國立高雄海洋科技大學 102 學年度碩士班考試入學

微電子工程系碩士班—微電子學試題

【*須使用工程用計算機】

1. About the enhanced mode P-MOSFET, (a) Plot the inverse channel at V_{SG} = -5 V< V_{TP} = -3 V，V_{SD} = -2V (consider the voltage drop in the channel), and identify this device is working in the saturated or non-saturated region? Why? (7%) (b) while the V_{SG} = -5 V < V_{TP} = -3 V，V_{SD} = -3V, does all the inverse channel fills between source and drain? Is the device working with the current? Why? (8%)

2. About the circuit shown in Fig. 1, the Vs is the sine wave with half-wave rectified, the diode with the forward voltage drop Vr and the R is several kΩ. (a) Plot the input Vs and output Vo in two period within the same time domain, and identify which region is charging or discharging? (5%) (b) How does the charging speed is consistent with the Vs. (5%) (c) How does the discharging work and why does the output wave form ignore the input wave form until the next charging? (5%) (d) in detail analysis, does the discharging start from the Vs drop out of the peak value? Why? (5%)

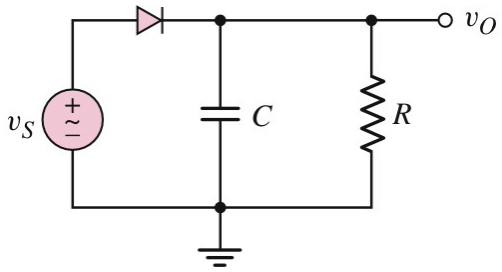

Fig.1

3. Calculate the transconductance of an n-channel MOSFET. Consider an n-channel MOSFET with parameters V_{TN}=1 V, ($\mu_n C_{ox}/2$)=20 μA/V^2, and W/L=40. Assume the drain current is I_D=1 mA. (10%)

4. For the circuit shown in Fig.2, assume that R_1=30 kΩ, R_2=20 kΩ, R_D=20 kΩ, V_{DD}=5 V, V_{TN}=1 V, and K_n=0.1 mA/V^2.

   (a) Calculate the drain current and drain-to-source voltage of a common-source circuit with an n-channel enhancement-mode MOSFET. (10%)

   (b) Find the power dissipated in the transistor. (10%)

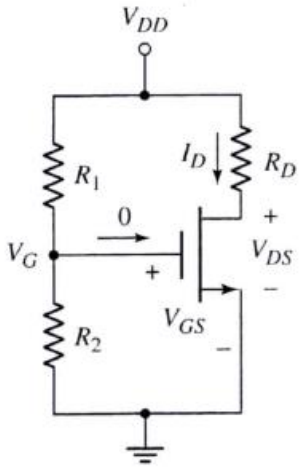

Fig.2

＜接續背面＞

5. 如圖 3 所示之電路，其中所有電晶體之 β=100，求出每個電路之 I_C 及 V_{CE}。(15%)

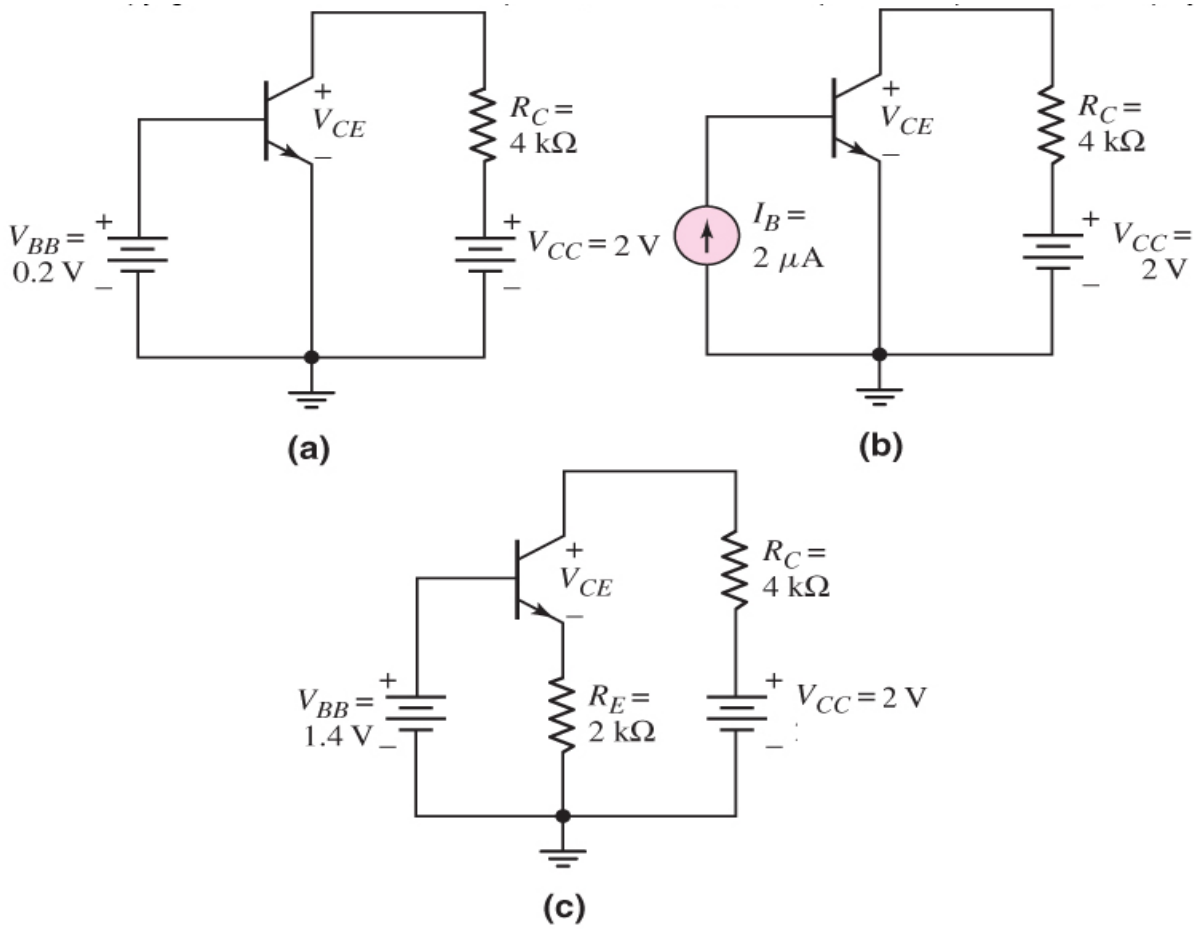

圖 3

6. 如圖 4 之電路，β=150、V_{BE}(on)=0.7V、V_A=∞。(a)找出操作點之 I_{CQ} 與 V_{CEQ}；(b)求小訊號電壓增益；(c) 求輸入電阻 R_i。(20%)

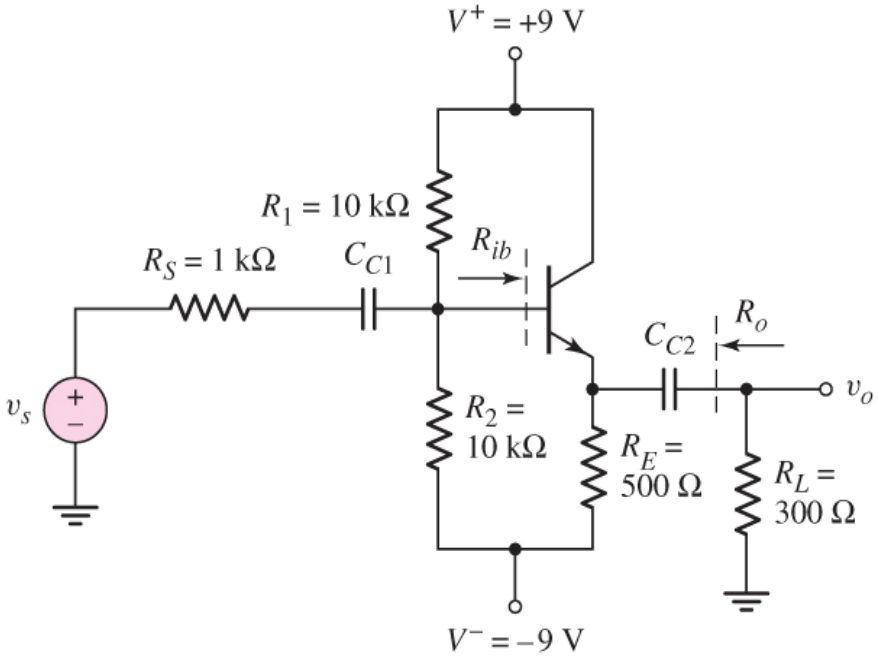

圖 4

＜試題結束＞