

國立高雄大學 101 學年度研究所碩士班招生考試試題

科目：電子學
 考試時間：100 分鐘

系所：應用物理學系
 本科原始成績：100 分

是否使用計算機：是

- The reverse-saturation current of a silicon pn junction diode at $T = 300 \text{ K}$ is $I_s = 10^{-12} \text{ A}$. Determine the temperature range over which I_s varies from $2 \times 10^{-12} \text{ A}$ to $60 \times 10^{-12} \text{ A}$. (20%)
- With the circuit in Fig. 1, let $\beta = 100$. (a) Find R_{TH} and V_{TH} for the base circuit. (10%) (b) Determine I_{CQ} , V_{CEQ} . (10%)
- If the emitter voltage (V_E) of the circuit shown in Fig. 2 is 1 V, assume that $|V_{BE}| = 0.7 \text{ V}$, what are V_B , I_B , I_E , I_C , V_C , β and α ? (20%)
- Determine the deviation from the ideal due to a finite differential gain. Consider an inverting op-amp with $R_1 = 10 \text{ k}\Omega$ and $R_2 = 100 \text{ k}\Omega$ in Fig. 3. Determine the closed-loop gain for: $A_{od} = 10^2$, 10^3 , 10^4 , 10^5 and 10^6 . Calculate the percent deviation from the ideal gain. (20%)
- Determine the corner frequencies and limiting horizontal asymptotes of a common-emitter circuit with an emitter bypass capacitor. Consider the circuit in Fig. 4 with parameters $R_E = 4 \text{ k}\Omega$, $R_C = 2 \text{ k}\Omega$, $R_S = 0.5 \text{ k}\Omega$, $C_E = 1 \mu\text{F}$, $V^+ = 5 \text{ V}$, and $V^- = -5 \text{ V}$. The transistor parameters are: $\beta = 100$, $V_{BE(on)} = 0.7 \text{ V}$, and $r_o = \infty$. (20%)

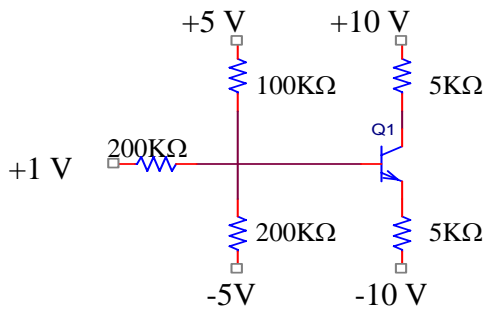


Fig. 1

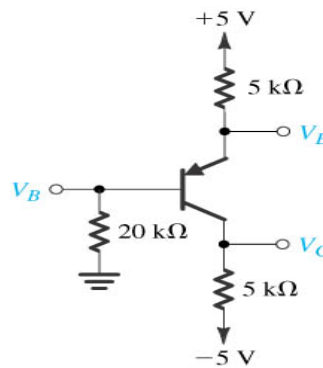


Fig. 2

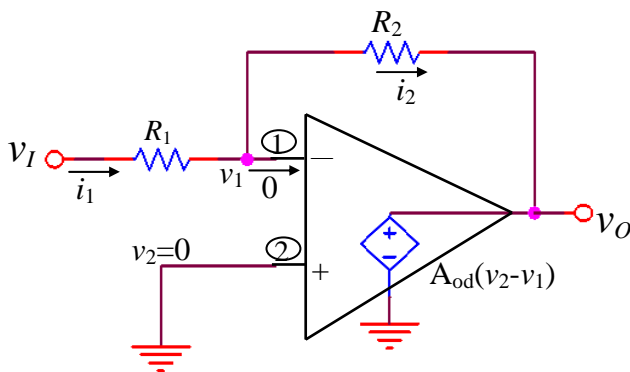


Fig. 3

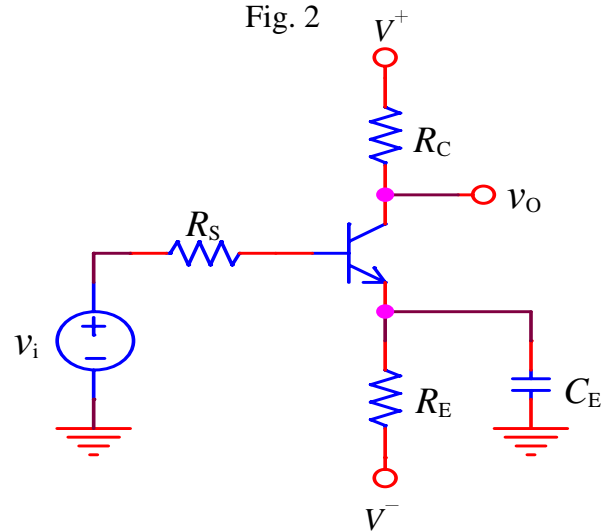


Fig. 4