Exercise Section I
(DC circuits analysis)

1. For the circuit of Fig.1 find the currents, in microamperes, if the powers absorbed are : $P_1 = 27.75$ nW, $P_2 = -0.3\,\mu W$, and $P_3 = 1.20\,\mu W$.
   Ans. 18.5, –200 , 800

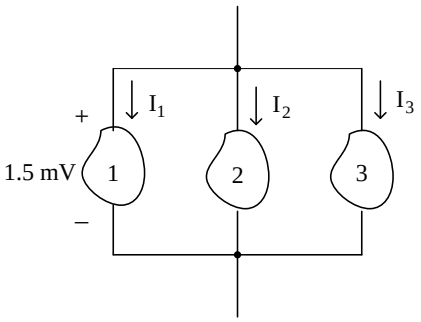

Fig.1

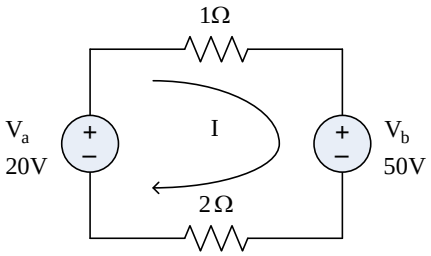

Fig.2

2. Find the power delivered by the sources in the circuit of Fig.2
   Ans. $P_a = 200\,W$, $P_b = -500\,W$

3. Find voltages V_1, V_2, and V_3 in Fig.3, given that the generalized circuit elements have absorbed powers P_1 = 250 W, P_2 = –125 W, and P_3 = 100 W
   Ans. 50 V, –25 V, –20 V

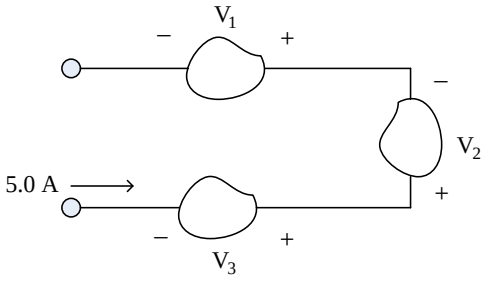

Fig.3

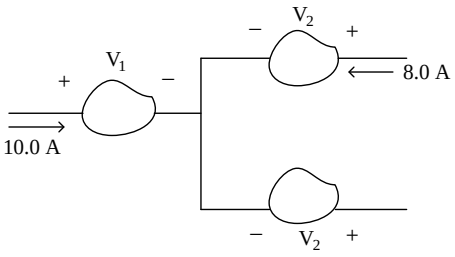

Fig.4

4. In the circuit shown in fig.4 , V_1 = 20 V and $V_2 = V_3$ = 15 V. What is the total power absorbed in the three circuit elements ?
   Ans. 50 W

5. Three resisters are in series and have a total constant voltage V_T. R_1 has a voltage of 20 V, R_2 has a power of 25 W, and R_3 = 2 Ω. If the constant current is 5 A, find V_T
   Ans. 35 V

6. In the circuit shown Fig.5 , find the power absorbed by the 5 V battery.
   Ans. – 5 W

7. For the ladder network shown in Fig.6, find the source voltage V_s which results in a current of 7.5 mA in the 3 - Ω resister.
   Ans. 0.705 V

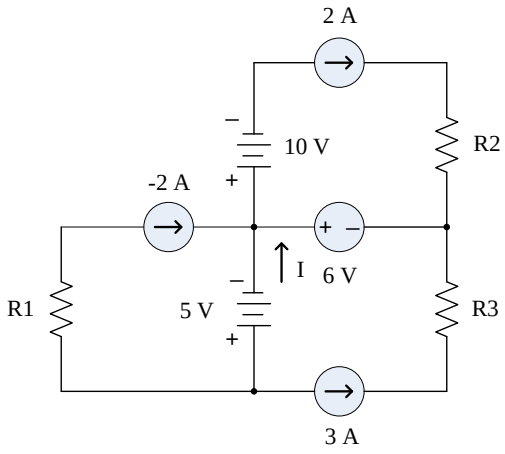

Fig.5

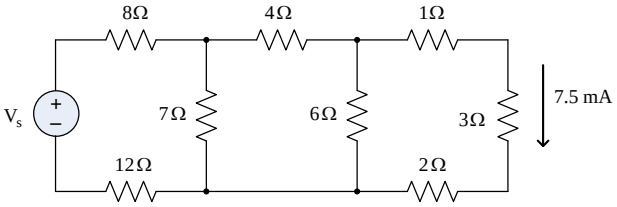

Fig.6

8. The network shown in Fig. 7, obtain the currents in all the network branches.

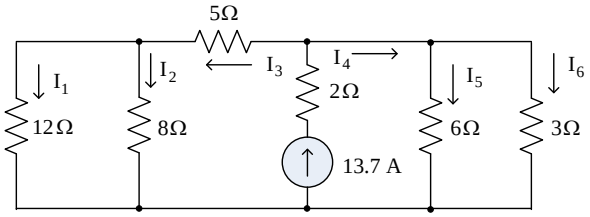

Fig.7

Ans. 0.93, 1.39, 2.32, 11.38, 3.79, 7.59 A

9. Obtain the current in each resistor in Fig. 8 , using network reduction methods.

Ans. $I_A = 1.67$, $I_B = 3.33$, $I_C = 2.50$, $I_D = 1.25$, $I_E = 1.25$, $I_F = 2.50$ A

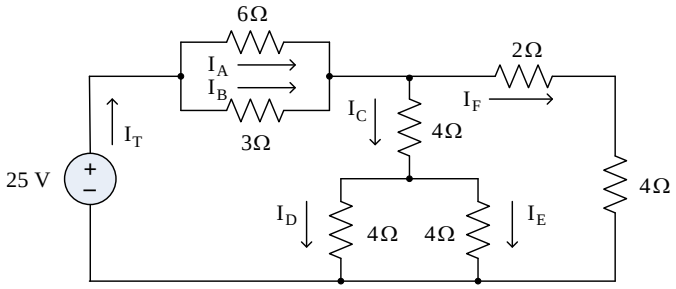

Fig.8

10. Obtain the current I_x in the 10-Ω resister in Fig.9, using superposition.
Ans. –1 A.

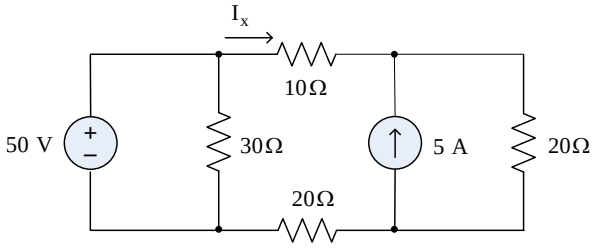

Fig.9

11. Replace the active network to the left of terminal AB in Fig.10 by a thevenin equivalent.
Ans. $R_{TH} = 50\ \Omega$, $V_{TH} = 80$ V

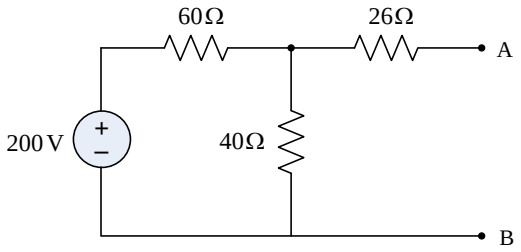

Fig.10

12. Obtain the Norton equivalent for the active network of Problem 11.
Ans. $R_{TH} = 50\ \Omega$, $I_N = 1.60$ A

13. For the network shown in Fig.11, obtain the mesh currents I_1, I_2 and I_3

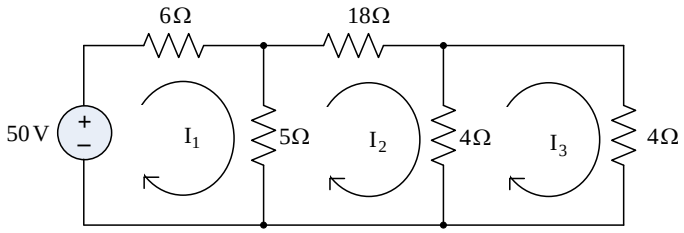

Fig.11

Ans. 5.0, 1.0, 0.5 A

14. Loop currents are shown in the network of Fig.12. Write the matrix equation and solve for I_1, I_2 and I_3

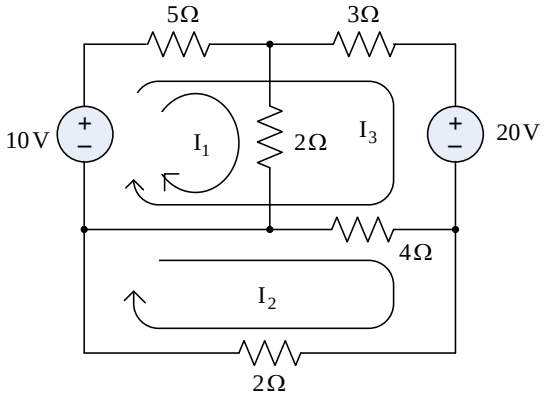

Fig.12

Ans. 3.55, –1.98, –2.98 A

15. The network of Problem 14 has been redrawn in Fig.13 for solution by the node voltage method. Find the node voltages V_1 and V_2 , and with then verify the three currents obtained in Problem 14.

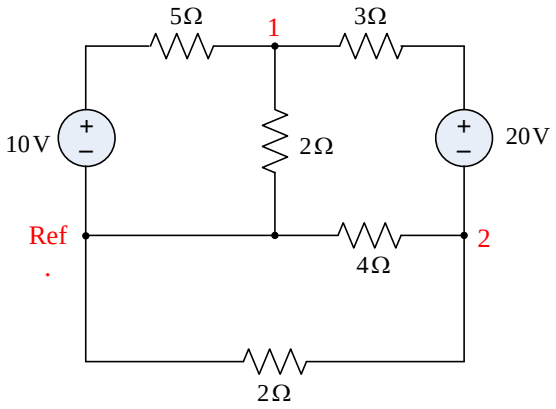

Fig.13

Ans. 7.11, –3.96 V

16. Obtain the four mesh currents in Fig.14

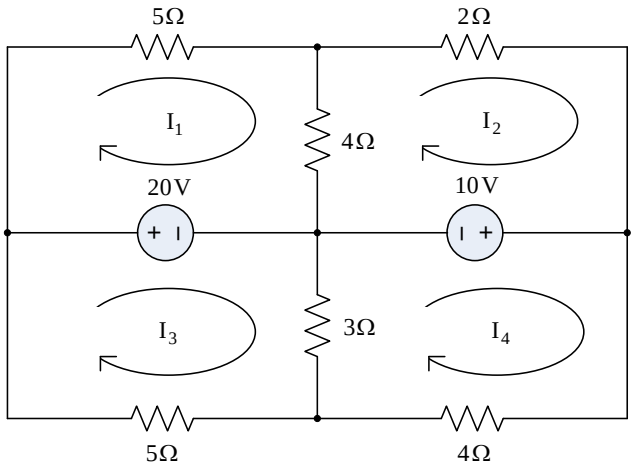

Fig.14

Ans. 2.11, – 0.263, – 0.34, 0.426 A

17. Find the node voltages V_1, V_2, V_3, and V_4

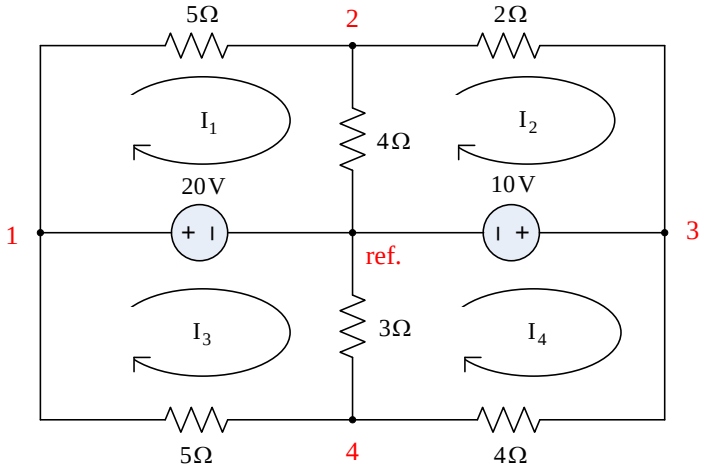

Fig.15

Ans. 20, 9.47, 10, 8.30 V