Midterm Exam I

October 21, 2019

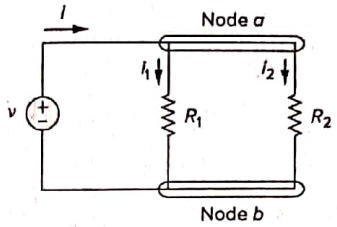
Rules and Regulations: It is permitted to bring one paper of A4 size with handwritten formulas. There is a time limit of one hour and fifty minutes.

Problems for Solution:

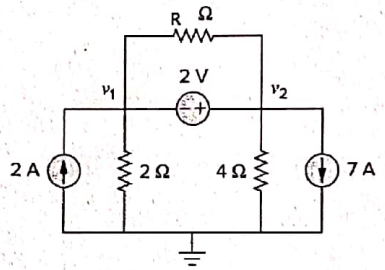
1. Please determine whether each of the following statements is *True* or *False.*

   (a) (4%) The system $y = 2x+1$ is linear where x is the input and y is the output.

   (b) (4%) If $R_1 \gg R_2$ in the following circuit, then $i_2 \approx 0$.



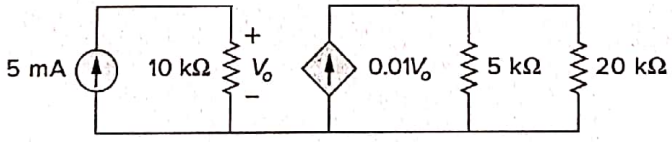
   (c) (4%) In the following circuit, the node voltage v_1 will not change if the R-Ω resistor is replaced by a $2R$-Ω resistor.



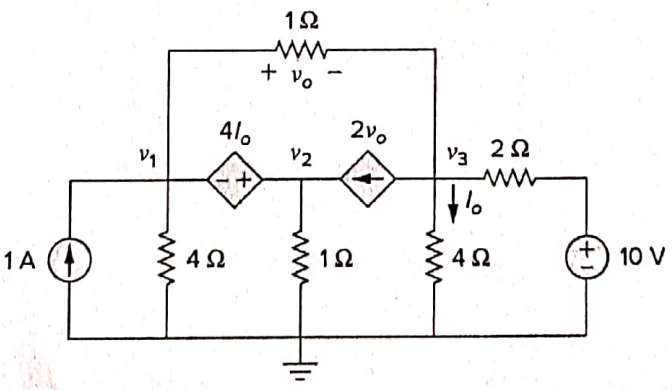
   (d) (4%) The power of any element in a circuit should be positive.

   (e) (4%) A direct current (DC) can be time varying.

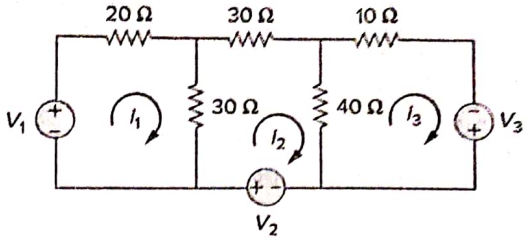
2. (10%) For the network as given below, find the power absorbed by the 20 kΩ resistor.



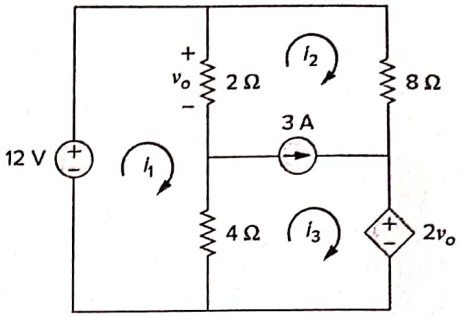
3. (20%) Find the node voltages v_1, v_2, and v_3 in the following circuit.



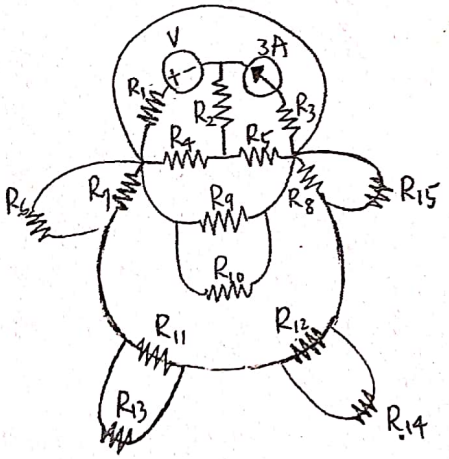
4. (10%) Determine the mesh currents in the following circuit if $V_1 = 6$ V, $V_2 = 4$ V, and $V_3 = 3$ V.



5. (20%) Use mesh analysis to find i_1, i_2, and i_3 in the following circuit.



6. (10%) 感謝出題王盧子晴、黃淑微同學提供此題目。 If $R_1 = 4\ \Omega$, $R_2 = R_4 = R_5 = 3\ \Omega$, $R_3 = 9\ \Omega$, $R_6 = R_{13} = R_{14} = R_{15} = 17\ \Omega$, $R_7 = R_{11} = R_{12} = R_8 = 19\ \Omega$, $R_9 = 5\ \Omega$, and $R_{10} = 7\ \Omega$, find V =?



7. (10%) 感謝出題王陳立得、林宣伯同學提供此題目。 Find the equivalent resistance R_{eq} if $R_1 = 1\ \Omega$.