

國立彰化師範大學 97 學年度碩士班招生考試試題

系所：機電工程學系碩士班

組別：乙組

科目：電子學

☆☆請在答案紙上作答☆☆

共 2 頁，第 1 頁

1. For the circuit as shown in Figure 1.
 - (a) Find I_1 , I_2 , I_3 , and V_x . (10%)
 - (b) What are the corresponding changes in I_L and in V_o if R_L is varied in the range 100Ω to $1 \text{ k}\Omega$? (10%)

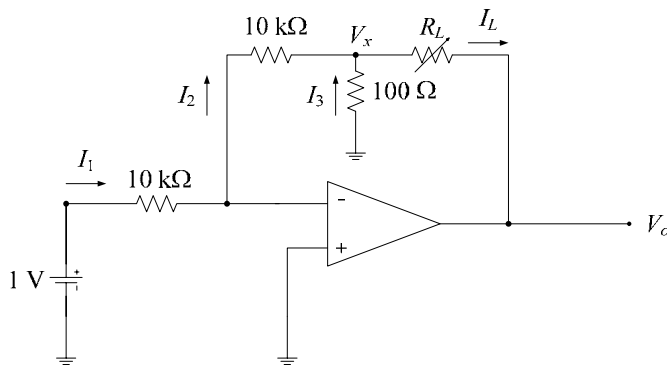


Figure 1

2. For the MOSFETs in the circuit of Figure 2, threshold voltage $|V_t| = 1 \text{ V}$, $\mu_n C_{ox} = 50 \mu\text{A}/\text{V}^2$, gate length $L = 1 \mu\text{m}$, and gate width $W = 10 \mu\text{m}$.
 - (a) Find I_x and V_x . (10%)
 - (b) How do I_x and V_x change if Q_1 and Q_3 are made to have $W = 100 \mu\text{m}$? (10%)

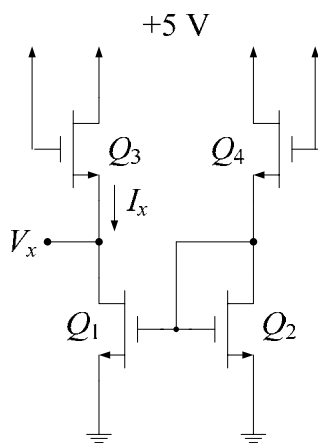


Figure 2

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3. Explain the following terms.
- (a) Common-mode rejection ratio. (5%)
 - (b) Early effect. (5%)
 - (c) Gummel-Poon Model t. (5%)
4. For the circuit in Figure 3, assuming that all transistors are matched and have finite β and ignoring the effect of finite output resistances,

(a) Show that $I_1 = I_2 = \dots = I_N = \frac{1}{1 + \frac{N+1}{\beta}} \cdot I_{REF}$. (10%)

- (b) For $\beta = 100$, find the maximum number of outputs for an error not exceeding 10%. (10%)

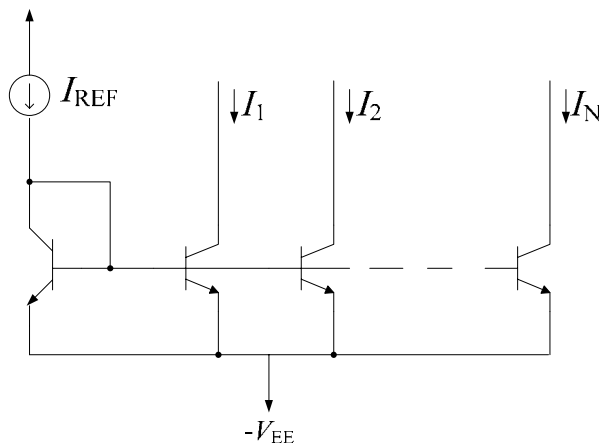


Figure 3

5. An amplifier has the voltage transfer function

$$T(s) = \frac{s^2}{\left(1 + \frac{s}{10}\right)\left(1 + \frac{s}{10^2}\right)\left(1 + \frac{s}{10^6}\right)}$$

- (a) Find the poles and zeros. (5%)
- (b) Draw the Bode plot for the magnitude of the transfer function. (10%)
- (c) Draw the Bode plot for the phase of the transfer function. (10%)