ID:	Name:

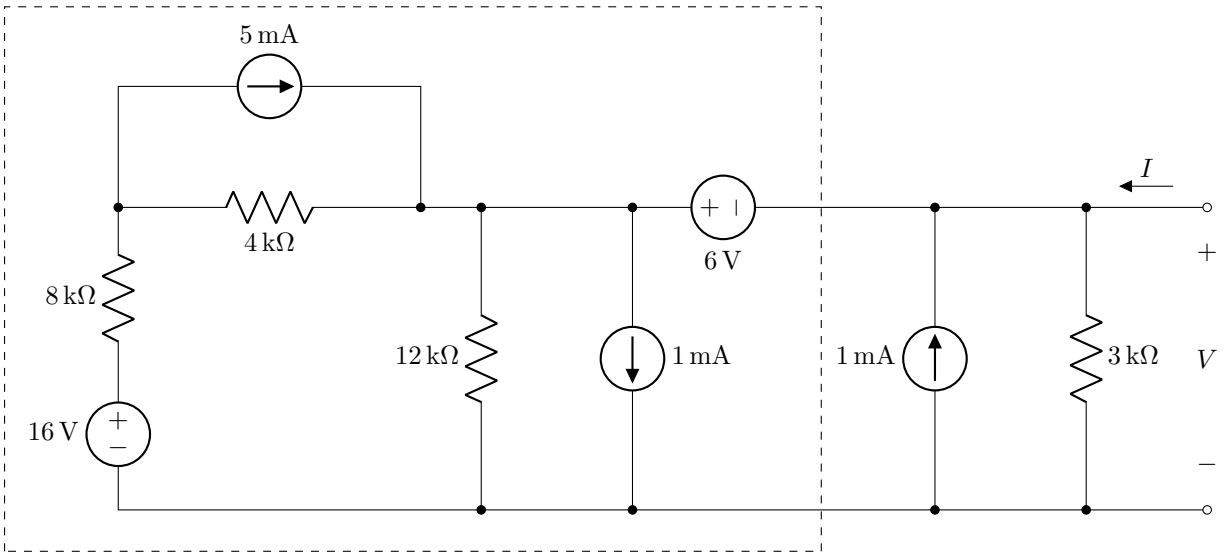
Set **B**

Brac University
Semester: Spring 2024
Course Code: CSE250
Circuits And Electronics

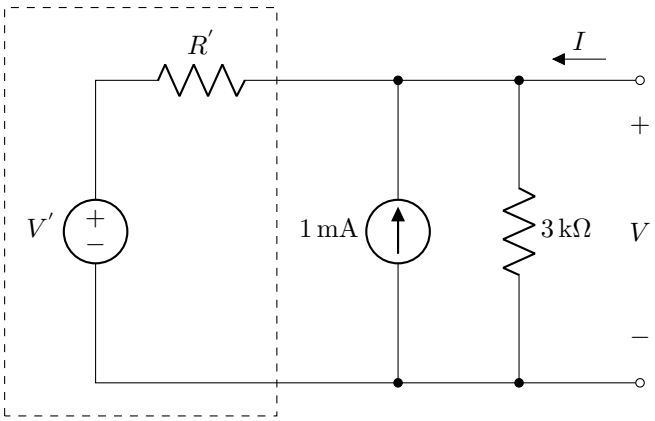
Assessment: *Midterm Exam*
Duration: 1 hour 30 minutes
Date: March 13, 2024
Full Marks: 50 + 5 (Bonus)

- ✓ 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 the invigilator.
- ✓ All **4 questions** are compulsory. Marks allotted for each question are mentioned beside each question.
- ✓ Draw the plot associated with the question 1(b) in the grid provided on the question paper.
- ✓ Symbols have their usual meanings.

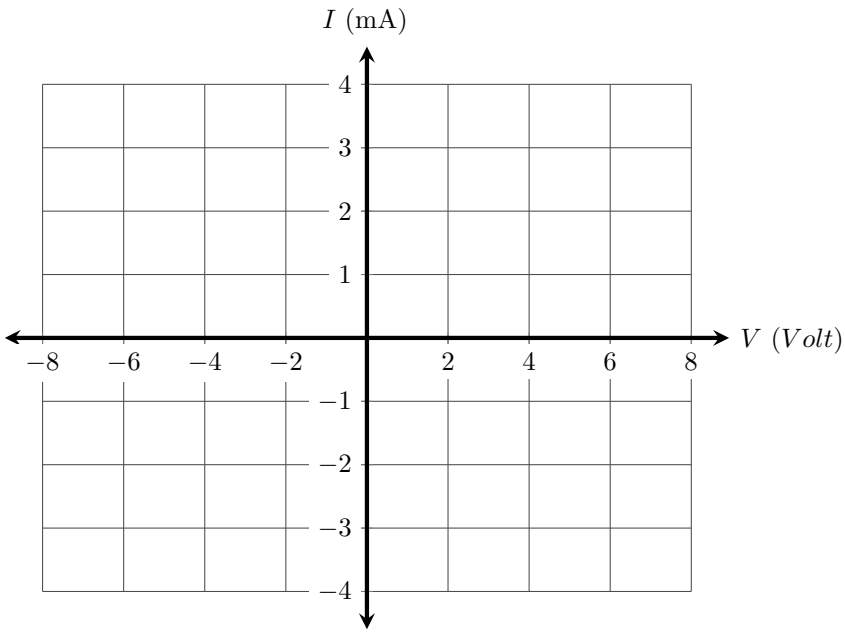
■ Question 1 of 4 *[CO2] [16 marks]*



Circuit 1



Circuit 2



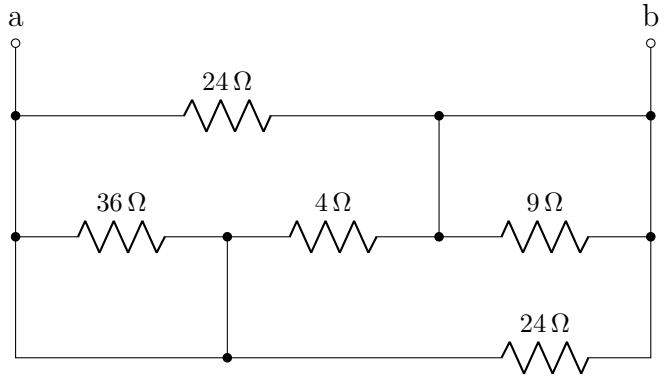
For the circuits shown above,

(a) ***[9 marks]*** **Apply Source Transformation** to reduce the dashed boxed portion of the *Circuit 1* to a single voltage source in series with a resistor as shown in *Circuit 2*. What are the values of $V^{'}$ and $R^{'}$?

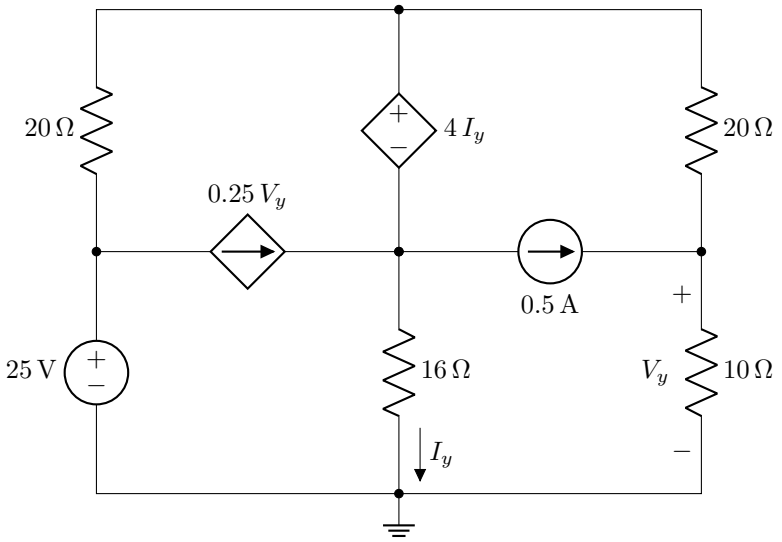
(b) ***[7 marks]*** Derive a **Current-Voltage Relationship** from *Circuit 2*. The $I-V$ equation cannot contain any variables other than I and V pointed out in the diagram. Plot the $I-V$ relation in the grid provided above.

■ Question 2 of 4 *[CO3] [8 marks]*

Determine R_{ab}, the equivalent resistance between the terminals a and b in the circuit shown below.



■ Question 3 of 4 *[CO3] [16 marks]*

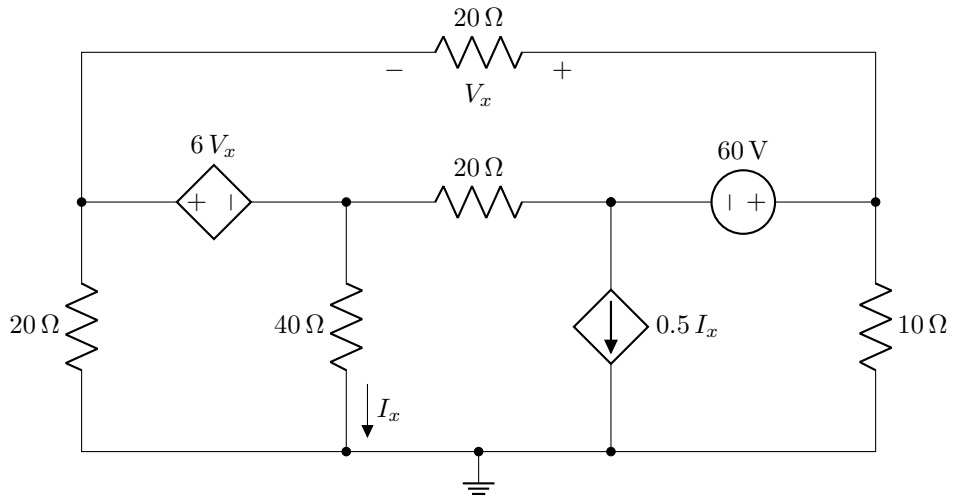


Apply Nodal/Mesh analysis to answer the following questions–

(a) ***[12 marks]*** Find all the node voltages/mesh currents in the circuit shown above. Note that, depending on the analysis method you are applying, you have to determine either the mesh currents or the node voltages, not both.

(b) ***[4 marks]*** Determine the power of the $4\,I_y$ dependent voltage source (with appropriate $\pm$ sign). Also mention, whether the source is supplying or consuming the power.

■ Question 4 of 4 *[CO3] [15 marks]*



Apply Nodal/Mesh analysis to answer the following questions–

(a) ***[12 marks]*** Find all the node voltages/mesh currents in the circuit shown above. Note that, depending on the analysis method you are applying, you have to determine either the mesh currents or the node voltages, not both.

(b) ***[3 marks]*** Determine the voltage across the $0.5\,I_x$ dependent current source.