國立彰化師範大學 95 學年度碩士班招生考試試題

系所：光電科技研究所　　選考：乙組　　科目：電子學

☆☆請在答案紙上作答☆☆　　

1. Find values for the resistance in the circuit of Fig. 1 with an input resistance of 20 kΩ and a gain of 100. (10%)
2. For the circuit of Fig. 2, use the constant-voltage-drop diode model to find numerical values of the dc component of the output voltage, the peak diode current, and the peak inverse voltage for the case in which v_s is a 12-V (rms) sinusoid, V_{DO}=0.7 V, and R=100Ω. [V_{DO} is the intercept on the voltage axis for diodes (D_1~D_4). D_1 is the same as D_2, D_3, or D_4.] (15%)
3. Please analyze the circuit of Figs. 3, 4, and 5 to determine the voltages at all nodes and the currents through all branches. Which (Figs. 3 or 4) is a bad design? Why? (15%)
4. For the circuit of Fig. 6, let $V_{DD}=V_{SS}=5V$, $V_{tn}=1V$, $V_{tp}=-1V$, all channel lengths = 10μm, $k'_n=20\mu A/V^2$, $k'_p=8\mu A/V^2$, and $\lambda=0$. For $I_{REF}=10\mu A$, find the widths of all transistors so as to obtain $I_2=50\mu A$, $I_3=2.5\mu A$, and $I_5=50\mu A$. It is further required that the voltage at the drain of Q_2 be allowed to go down to within 0.5V of the negative supply and that the voltage at the drain of Q_5 be allowed to go up to within 0.5V of the positive supply. (15%)
5. For the enhancement-load amplifier. Let $W_1=100\mu m$, $L_1=6\mu m$, $W_2=6\mu m$, $L_2=30\mu m$. If the body-effect parameter $\chi=0.2$, find the voltage gain without and with the body effect taken into account. Neglect the effect of r_o. (15%)
6. If in the circuit of Fig. 7, A is an ideal voltage amplifier of gain 100 V/V, find A_M, $F_L(s)$, and $F_H(s)$. Also find ω_L,ω_H, and the frequencies at which the gain reduces to unity. [A_M is the magnitude of midband gain in volts per volt. $F_L(s)$ and $F_H(s)$ are functions that account for the dependence of gain on frequency in the low-frequency band and in the high-frequency band, respectively. The extent of the midband is defined by two frequencies ω_L and ω_H.] (15%)
7. Use the feedback method to find the voltage gain V_o/V_s, the input resistance R_{in}, and the output resistance R_{out} of the inverting op-amp configuration of Fig. 8. Let the op amp have open-loop gain $\mu=10^4$ V/V, a differential input resistance $R_{id}=100k\Omega$, and an output resistance $r_o=1k\Omega$. (Hint: The feedback is of shunt-shunt type.) (15%)

題目與圖引用 “Microelectronic Circuits / Sedra and Smith (Oxford 出版)”一書

Fig.1

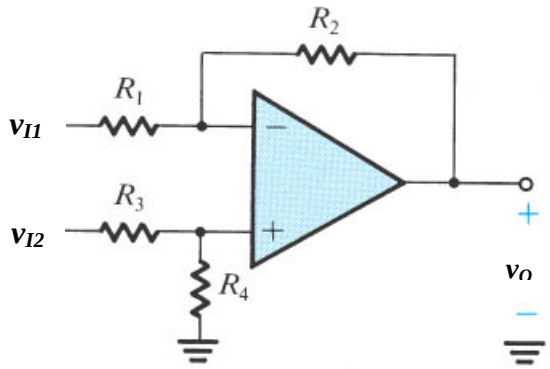
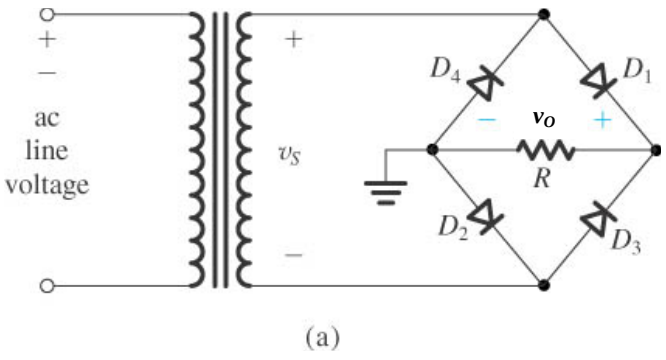


Fig. 2



(a)

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Fig.3

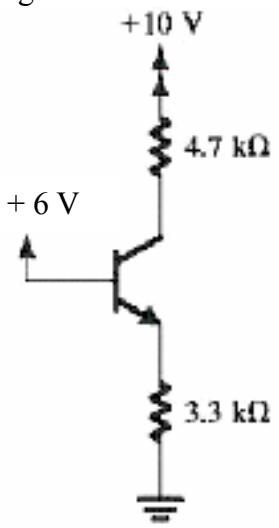

Fig. 4

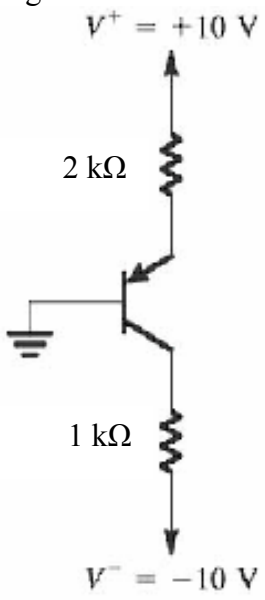

Fig.5

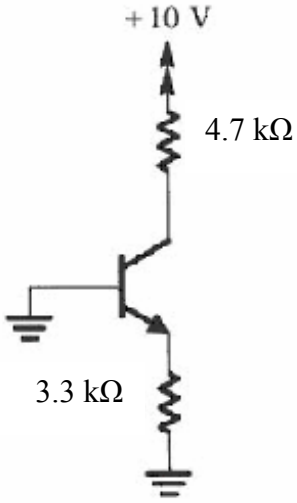

Fig.6

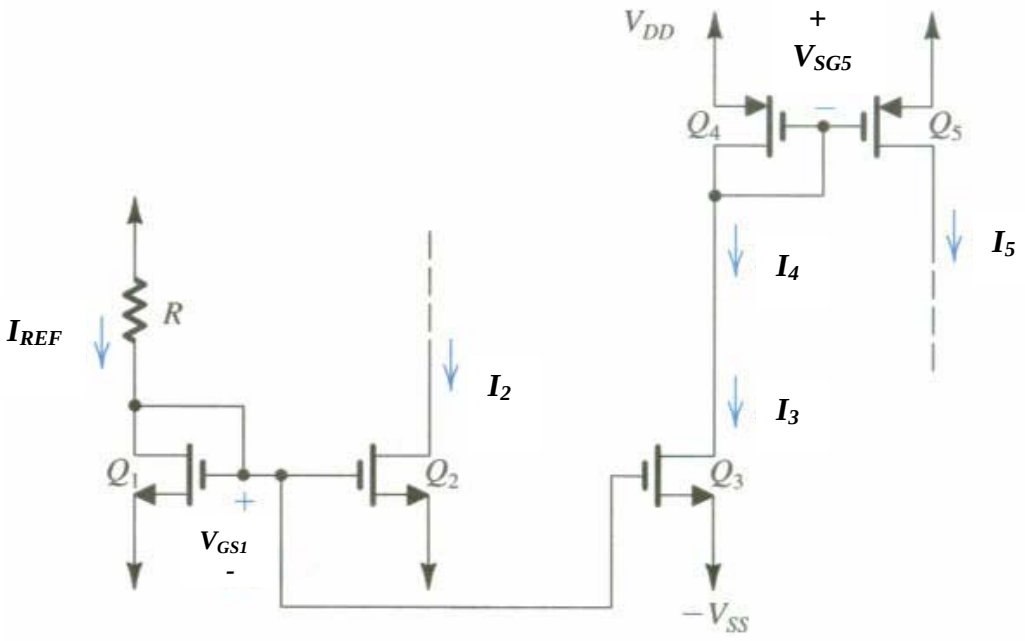

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Fig.7

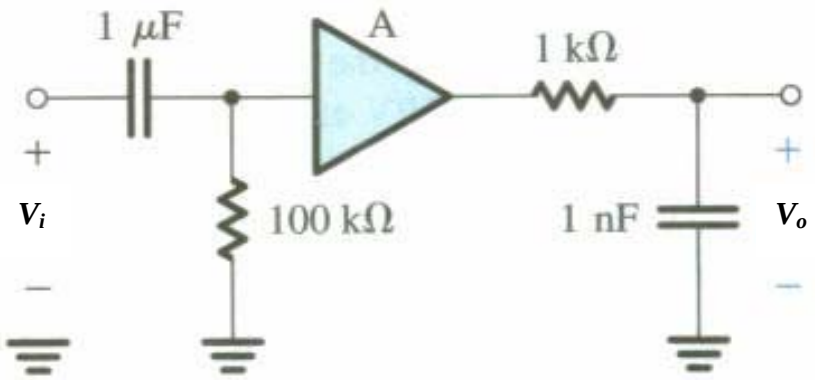
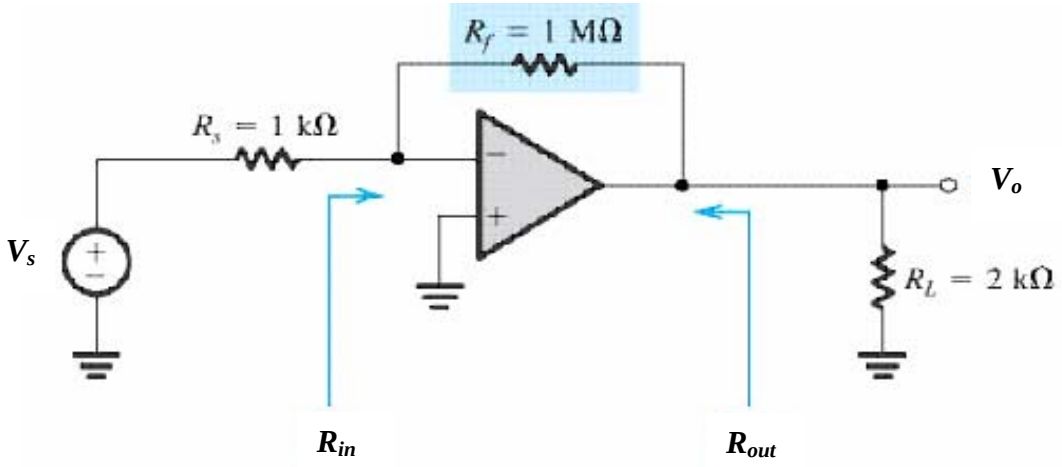
Fig. 8