ESc201A Home Assignment 1 Aug. 05, 2019.

Solutions of the HA#1 will be in copy point and Brihaspati on 09/08/19.

Consider all voltage and current sources to be ideal.

1. Use the Node-voltage method to calculate the power delivered by the dependent voltage source of fig.1.1.

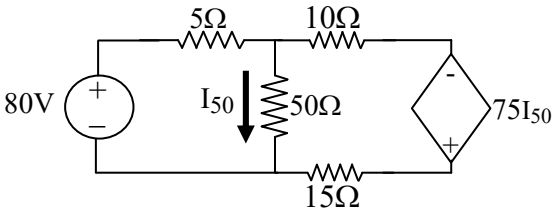

Figure 1.1

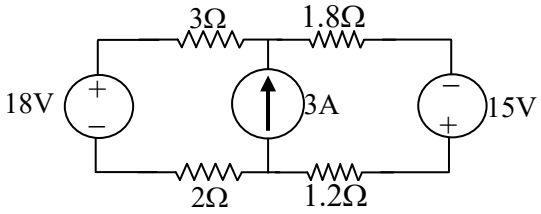

Figure 1.2

2. Use the Mesh-current method to find the total power dissipated in the circuit of fig. 1.2.
3. Use the node-voltage method to find V_1 and V_2 in the circuit in fig. 1.3.

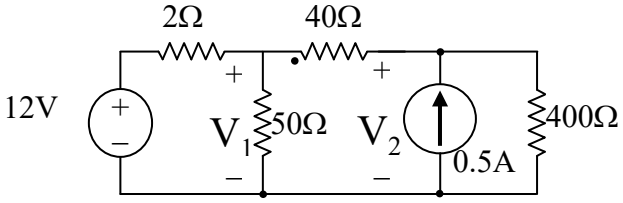

Figure 1.3

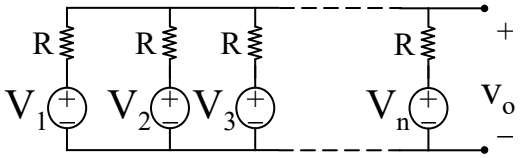

Figure 1.4

4. Use the node-voltage method to show that the output voltage V_o in the circuit in fig. 1.4 is equal to the average value of the source voltages.
5. Use the Mesh-current method to find all the branch currents of circuit in fig. 1.5. Hence show that the total power dissipated in the circuit is equal to the total power developed in the circuit.

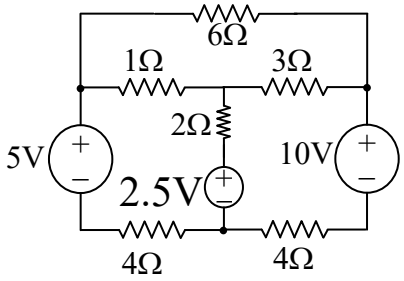

Figure 1.5

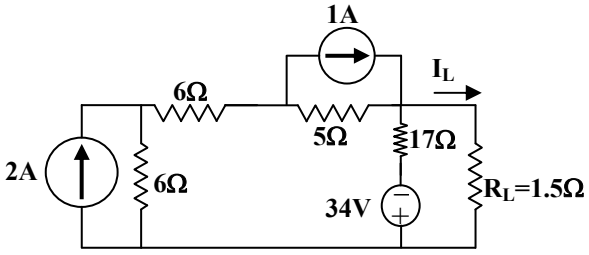

Figure 1.6

6. (a) Using mesh analysis find the current I_L in fig. 1.6. (b) Using source transformation, show that the same result can be obtained by just really one calculation.
7. Use the principle of superposition to solve for I_o and V_o in the circuit in fig. 1.7.

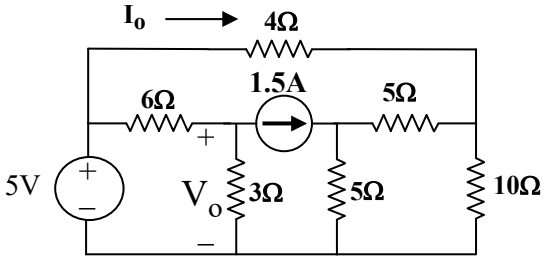

Figure 1.7

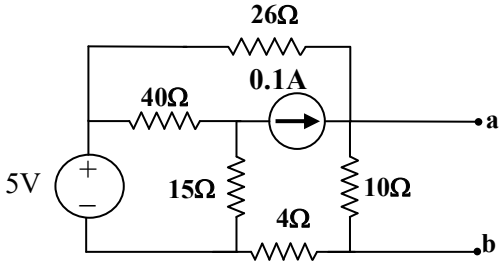

Figure 1.8

8. Find the Thevenin Equivalent of the circuit of fig. 1.8 with respect to the terminals ‘a’ and ‘b’. Show that the R_{Th} can be obtained in this case without calculating the I_{sc}, by nulling the independent sources.
9. A Wheatstone bridge, shown in Fig. 1.9, is balanced (no Galvanometer current) when R_2=3kΩ (This resistance come with a tolerance of 0.1%). If the galvanometer has a resistance of 50Ω, how much current will the galvanometer detect when the bridge is unbalanced, by having R_2 off by 0.1%? (Hint: Find the Thevenin equivalent with respect to the galvanometer terminals when R'_2 is now 1.001xR_2.)

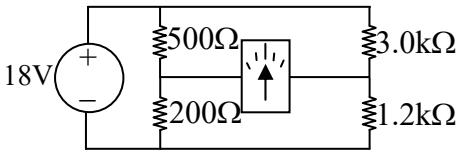

Figure 1.9

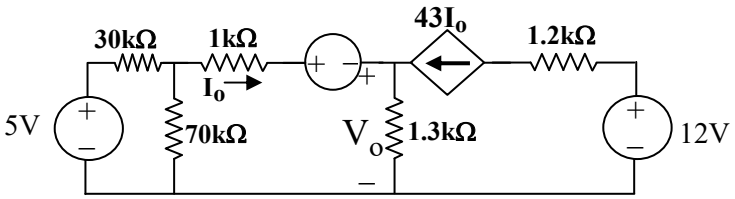

Figure 1.10

10. When a voltmeter is used to measure the voltage V_o in fig. 1.10 it reads 5.5 V. What is the resistance of the voltmeter?
11. Find the Thevenin equivalent of the circuit shown in fig. 1.11, with respect to the terminals (a, b).

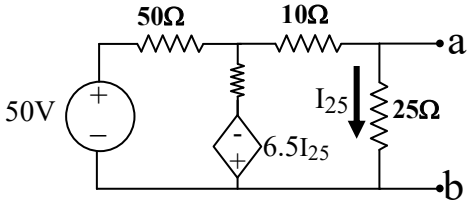

Figure 1.11

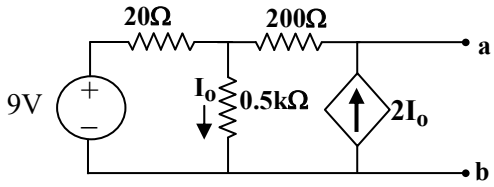

Figure 1.12

12. Find the Norton’s equivalent of the circuit shown in fig. 1.12 between the terminals a,b.