國立彰化師範大學 102 學年度碩士班招生考試試題

系所：電信工程學研究所　　選考甲　　科目：電子學

☆☆請在答案紙上作答☆☆　　

1. From Fig. 1 find v_x / v_I and v_O / v_I. (20 %)

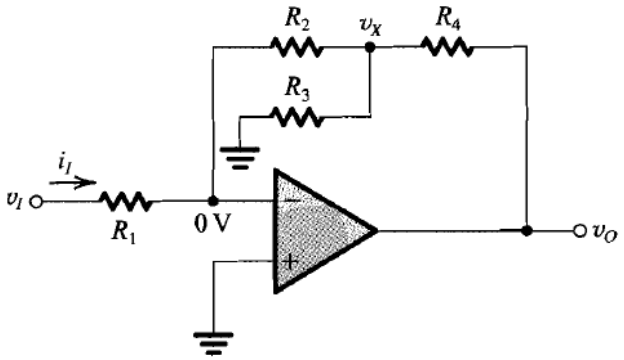

Fig. 1.

2. A diode has a 0.7-V drop at a current of 2 mA and n = 2. What is the diode conducting current at V_D = 0.8 V, and what is the diode voltage drop at I_D = 10 mA? (20%)

3. A CE amplifier utilizes a BJT with β =100 and V_A = 50 V, biased at I_C = 0.5 mA; it has a collector resistance R_C = 10 kΩ, a resistance R_E = 100 Ω is connected in the emitter. Find R_{in}, A_{vo} and R_o. (20%)

4. An NMOS differential pair is biased by a current source I = 0.2 mA having an output resistance R_{CS} = 200 kΩ. The amplifier has drain resistances R_D = 20 kΩ, using transistors with k_n' = 200 μA/V, W / L = 10, and neglecting r_o. If the output is taken differentially and there is a 2% mismatch between the drain resistances, find $|A_d|$, $|A_{cm}|$, and CMRR. (20%)

5. A common-source amplifier has R_{in} = 200 kΩ, R_D = 10 kΩ. The transistor has g_m = 2 mA/V, r_o = 100 kΩ, C_{gs} = 1.5 pF, and C_{gd} = 0.5 pF. The amplifier is fed from a voltage source v_s with an internal resistance of 200 kΩ and is connected to a 10 kΩ load.
   Find: (a) the overall midband voltage gain $A_M = v_o / v_s$. (b) the upper 3-dB frequency f_H. (20%)