

# 國立中央大學九十學年度碩士班研究生入學試題卷

所別: 光電科學研究所 不分组 科目: 電子學 共 1 頁 第 1 頁

1. Employing the MOSFET characteristic curves of Fig. P-1. Show how saturation drain current values  $I_{DSS}$  can be obtained and from then other  $I_{DS}$  drain current values in saturation of  $V_{GS} = -9V$ . (20 分)
2. Verify that the exclusive OR logic function can be performed by the diode logic gate of Fig. P-2. (20 分)
3. For the Schmitt trigger circuit shown in Fig. P-3. Assume  $i_B$  and  $V_{BE}$  are negligibly small. Please determine the transfer curve  $V_O$   $V_S$ ,  $V_T$ . (20 分)
4. Figure P-4 shows a transconductance amplifier with an infinite input resistance, a  $10\text{-K}\Omega$  output resistance, and a transconductance  $G_m = 0.1\text{A/V}$ . A  $1\text{-M}\Omega$  resistor  $R_f$  is connected from the output of the amplifier back to its input. The amplifier is fed with a source  $V_s$  having a source resistance  $R_s$ . Find  $R_{in}$ ,  $V_o/V_s$ , and  $R_{out}$ . (Hint: Miller's theorem is useful in finding  $R_{in}$  but not  $R_{out}$ .) (20 分)
5. An op amp having a single-pole rolloff at  $100\text{Hz}$  and a low-frequency gain of  $10^5$  is operated in a feedback loop with  $\beta = 0.01$ . What is the factor by which feedback shifts the pole? To what frequency? If  $\beta$  is changed to a value that results in a closed-loop gain of  $+1$ , to what frequency does the pole shift? (20 分)

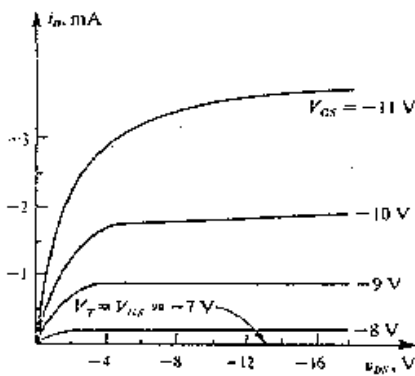


Fig. P-1

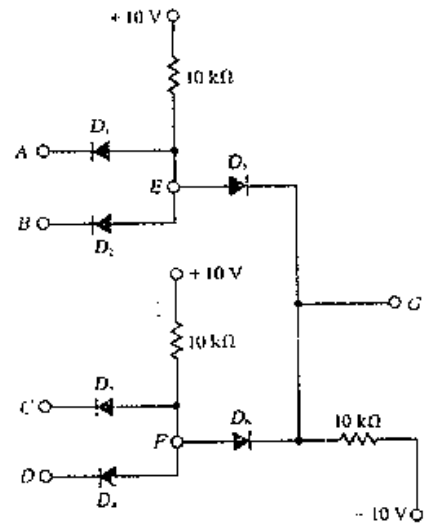


Fig. P-2

