VE215 2022Fall Assignment 1

Due Date: 23:59, October 10th, 2022

Exercise 1.1 (20%)
The voltage v (unit:V) across a device and the current i (unit:A) through it are

$$v(t) = 4e^{-t/2} \qquad i(t) = \begin{cases} 0 & t<0 \\ 5\sin 3t & 0 \le t<\dfrac{\pi}{6} \\ 5 & t \ge \dfrac{\pi}{6} \end{cases}$$

(a) (10%) Calculate the total charge in the device at $t = 2$.
(b) (10%) Calculate the energy consumed by the device in the time period $3 \le t \le 5$.

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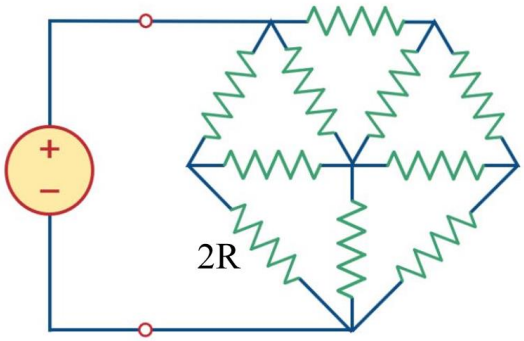
Exercise 1.2 (35%)

In the circuit below, all the resistors have a resistance of R except the labeled one on the left bottom.

(a) (10%) Determine the number of branches, nodes, loops and meshes. Write your answers directly.

(b) (25%) Calculate the equivalent resistance between the terminals.



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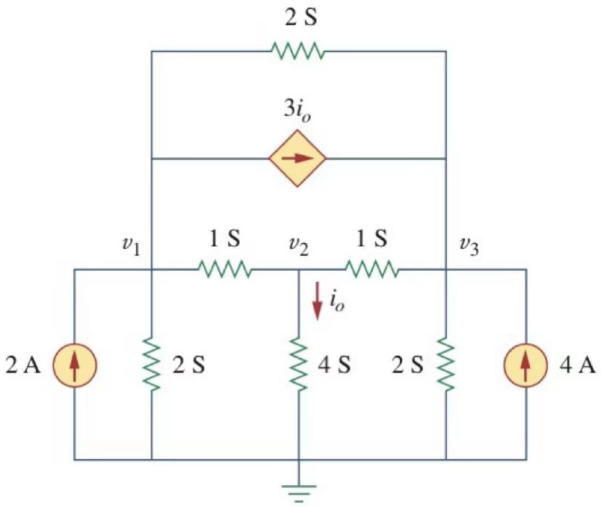
Exercise 1.3 (30%)
Use nodal analysis to determine voltages v_1, v_2 and v_3 in the circuit.



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Exercise 1.4 (15%)
Calculate the current gain i_o/i_s in the circuit.