

本試題是否可以使用計算機: 可使用, 不可使用 (請命題老師勾選)

1. If a voltage source $V(t) = 100\sin 10t$ Volt is applied onto a RL series circuit with $R = 100\Omega$, $L = 20H$ and the initial current=0, please find the current in the circuit $i(t)=?$ (10%)
2. For a p-n junction with $N_a=10^{17}/\text{cm}^3$ and $N_d=10^{16}/\text{cm}^3$, find, at $T=300k$, the built-in voltage (5%) and the width of the depletion region (15%). Use $n_i=1.5 \times 10^{10}/\text{cm}^3$.
3. The 6.8V zener diode in the circuit of figure 1 is specified to have $V_Z = 6.8V$ at $I_Z = 5mA$, $r_Z = 20\Omega$, and $I_{ZK} = 0.2mA$. The supply voltage V^+ is 10V. Find V_o when $R_L = 2k\Omega$ (15%)
4. For the transfer function, $A_v(s) = \frac{8 \times 10^{13} s(s + 20)}{(s + 30)(s + 400)(s + 10000)(s + 100000)}$, (a) please write down the poles and zeros. (5%) (b) please state which pole is the dominant low frequency pole and which frequency is the dominant high frequency pole (5%) please sketch the Bode magnitude plot (5%)
5. Assuming the op amp in figure 2 is ideal, derive an expression for the closed-loop gain v_o/v_i of the circuit (15%)
6. For the circuit shown in figure 3, if we already know the values of β , r_o , r_{π} , I_c and g_m find $A_M=?$ $\omega_L=?$ (25%)

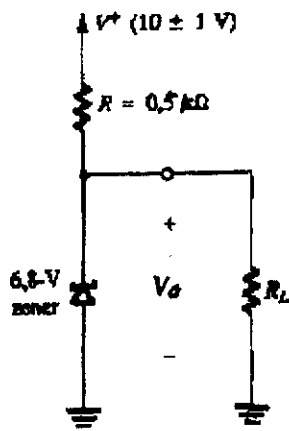


Figure 1

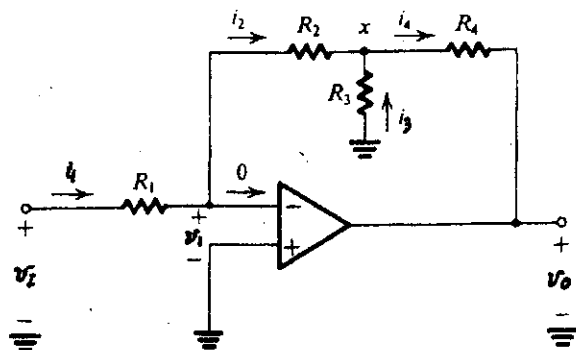


Figure 2

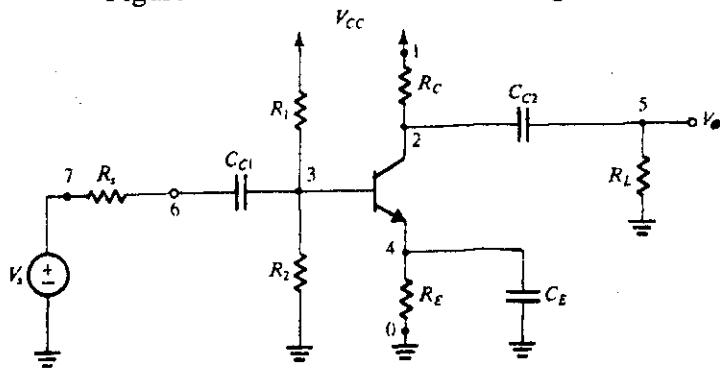


Figure 3