

國立臺北科技大學  
九十七學年度研究所碩士在職專班(含EMBA)入學考試

電腦與通訊研究所  
丁組：電子學試題

填准考證號碼

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注意事項：

1. 本試題共【6】題，配分共100分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在試卷答案欄內，否則不予計分。

第一頁 共二頁

1. Use the superposition principle to find the output voltage ( $V_o$ ) of the circuit shown in Figure 1. (10 分)

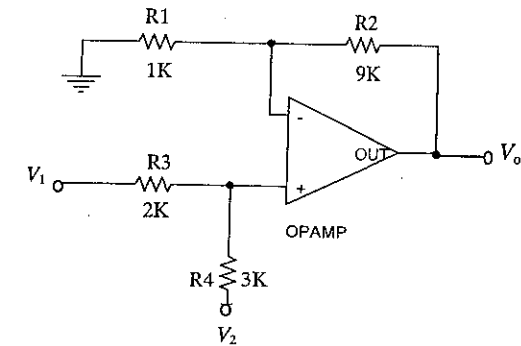


Figure 1

2. For the circuit shown in Figure2, if current gain  $\beta = 200$  for each transistor, determine: (a)  $I_{E1}$  (b)  $V_{C1}$  (10 分)

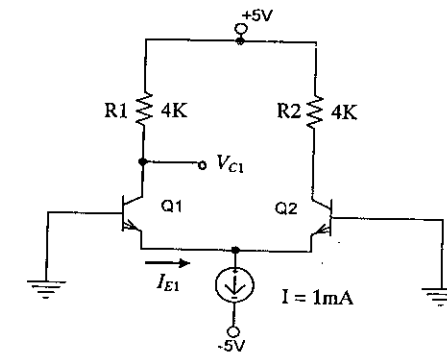


Figure 2

3. (a) Determine the logic function implemented by the circuit in Figure 3. (10 分)  
(b) Given inputs A, B, C, and D, design a CMOS circuit to implement the logic function  $Y = \overline{(A + B)(C + D)}$ . (10 分)

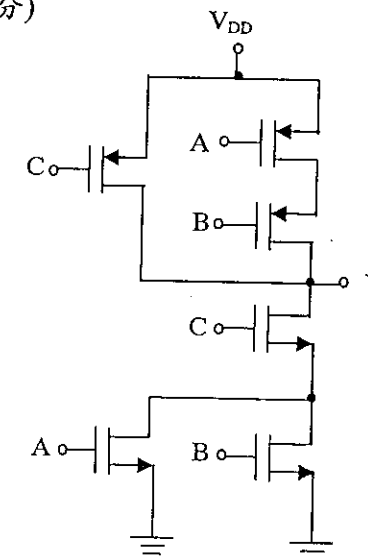


Figure 3

注意：背面尚有試題

4. Analyze the circuit shown in Figure 4 to determine the voltages  $V_S$ ,  $V_{GS}$ ,  $V_D$  and the current  $I_D$ . Let the threshold voltage  $V_t = 1V$ , and  $K'_n \left( \frac{W}{L} \right) = 1mA/V^2$ , where  $K'_n$  is the value of MOSFET transconductance. The  $W$  and  $L$  is the channel width and channel length of MOSFET, respectively. Neglect the channel-length modulation effect (i.e. assume  $\lambda=0$ ). (20 分)

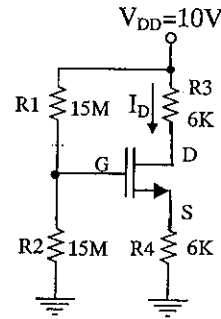


Figure 4

5. A Butterworth active filter is shown in Figure 5. Find the maximum gain of the filter and its bandwidth. (20 分)

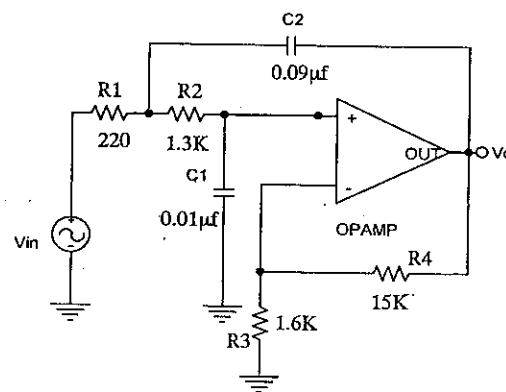


Figure 5

6. A negative feedback amplifier is shown in Figure 6.
- (a) Prove that the total system gain (closed-loop gain) is  $A_{sys} = S_o/S_{in} = A/(1+AH)$ , where Forward-path gain =  $A$ , Feedback gain =  $H$ , Closed-Loop (System gain) =  $A_{sys}$ . (10 分)

- (b) Prove that the Gain Sensitivity is  $\frac{dA_{sys}}{A_{sys}} = \left( \frac{A_{sys}}{A} \right) \left( \frac{dA}{A} \right)$ . (10 分)

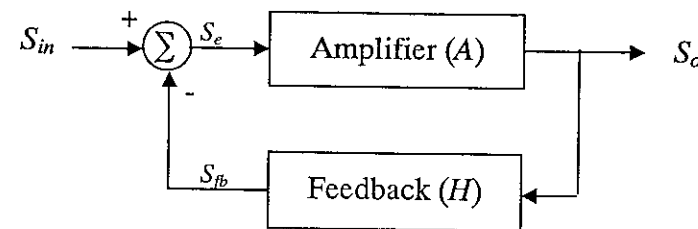


Figure 6