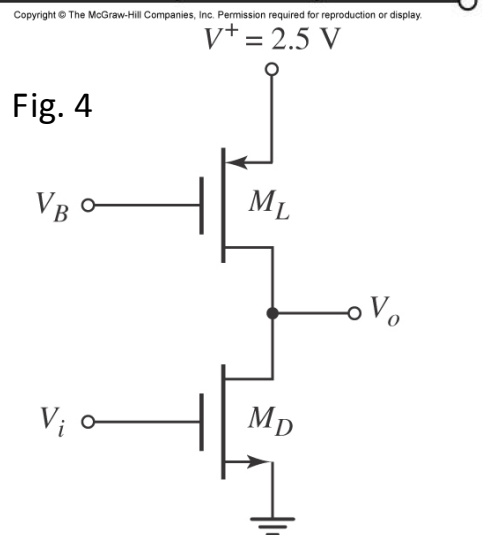
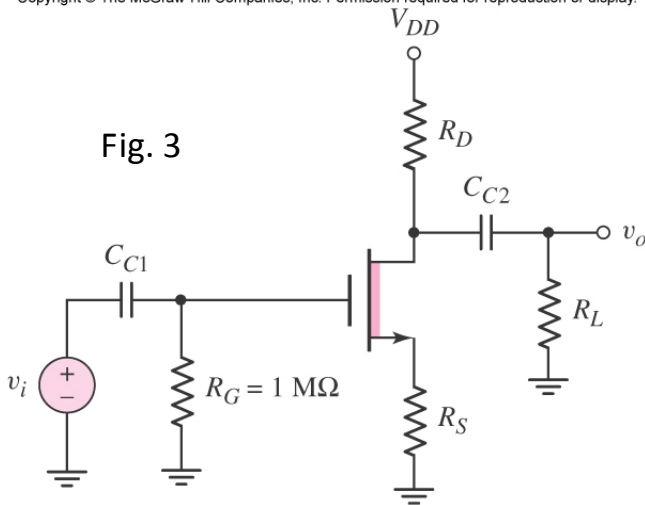
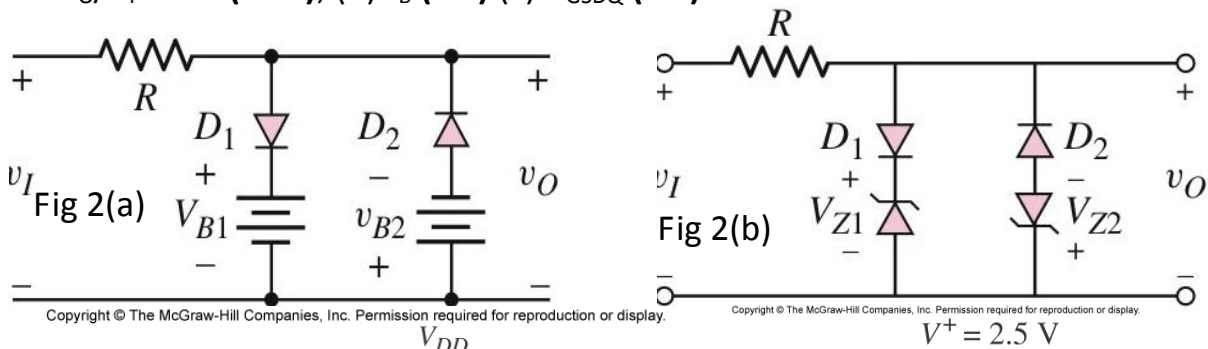


國立高雄海洋科技大學104學年度碩博士班考試入學
微電子工程系碩士班—微電子學試題

【※須使用計算機】

1. A Si-PN junction with boron doping 10^{18} cm^{-3} and phosphorous doping 10^{17} cm^{-3} , respectively? $\epsilon_r=11.7$, $n_i=1.5 \times 10^{10} \text{ cm}^{-3}$, what is the (a) built-in potential **(5%)** (b) space charge width **(5%)** (c) peak electric field **(5%)** (d) junction capacitance per area **(5%)**
2. (a) For the circuit in Fig 2(a), plot the Voltage transform characteristic of V_i to V_o and For the circuit in Fig 2(b), plot the output voltage with the input voltage in sine wave **(5%)**; (b) Do these two circuits show the same Voltage transform characteristic? Which circuit is suit for IC design? Why? **(5%)**
3. For the circuits in Fig. 3, the parameters of the transistor are $V_{TN} = -1 \text{ V}$, $K_n = 2 \text{ mA/V}^2$ and $\lambda = 0$. The parameters of the circuit are $V_{DD} = 4 \text{ V}$ and $R_L = 10 \text{ K}\Omega$. (a) Design the circuit for $I_{DQ} = 1 \text{ mA}$ and $V_{DSQ} = 2 \text{ V}$ **(10%)**; (b) Determine small-signal voltage gain **(10%)**
4. For the circuits in Fig. 4, the parameters of the transistor are $V_{TND} = 0.5 \text{ V}$, $V_{TPL} = -0.5 \text{ V}$, $(W/L)_L = 100$, $\lambda_D = 0.01 \text{ V}^{-1}$, $\lambda_L = 0.02 \text{ V}^{-1}$, $k'_n = 200 \mu\text{A/V}^2$ and $k'_p = 80 \mu\text{A/V}^2$ and $I_{DQ} = 1 \text{ mA}$ at Q point. (a) Design the $(W/L)_D$ for small-signal voltage gain $A_v = V_o/V_i = -50$ **(10%)**; (b) V_B **(5%)** (c) V_{GSDQ} **(5%)**?



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5. 如圖5所示電路，其電晶體參數 $V_{EB(on)}=0.7V$ 及 $\beta=100$ ，若 $V_{EC}=V^+/2$ ，試求 I_B 、 I_C 、 I_E 及 R_C (15%)。

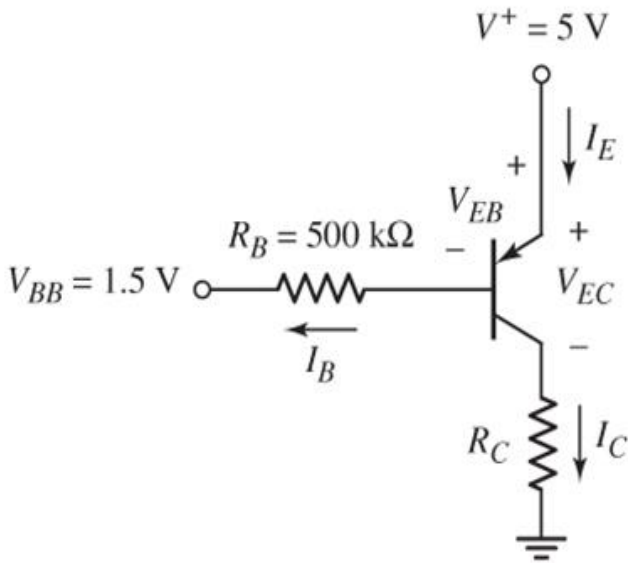


圖 5

6. 如圖 6 所示電路，其電晶體參數 $V_{BE(on)}=0.7V$ 、 $V_A=80V$ 及 $\beta=100$ 。(a)求訊號源所見之輸入電阻(5%)；(b)求其小訊號電壓增益(10%)。

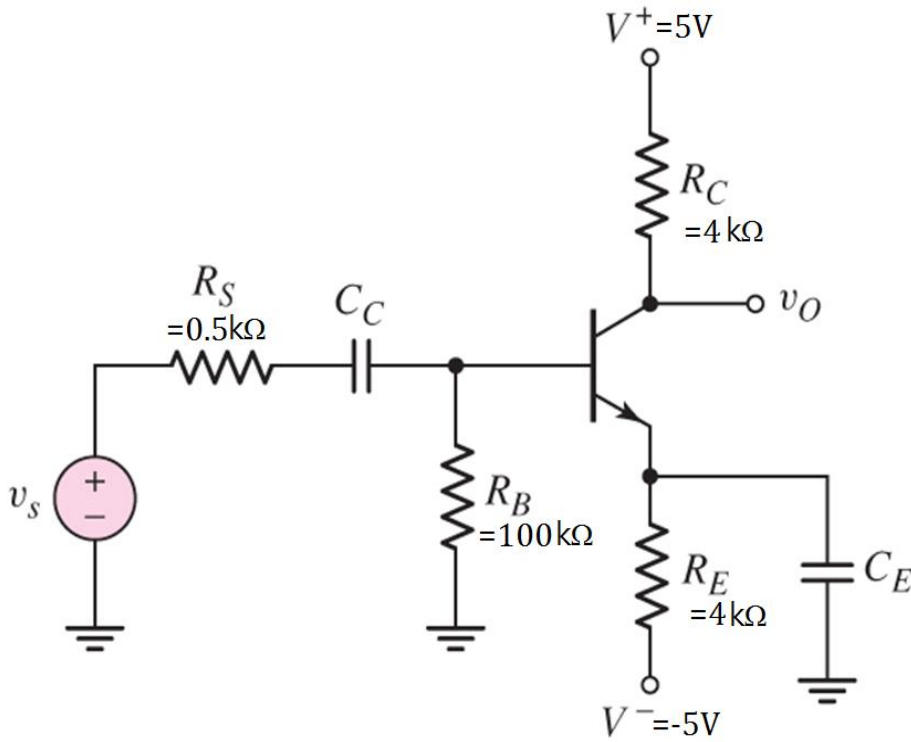


圖 6

<試題結束>