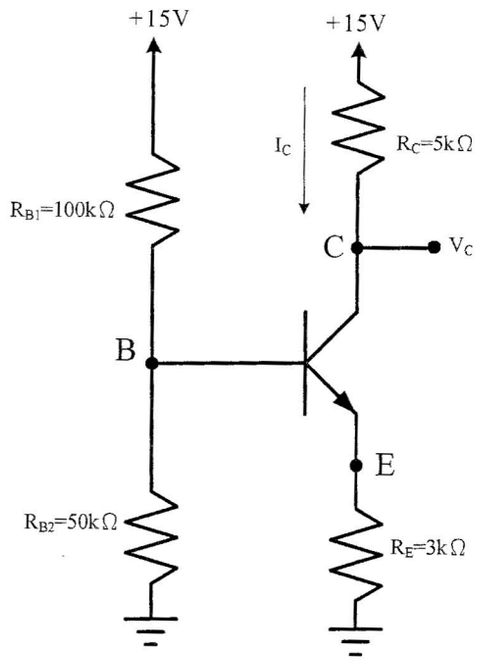
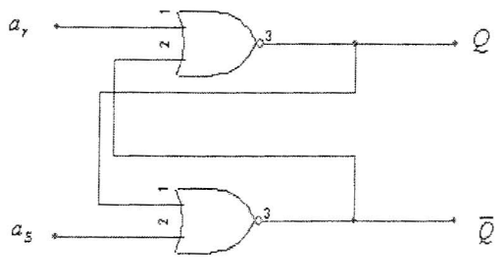


Fig. 5

6. Find the truth table in Fig. 6. (10%)



a_R	a_S	Q_{n+1}	$\overline{Q_{n+1}}$
0	0		
0	1		
1	0		
1	1		

Fig. 6

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7. Find the time constant of the circuit shown in Fig. 7. (10%)

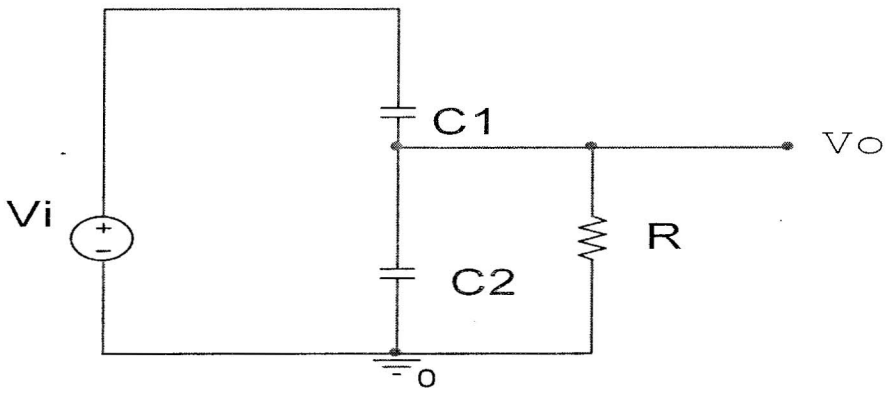

Fig. 7

8. Find the value required for R, and find the dc voltage V_D in Fig. 8 where

$I_D = 80\mu A$

$V_t = 0.6v \qquad \mu_n C_{ox} = 200\mu A/V^2 \quad \mathrm{L} = 0.8\mu m \quad and \quad \mathrm{W} = 4\mu m.$

Neglect the channel-length modulation effect. (10%)

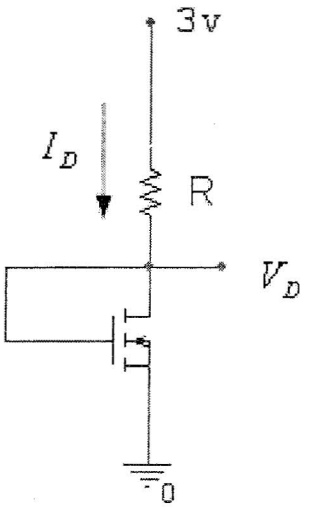

Fig. 8

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9. Find R_D *and* R_S in Fig. 9. The transistor operates at $I_D = 0.4mA$ *and* $V_D = +0.5v$ with

$$V_t = 0.7V, \mu_n C_{ox} = 100\mu A/V^2, L = 1\mu m, and\ W = 32\mu m.$$

Neglect the channel-length modulation effect. (10%)

10. Plot high-frequency equivalent circuit model for the MOSFET shown in Fig. 10. (10%)

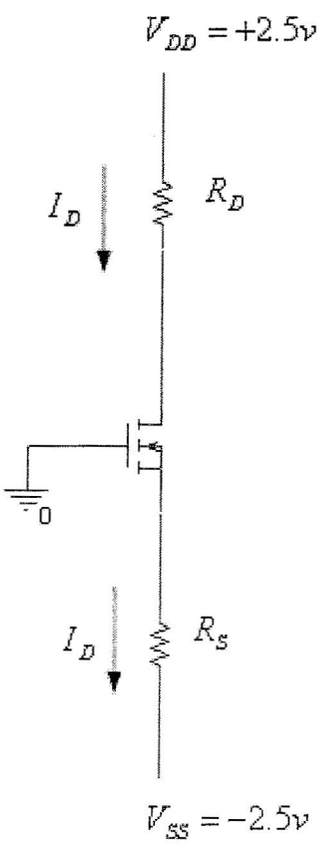

Fig. 9

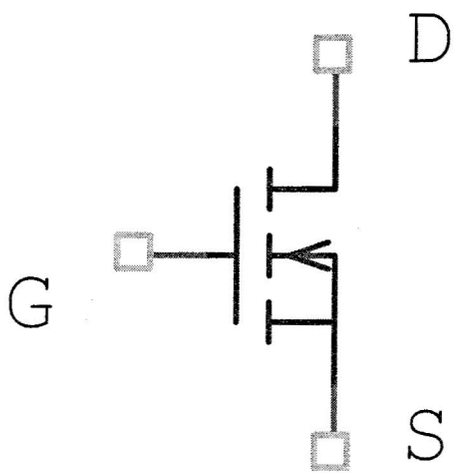

Fig. 10