Electrical Power Engineering Fundamentals

Departamento de Ingeniería Eléctrica. Universidad Carlos III de Madrid

Module 1. Basic Concepts. Week 2

Exercise 1. In the following circuit:
  a) Find U_{AB} and U_X when I_g=2 A.
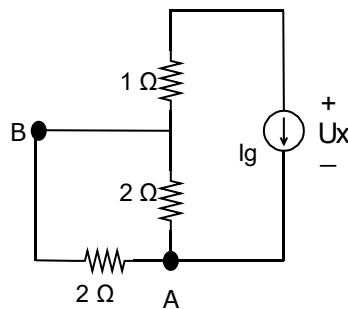 **b)** Find U_{BA} and U_X when I_g=1 A

Figure 1. DC circuit 1

Solution: a) U_{AB} = 2V; U_X = -4V   **b)** U_{BA} = -1V; U_X = -2V

Exercise 2. In the following circuit:
  a) Find I_1 and I_T when U_g= 2 V
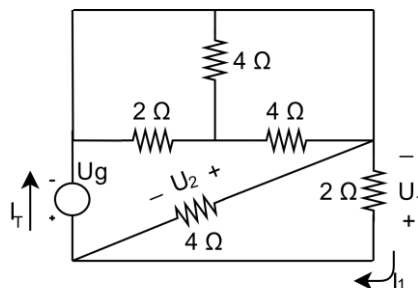 **b)** Find U_1 and U_2 when U_g= -1 V

Figure 2. DC circuit 2

Solution: a) I_1 = -1A; I_T = -1.5A   **b)** U_1 = -1V; U_2 = 1V

Exercise 3. Using resistor association techniques and real source equivalences simplify the circuit below to a real voltage source:
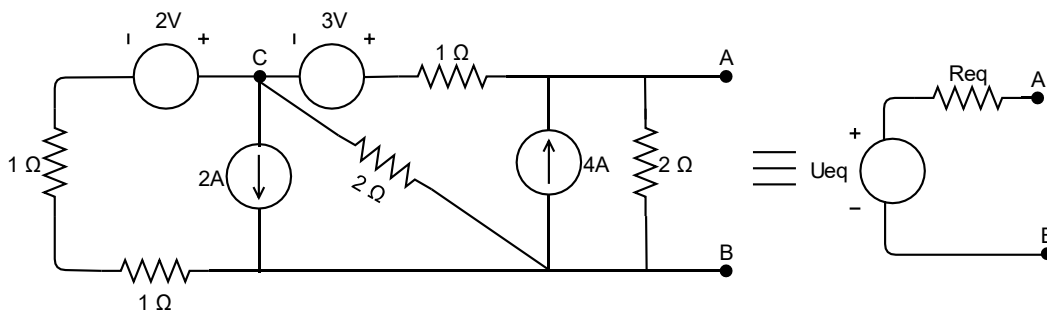

Figure 3. DC circuit 3

Solution: U_{eq} = 5V; R_{eq}=1 Ω

Exercise 4. In the circuit below:
   a) Find U_{BC} and IR1
   b) Find the power generated by each power source.
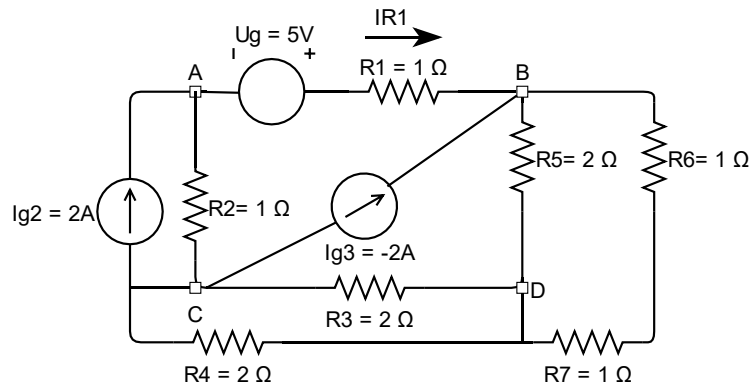   **c)** Check the power balance

Figure 4. DC circuit 4

Solution: a) U_{BC} = 1.5V; IR1 = 2.75A   **b)** P_{Ug} = 13.75W; P_{Ig2} = -1.5W; P_{Ig3} = -3W;   **c)** $P_{generated\_sources}$ = $P_{consumed\_resistors}$ = 9.25W

Exercise 5. In the circuit below, calculate the power consumed by the resistors P_{R1}, P_{R2}, P_{R3}, and P_{R4} and the power generated by the sources P_{Ug} and P_{Ig}.
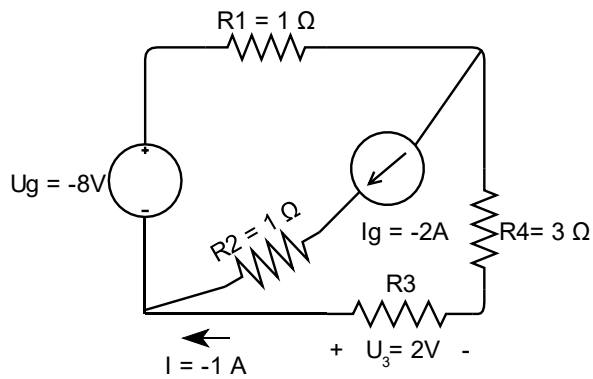

Figure 5. DC circuit 5

Solution: P_{R1} = 9W; P_{R2} = 4W; P_{R3} = 2W; P_{R4} = 3W; P_{Ug} = 24W; P_{Ig} = -6W

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