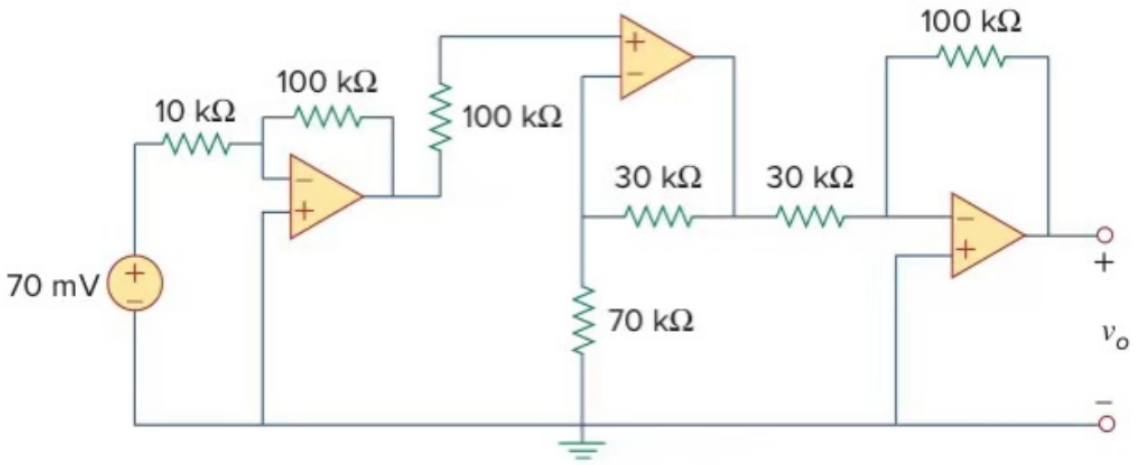
VE215 2023Su Assignment 3

Due Date: 23:59, June.8th, 2023

In order to get full marks, you shall write all the intermediate steps of calculation or proof unless otherwise indicated.

Exercise 3.1 (20%)
Find v_0 in the following op amp circuit.

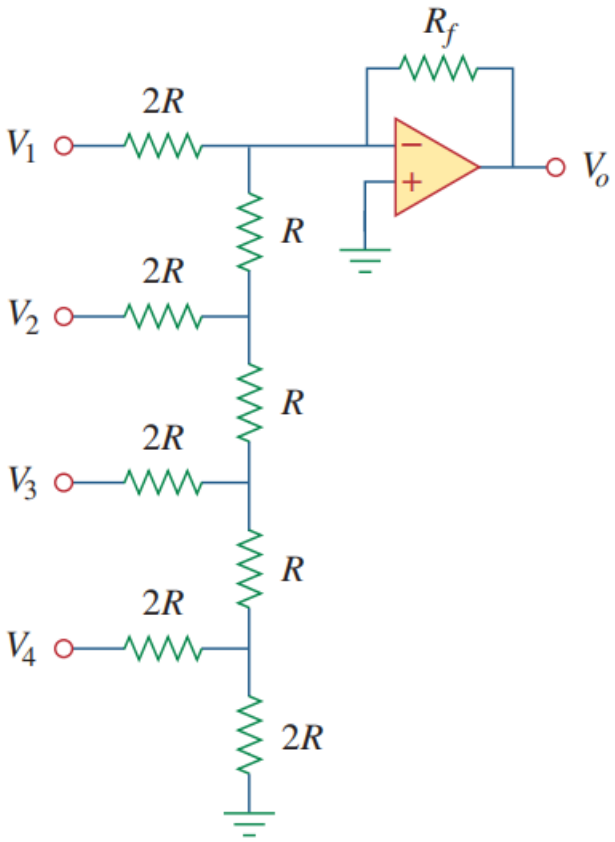


VE215 2023Su Assignment 3

Exercise 3.2 (30%)
A four-bit R-$2R$ *ladder* DAC is presented in figure below.
(a) (15%) Show that the output voltage is given by

$$-V_o = R_f\left(\frac{V_1}{2R} + \frac{V_2}{4R} + \frac{V_3}{8R} + \frac{V_4}{16R}\right)$$

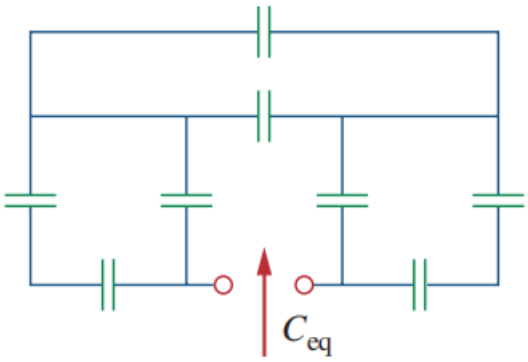
(b) (15%) If $R_f = 12k\Omega$ and $R = 10k\Omega$, find $|V_0|$ for $[V_1V_2V_3V_4] = [0101]$ and $[V_1V_2V_3V_4] = [1011]$.



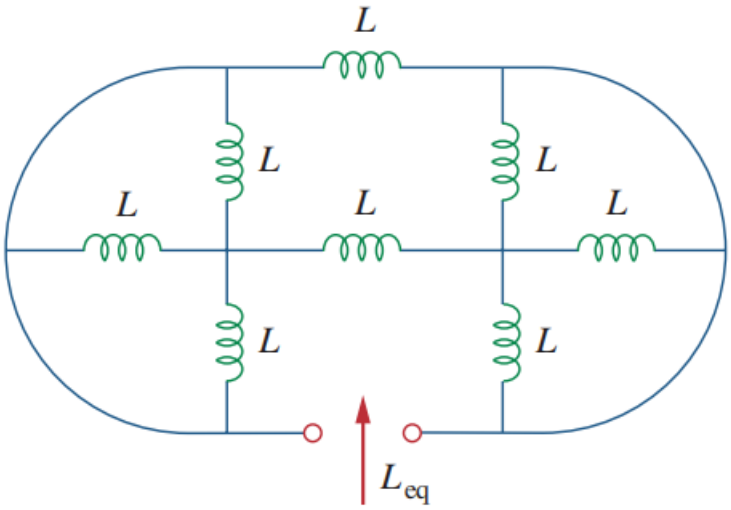
VE215 2023Su Assignment 3

Exercise 3.3 (20%)

(a) (10%) Find C_{eq} in the circuit below if all capacitors are $1\mu F$.



(b) (10%) Find L_{eq} in the circuit below.



VE215 2023Su Assignment 3

Exercise 3.4 (30%)
A 4-mF capacitor has the terminal voltage

$$v = \begin{cases} 50V, & t \leq 0 \\ Ae^{-100t} + Be^{-600t}V, & t \geq 0 \end{cases}$$

If the capacitor has an initial current of 2A, find:
(a) (10%) the constants A and B,
(b) (10%) the energy stored in the capacitor at $t = 0$,
(c) (10%) the capacitor current for $t > 0$.