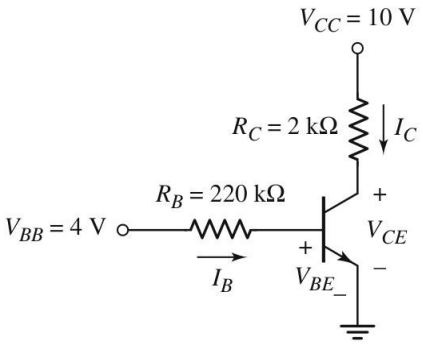
國立高雄海洋科技大學 106 學年度碩博士班考試入學
微電子工程系碩士班---微電子學試題【＊須使用計算機】

1.10%Figure (a) shows the circuit without explicitly showing the voltage sources. The parameters are: V_{BB}=4 V, R_B = 220kΩ, R_C = 2kΩ, V_{CC} = 10V, V_{BE}(on)=0.7V, and β =200.

(1) Calculate the base (I_B), collector (I_C), and emitter currents (I_E) and the C-E voltage (V_{CE}) for a common-emitter circuit.

(2) Calculate the transistor power dissipation (P_T).



(a)

2.14%Analyze a pnp transistor circuit. Consider the circuit shown in Figures (a) and (b). The transistor parameters are V_{EB}(on)= 0.7 V, β = 80, and V_A =∞. Determine the quiescent parameter values and then the small-signal voltage gain including: (Hint: $r_\pi = \dfrac{\beta V_T}{I_{CQ}}$ and V_T=0.026 V)

(1)Thevenin equivalent voltage (V_{TH}),

(2) Thevenin equivalent resistance (R_{TH}),

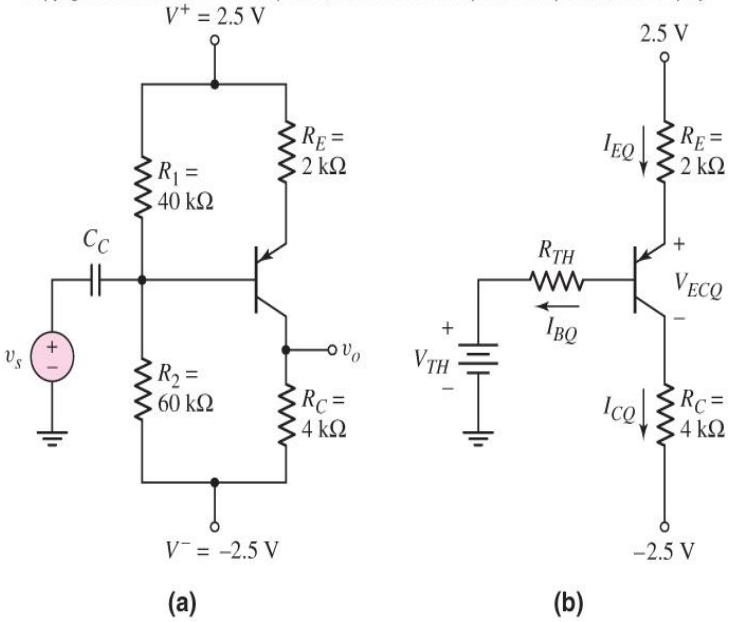
(3) collector current (I_{CQ}),

(4) collector-emitter voltage (V_{ECQ}),

(5)diffusion resistance (r_π),

(6) transconductance (g_m),

(7)small-signal transistor output resistance (r_o).



(a) (b)

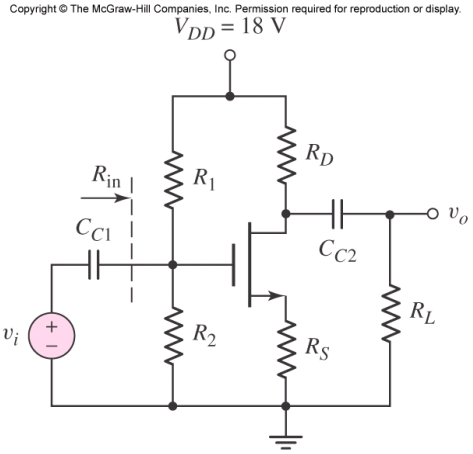
背面有試題

3. 16% (a) What are the two basic processes which cause electrons and holes to move in a semiconductor? 4% (b) Describes and plots how the effect on e^- in (a) caused by electric field contribute to the current? 3% (c) Describes and plots how the effect on e^- in the other process of (a) contribute to the current? 3% (d) Describes and plots how the effect on h^+ in (a) caused by electric field contribute to the current? 3% (e) Describes and plots how the effect on h^+ in the other process of (a) contribute to the current? 3%

   All the answers of (b) to (e) have to be included vector and moving direction.

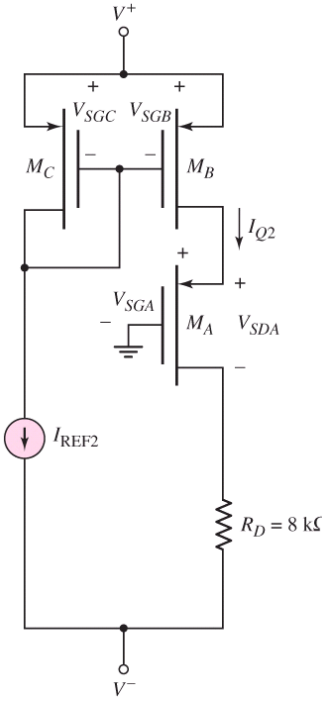
$$J_{np} = |q| \times n(p) \times |v_{dn}| = |q| \times n(p) \times |\mu_{np} E| \qquad J_{np} = |q| D_{np} \frac{dn(p)}{dx}$$

4.



30% Design the circuit in Figure. The DC values are to be I_{DQ} = 6 mA, V_{GSQ} = 2.8 V, and V_{DSQ} = 10 V. The g_m = 2.2 mA/V. Let R_L = 1 kΩ, and Av = -1, and R_{in} = 100 kΩ. Find R_1, R_2, R_S, R_D, K_n and V_{TN}.

5. 30%In Figure, all transistors have parameters V_{TP} = -0.4 V and $k`_p$ = 0.05 mA/V^2.The bias source are V^+ = 5V and V^- = -5V. The currents are to be I_{Q2} = 0.2 mA and I_{REF2} = 0.125 mA. For M_B, we require V_{SDB}(sat) = 0.8 V, and for M_A, we require V_{SDA} = 4V. Transistor M_A and M_B are matched. (a) Find the W/L ratios of the transistors. (b) Find the value of R_D.



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