Microelectronic Circuits I (Quiz 1)

date: 2008/10/17 (Fri)
time: 14:20~15:10

1. (50%) The circuit is in Fig.1.
   (a) Find the resistances looking into node V_1, R_1; node V_2, R_2; node V_3, R_3; and node V_4, R_4.
   (b) Find the currents I_1, I_2, I_3, and I_4 in terms of the input current I.
   (c) Find the voltages V_1, V_2, V_3, and V_4 in terms of (IR).

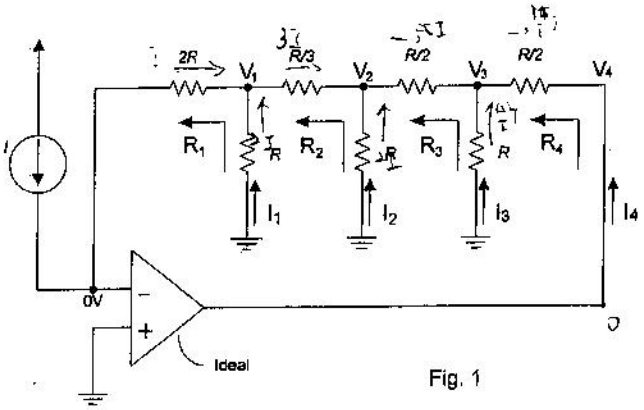

Fig. 1

2. (50%) Derive the transfer function of the circuit in Fig.2 (for an ideal op amp)
   (a) show that it can be written in the form

$$\frac{V_o}{V_i} = \frac{-\frac{R_2}{R_1}}{[1+\frac{\omega_1}{j\omega}]\times[1+j\frac{\omega}{\omega_2}]},$$

Where $\omega_1 = \frac{1}{C_1 R_1}$ and $\omega_2 = \frac{1}{C_2 R_2}$.

Assuming that the circuit is designed such that $\omega_2 >> \omega_1$, find approximate expressions for the transfer function in the following frequency regions:

(b) $\omega << \omega_1$

(c) $\omega_1 << \omega << \omega_2$

(d) $\omega >> \omega_2$

(e) If $\omega_1 >> \omega_2$, find an approximate expression for the transfer function in the frequency range of $\omega_2 << \omega << \omega_1$. (50%)

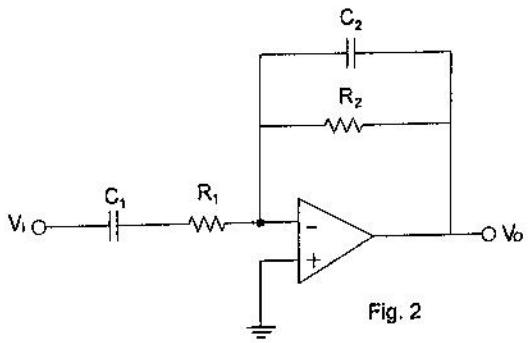

Fig. 2