

ID:

Name:

**Brac University**

Semester: Spring 2023

Course Code: CSE250

Circuits And Electronics

Set

A

Assessment: *Midterm*

Duration: 1 hour 30 minutes

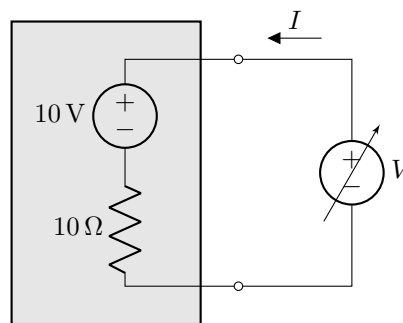
Date: March 4, 2023

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]

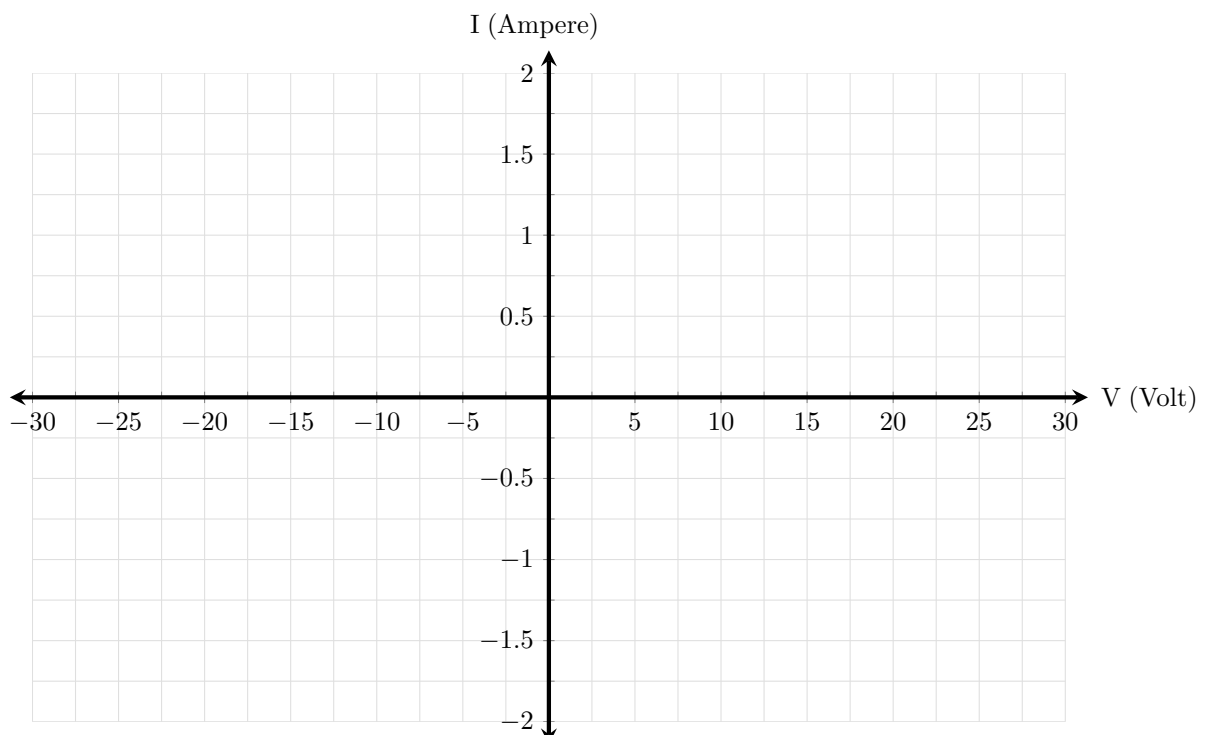
- (a) In order to test the $I - V$ characteristics of a two-terminal linear circuit (inside the gray box), the following circuit was constructed.



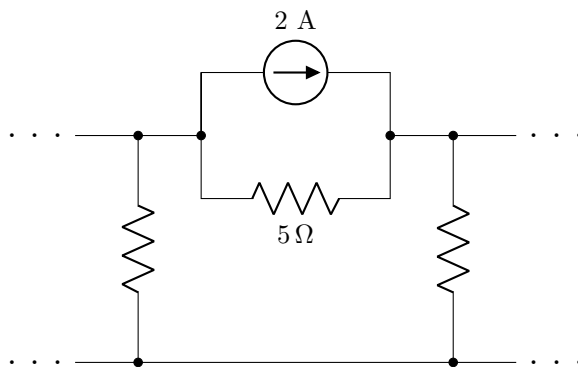
- (i) [1 mark] **Determine** the relationship between I and V , where V is the applied voltage difference across the test circuit and I is the current through it. In the following box write I in terms of V .

$$I =$$

- (ii) [2 marks] Based on your answer in (i), plot the $I - V$ characteristics of the test circuit in the following grid.



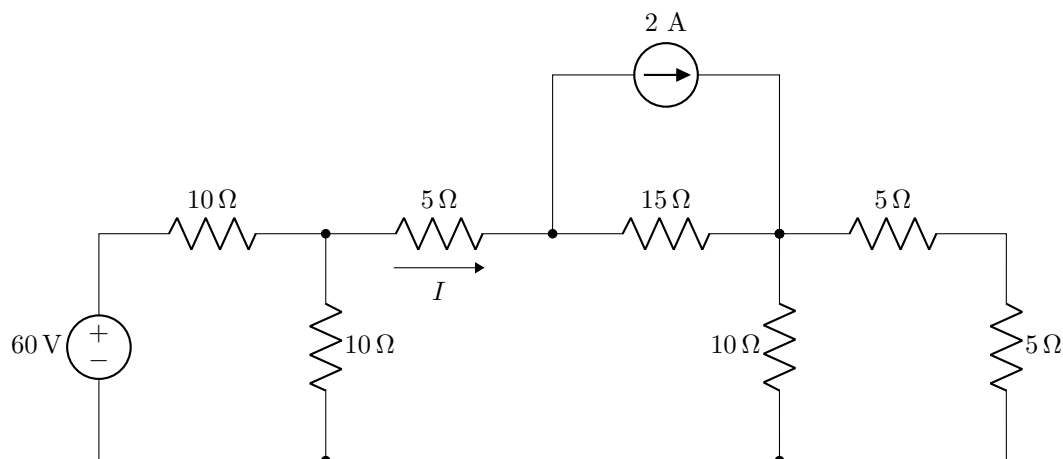
(b) [2 marks] Which one is the correct **Source Transformation** of the following circuitry?



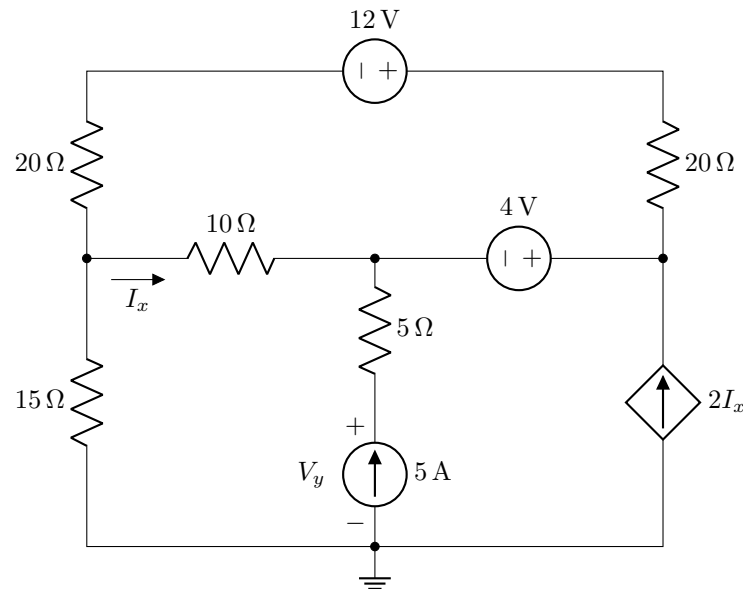
Cross-out or fill-in the checkbox (☐) at the top-left corner of the correct answer.

<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>

(c) [15 marks] Determine the current I as shown in the circuit below using **Superposition Principle** and/or **Source Transformation**.



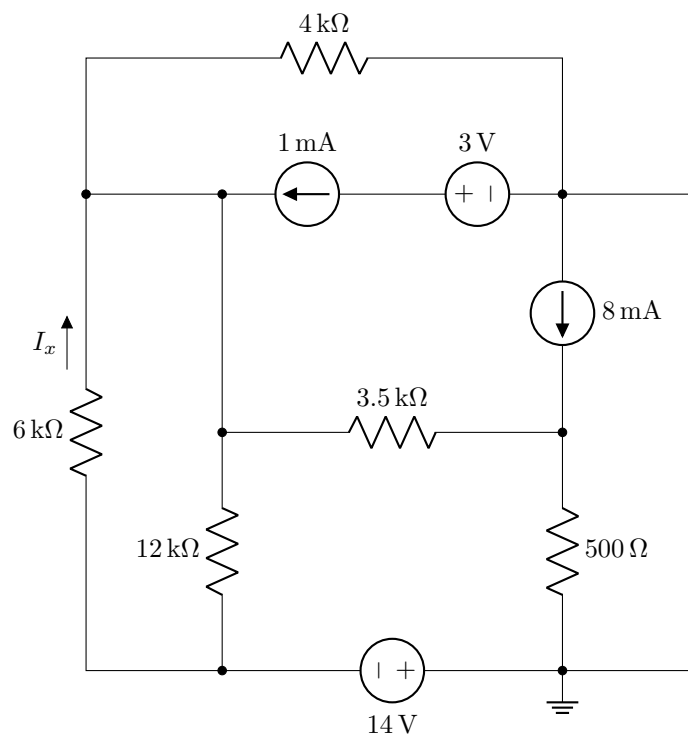
■ Question 2 of 3 [CO2, CO4] [20 marks]



Apply Nodal/Mesh analysis to answer the following questions:

- [1 mark] Which analysis method should be more advantageous in solving the above circuit?
- [15 marks] Find all the node voltages/mesh currents in the circuit.
- [2 marks] Find V_y , the voltage across the 5 A current source.
- [2 marks] How much **power** is the 5 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:

- [1 mark] Which analysis method should be more advantageous in solving the above circuit?
- [14 marks] Find all the node voltages/mesh currents in the circuit.
- [1 mark] Find I_x , the amount of current through the 6 kΩ resistor.