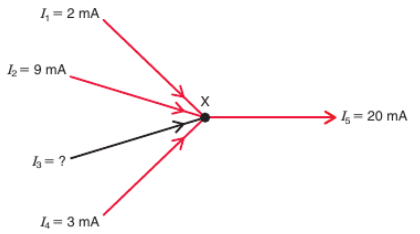
Jimma University

Department of Physics

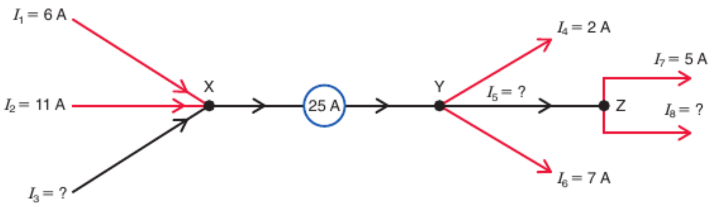
Assignment I for the course Electronics I Phys (2062)

Section I: Network theories and Equivalent circuits

1. State Kirchhofes Laws.
2. State Thévenin's theorem
3. State the superposition theorem, and discuss how to apply it.
4. How is a voltage source converted to a current source, and vice versa?
5. Draw a delta network and a wye network, and give the six formulas needed to convert from one to the other.
6. What is the difference between a loop and a mesh? What is the difference between a branch current and a mesh current?
7. In the figure below, solve for the unknown current, I 3 .



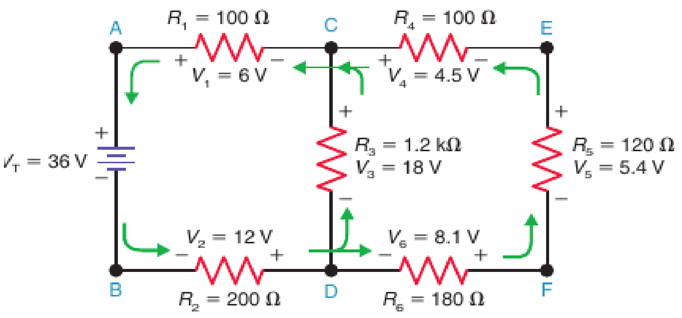
8. In the figure below, solve for the following unknown currents: I 3 , I 5 , and I 8 .



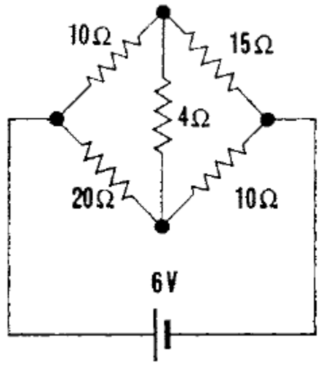
9. In the figure below, a. Write a KVL equation for the loop CEFDC going clockwise from point C.

   b. Write a KVL equation for the loop ACDBA going clockwise from point A.

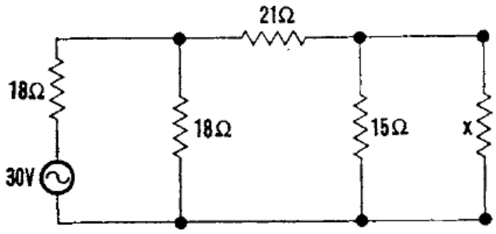
   c. Write a KVL equation for the loop ACEFDBA going clockwise from point A.



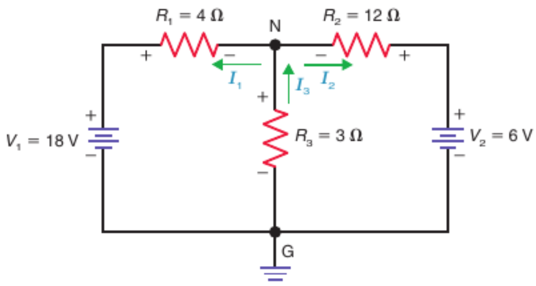
10. For the circuit shown below, calculate the current in the 4 Ω resistor, the power dissipated in the 20 Ω resistor and the equivalent resistance of the network.



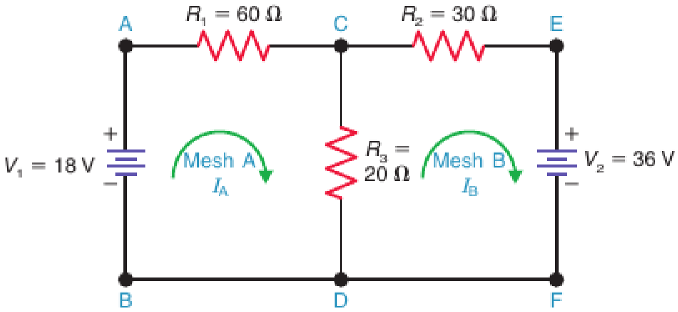
11. By the use of Thévenin's Theorem or otherwise, derive an expression for the current which flows through the resistance of x ohms in the circuit shown in Fig. below. Hence find the value of x to give the maximum power dissipated in this resistance, and the value of this power.



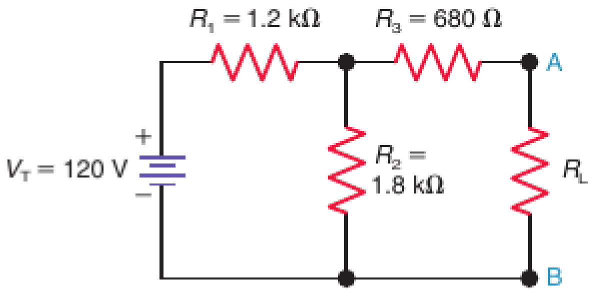
12. Using the method of node-voltage analysis, solve for all unknown values of voltage and current in Fig. below. To do this, complete steps a through l. The assumed direction of all currents is shown in the figure.



13. Using the method of mesh currents, solve for all unknown values of voltage and current in Fig. below.

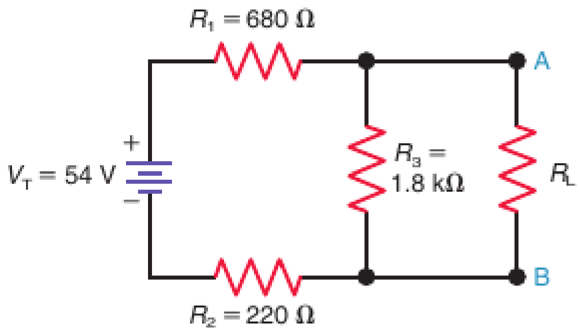


14. In Fig. below, draw the Thevenin equivalent circuit with respect to terminals A and B



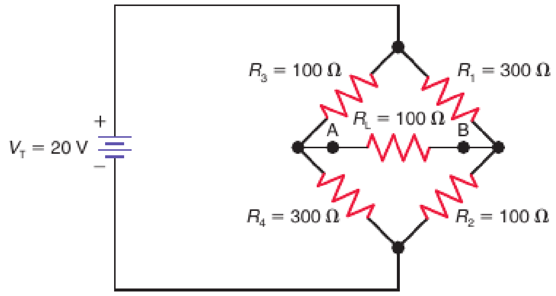
15. In the above figure, use the Thevenin equivalent circuit to calculate IL and VL for the following values of RL : RL=100 Ω, RL=1 kΩ , and RL = 5.6 k Ω

16. In Fig. below, draw the Thevenin equivalent circuit with respect to terminals A and B

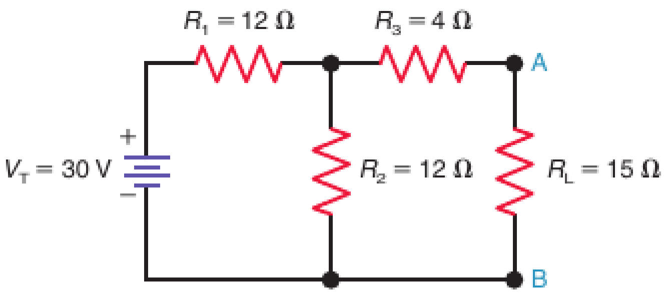


17. In Fig. 1below, use the Thevenin equivalent circuit to calculate I L and V L for the following values of RL : RL= 200 Ω, RL =1.2 kΩ , and RL=1.8 k Ω

18. In Fig. below, draw the Thevenin equivalent circuit with respect to terminals A and B



19. In the figure below, draw the Norton equivalent circuit with respect to terminals A and B



20. Using the Norton equivalent circuit for the figure above, calculate the values for IL and VL . If R3 is changed to 24 Ω , redraw the Norton equivalent circuit with respect to terminals A and B. Also, recalculate the new values for IL and VL .