



Midterm ELEC 275 Winter 2024 - B

Principles of Electrical Engineering (Concordia University)



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ELEC275: Principles of Electrical Engineering
Midterm EXAM
Version B

Date: Tuesday March 5 5.45pm -8.30pm, 2024

Notes:

1. Each problem: 10 marks, and Total marks: **40**
2. Start a new page of the booklets for every problem
3. Attach this page **only** with your booklets
4. Only ENCS calculator allowed.
5. Closed book exam

Your name: _____

Concordia ID: _____

Problem 1. In the circuit shown in Fig.1, $R_1=2.5\ \Omega$, $R_2=15\ \Omega$, $R_3=6\ \Omega$, $R_4=12\ \Omega$, $R_5=60\ \Omega$, $R_6=20\ \Omega$, $R_7=80\ \Omega$,

- Calculate the equivalent resistance observed between nodes **a** and **d**, when switch S_1 is closed but S_2 and S_3 are open. **(4 marks)**
- Calculate the equivalent resistance observed between nodes **a** and **c**, when S_1 and S_3 are open but S_2 is closed. **(4 marks)**
- When all switches are closed, what is the total resistance observed between terminals **c** and **d**? **(2 marks)**

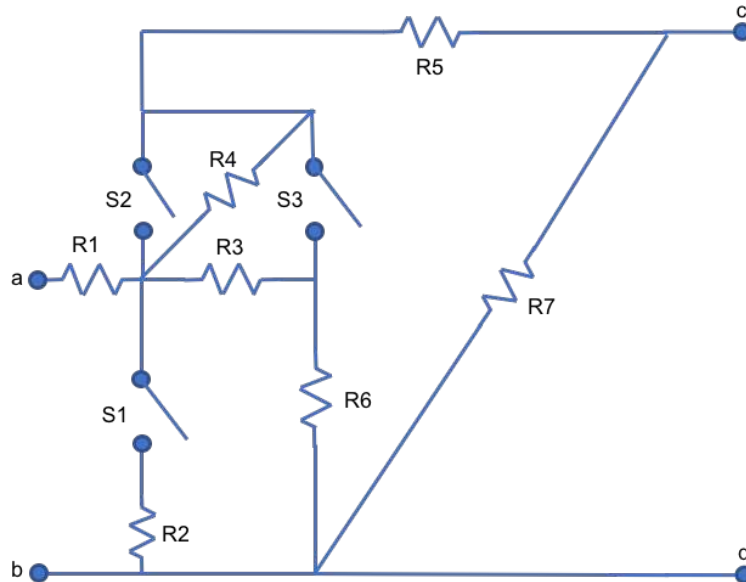


Fig. 1

Problem 2. Using **mesh current method (KVL)**, calculate the current through resistance R_1 in the circuit shown in Fig. 2 and identify the direction of its flow. *First write down the mesh current equation(s), and then solve the problem.* $R_1=10\ \Omega$, $R_2=5\ \Omega$, $R_3=3\ \Omega$, $I_S=7\ \text{A}$, and $V_S=10\ \text{V}$ **(5 marks)**

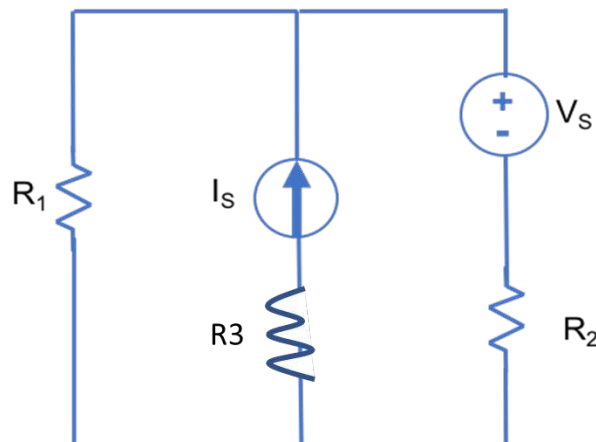


Fig.2.

Problem 3. A circuit shown in Fig. 3 has $R_1=15\ \Omega$, $R_2=8\ \Omega$, $R_3=4\ \Omega$, $R_4=4\ \Omega$, $R_5=2\ \Omega$, $V_s=10\text{ V}$, $I_1=2\text{ A}$ and $I_2=3\text{ A}$. Using nodal voltage method (KCL) to find the voltage across the current source I_1 , and to indicate the polarity of the voltage. First write down the mesh current equations, and then solve them to find the answer. (10 marks)

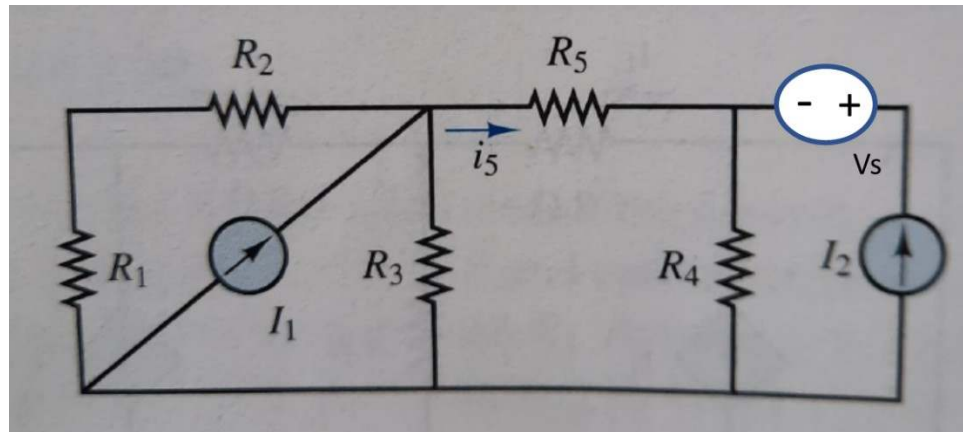


Fig. 3

Problem 4. For the circuit depicted in Fig. 4: $R_1=1\ \Omega$, $R_2=0.5\ \Omega$, $R_3=1\ \Omega$, $R_4=0.5\ \Omega$, $R_5=0.5\ \Omega$, $R_6=100\ \Omega$, $V_{S1}=6\text{ V}$, $V_{S2}=15\text{ V}$, $I_{S1}=2\text{ A}$, $I_{S2}=2\text{ A}$, and $I_{S3}=15\text{ A}$. R_L is the load.

- Find the Thévenin voltage ($V_{th} = V_{ab}$) by first writing circuit equations with only variables, and then find V_{th} . (8 marks)
- What is the load value to have a maximum power transfer? and what is the maximum amount of power deliverable to a load? (2 marks)

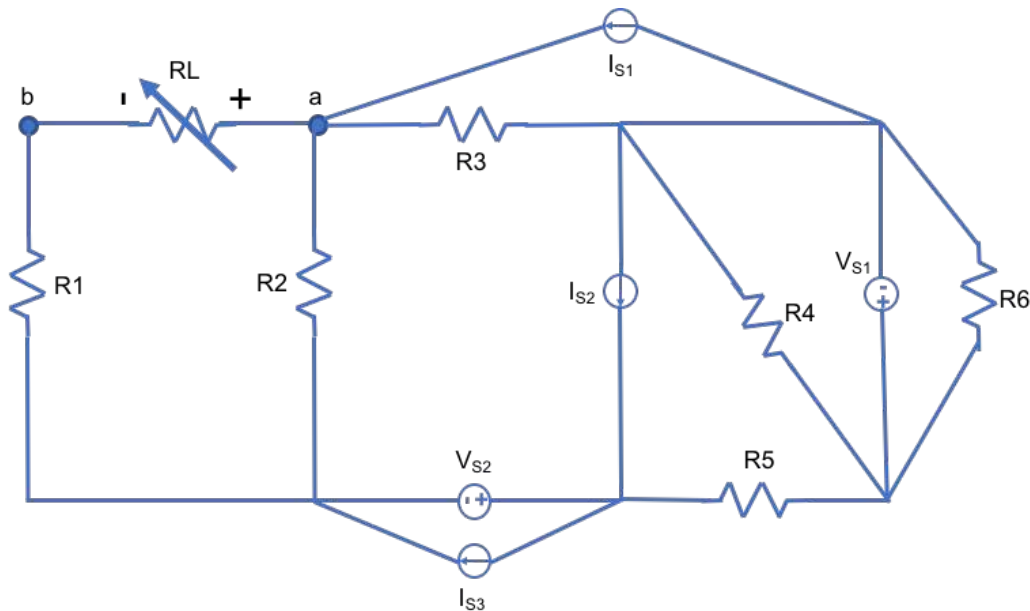


Fig. 4

