

國立台灣科技大學九十六學年度碩士班招生試題

系所組別：電子工程系碩士班丙組

科 目：電子學

總分100分

1. For a typical n-MOSFET at a given positive gate bias (with $V_{bs}=0V$), please plot the drain current as a function of drain voltage, and explain why? (10%)
2. Please sketch the I-V characteristics for a typical p-i-n solar cell, and why? (10%)
3. What are the Schottky contact and the Ohmic contact, respectively? (10%)
4. Please sketch the electrical conductivity as a function of temperature for a Si material boron-doped with $1 \times 10^{15} \text{cm}^{-3}$, and why? (10%)
5. Please sketch a typical forward I-V curve (I in log scale and V in linear scale) for a realistic Si pn junction diode, and explain why? (10%)

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6. Please find the loop gain function $T(j\omega)$, the frequency of oscillation, and the R_2/R_1 required for oscillation for the circuit in Figure 1. (20%)

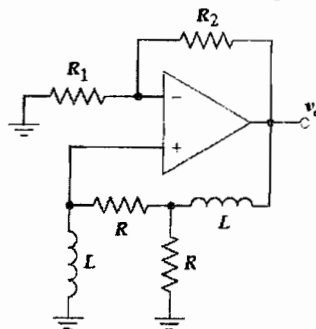


Figure 1

7. Consider the circuit shown in Figure 2. Please derive the relationship between the load current I_o and the input voltage V_i . (10%)

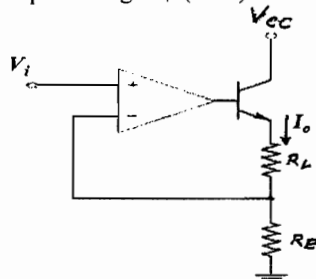


Figure 2

8. Consider an inverting amplifier shown in Figure 3.
- Assume the op-amp has a finite open-loop gain A_{ol} , an ideal open-loop input differential resistance, and an ideal output resistance. Please determine the closed-loop voltage gain of the inverting amplifier. (10%)
 - Assume the op-amp has a finite open-loop gain A_{ol} , a finite open-loop input differential resistance R_i , and a nonzero output resistance R_o . Please determine the closed-loop input resistance R_{if} of the inverting amplifier. (5%)
 - Assume the op-amp has a finite open-loop gain A_{ol} , a nonzero output resistance R_o , and an infinite input resistance R_i . Please determine the closed-loop output resistance R_{of} of the inverting amplifier. (5%)

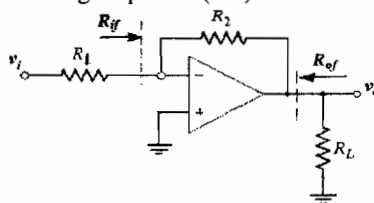


Figure 3