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Inspiring Excellence

Brac University
Semester: Spring 2023
Course Code: CSE250
Circuits And Electronics

Assessment: *Midterm*
Duration: 1 hour 30 minutes
Date: March 4, 2023
Full Marks (incl. bonus 6): 56

✓ No washroom breaks. Phones must be turned off. Using/carrying any notes during the exam is not allowed.
✓ At the end of the exam, both the **answer script** and the **question paper** must be returned to invigilator.
✓ All **3 questions** are compulsory. Marks allotted for each question are mentioned beside each question.
✓ Write your answers inside the indicated boxes where applicable.
✓ Symbols have their usual meanings.

■ Question 1 of 3 *[CO1, CO3]* *[20 marks]*

(a) In order to test the $I - V$ characteristics of a two-terminal linear circuit (inside the gray box), the following circuit was constructed.
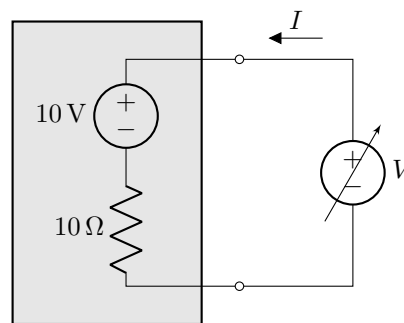

(i) *[1 mark]* **Determine** the relationship between I and V, where V is the applied voltage difference across the test circuit and I is the current through it. In the following box write I in terms of V.

$$I =$$

(ii) *[2 marks]* Based on your answer in (i), plot the $I - V$ characteristics of the test circuit in the following grid.
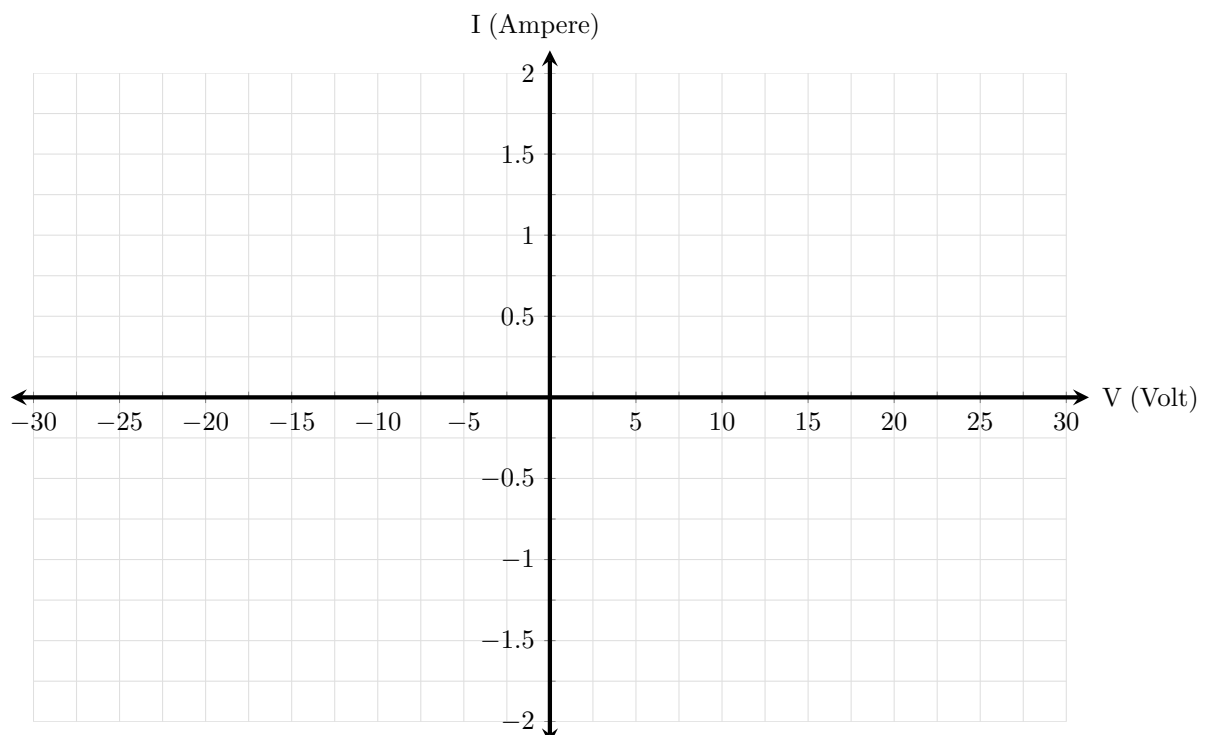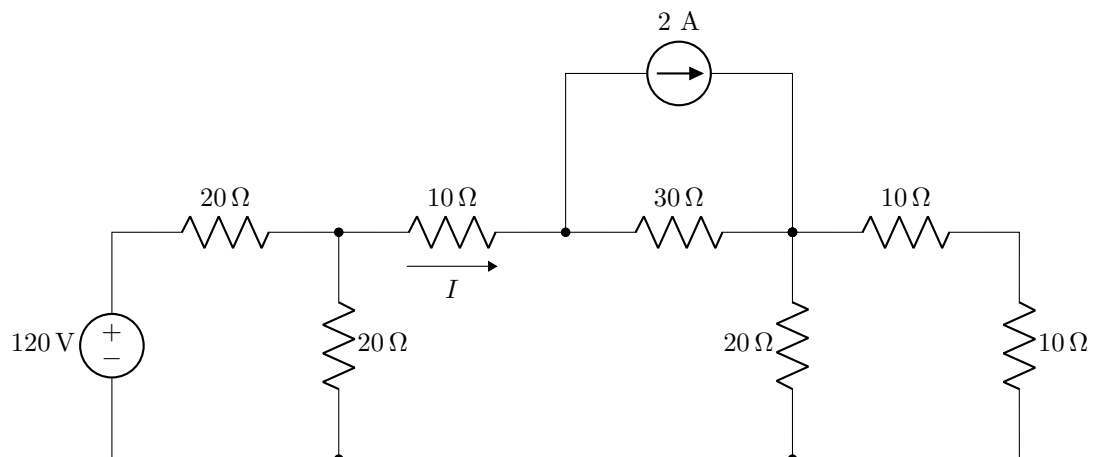
(b) *[2 marks]* Which one is the correct **Source Transformation** of the following circuitry?
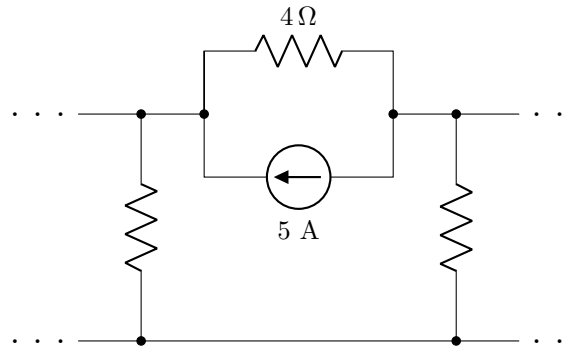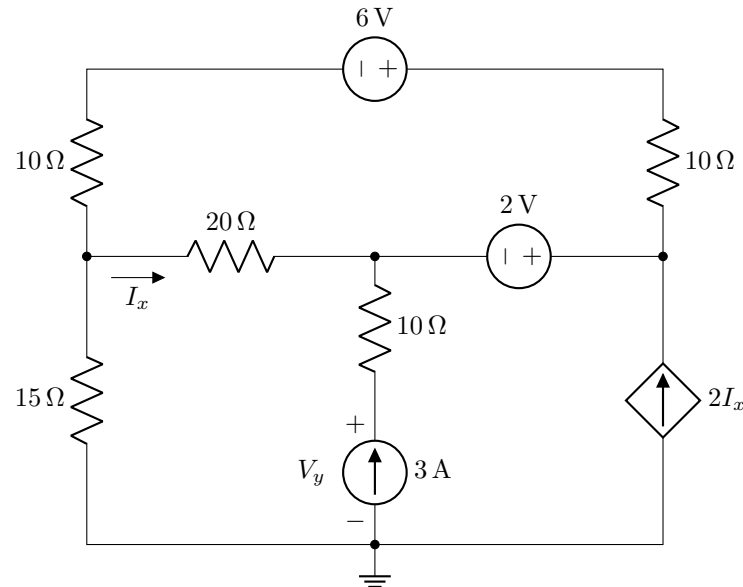

Cross-out or fill-in the checkbox (□) at the top-left corner of the correct answer.

(c) *[15 marks]* **Determine** the current I as shown in the circuit below using **Superposition Principle** and/or **Source Transformation**.
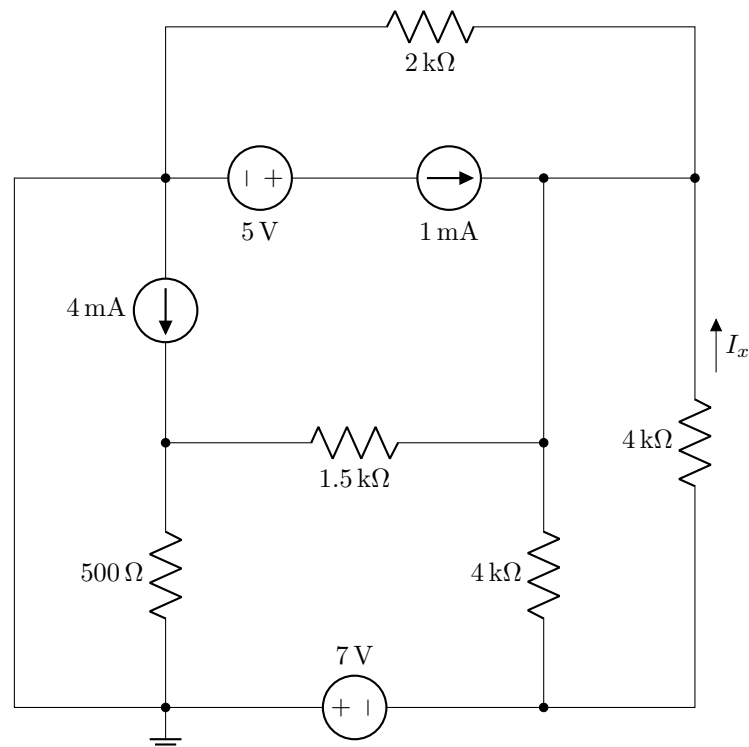
■ Question 2 of 3 *[CO2, CO4] [20 marks]*

Apply Nodal/Mesh analysis to answer the following questions:

(a) *[1 mark]* Which analysis method should be more advantageous in solving the above circuit?

(b) *[15 marks]* Find all the node voltages/mesh currents in the circuit.

(c) *[2 marks]* Find V_y, the voltage across the 3 A current source.

(d) *[2 marks]* How much **power** is the 3 A current source consuming/supplying to the circuit? Also mention whether the source is supplying or consuming power.

■ Question 3 of 3 *[CO2, CO4] [16 marks]*

Apply Nodal/Mesh analysis to answer the following questions:

(a) *[1 mark]* Which analysis method should be more advantageous in solving the above circuit?

(b) *[14 marks]* Find all the node voltages/mesh currents in the circuit.

(c) *[1 mark]* Find I_x, the amount of current through the 4 kΩ resistor.