

國立彰化師範大學 99 學年度碩士班招生考試試題

系所：電機工程學系

科目：電子學

☆☆請在答案紙上作答☆☆

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計算或推導過程須詳細寫出，否則不予計分。

1. In the circuit of Figure 1, diodes D_1 and D_2 have different cross section areas but are otherwise identical (i.e., $I_{S1} \neq I_{S2}$). Assume V_{in} to be greater than the cut-in voltage of diodes. Determine the current flowing through each diode. (10%)

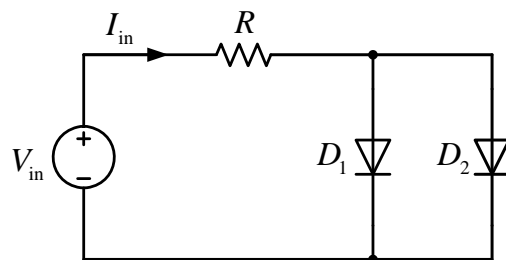


Figure 1

2. For the circuit shown in Figure 2, the BJT is specified to have $\beta = 100$. Find:
- the small-signal resistance r_e , (5%)
 - the input resistance R_{in} , (5%)
 - the voltage gain v_o/v_{sig} . (5%)

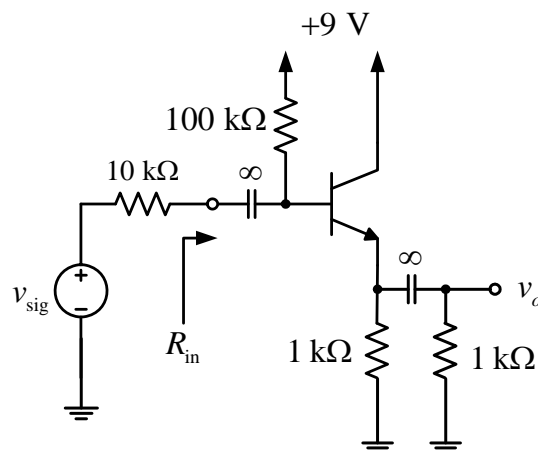


Figure 2

3. Consider the Widlar current source circuit shown in Figure 3. Assume Q_1 and Q_2 to be matched devices. Derive an expression for the output current I_o . (10%)

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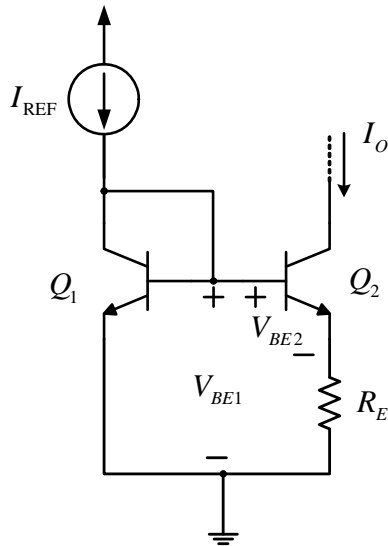


Figure 3

4. The transistors in the active-loaded MOS differential amplifier of Figure 4 are characterized with the same transconductance g_m and the same output resistance r_o . Assuming $g_m r_o \gg 1$, find:
- the output resistance R_o of the circuit, (10%)
 - the differential gain A_d . (10%)

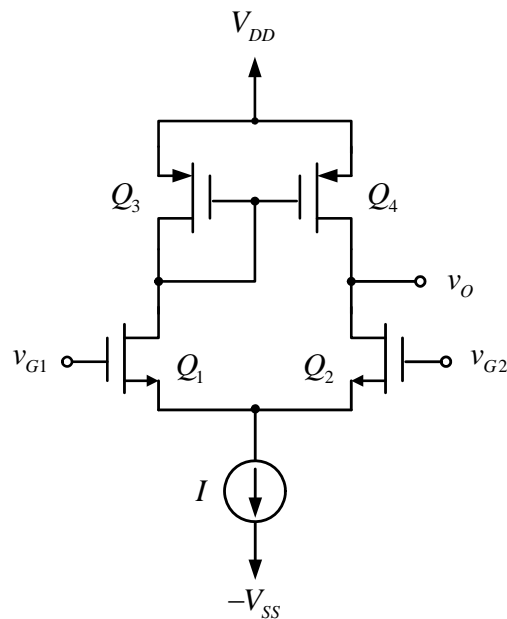


Figure 4

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5. Figure 5 shows an op amp connected in the noninverting configuration. Find expressions for open-loop gain A , feedback factor β , the closed-loop gain V_o/V_s , the input resistance R_{in} , and the output resistance R_{out} . (25%)

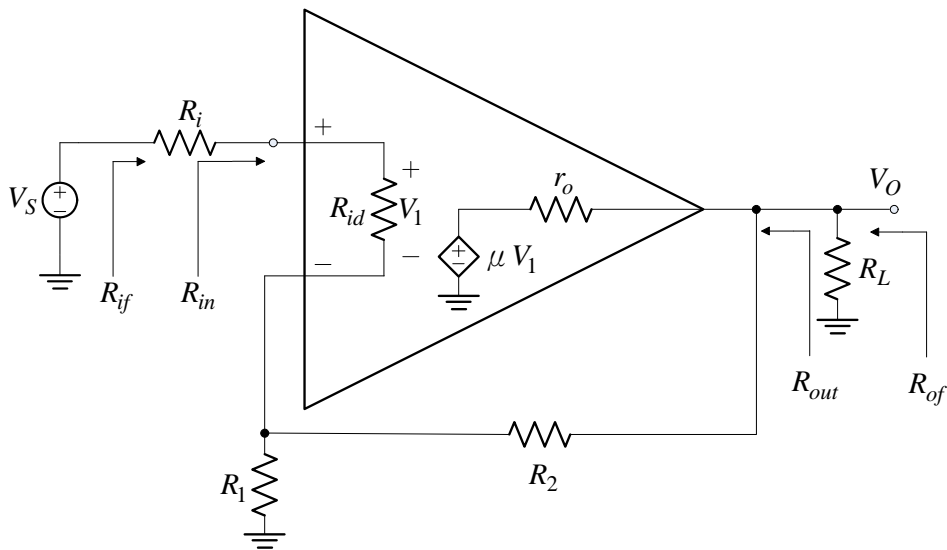


Figure 5

6. Figure 6 shows an oscillator. Find expression for the output frequency f_o . (10%)

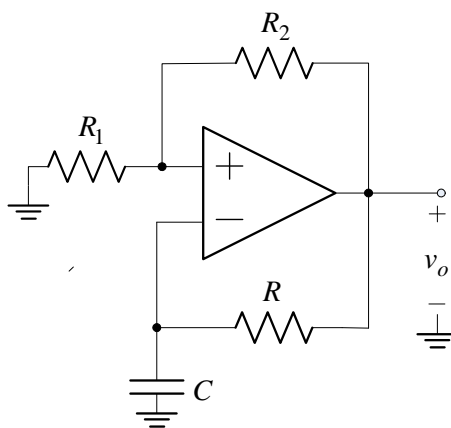


Figure 6

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7. Figure 7 shows a filter. Find transfer functions $V_{O1}(s)/V_i(s)$ and $V_{O2}(s)/V_i(s)$. (10%)

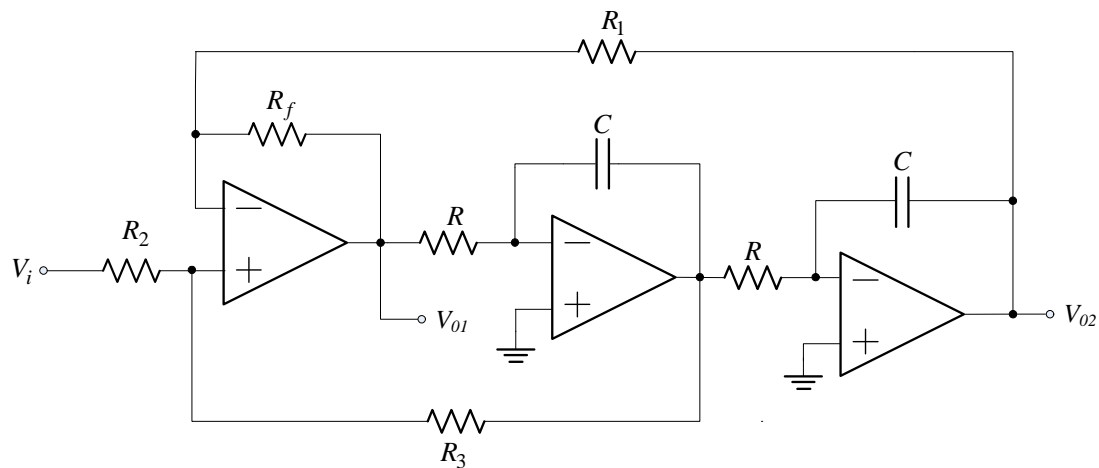


Figure 7