

ID:

Name:

**Brac University**

Semester: Spring 2023

Course Code: CSE250

Circuits And Electronics

Set

A

Assessment: *Final*

Duration: 2 hours

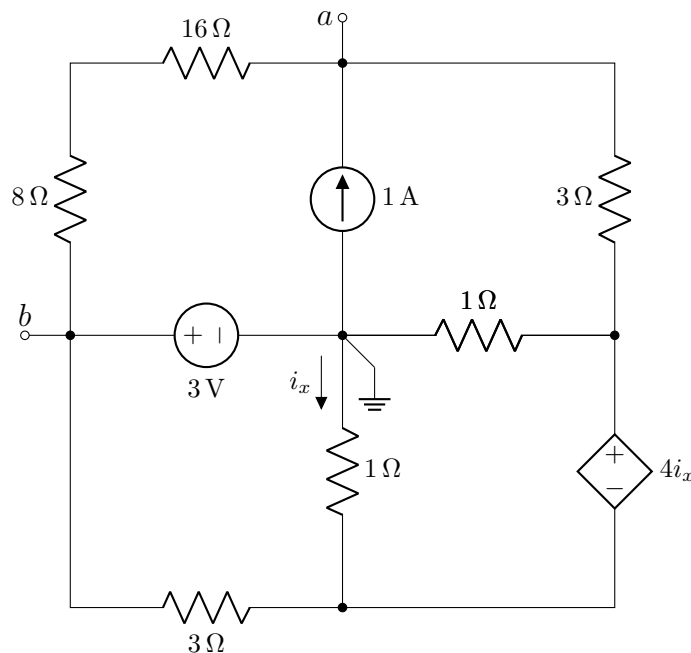
Date: May 2, 2023

Full Marks (incl. bonus 5): 55

- ✓ 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.
- ✓ Symbols have their usual meanings.

### ■ Question 1 of 3 [CO2 CO3 CO4] [20 marks]

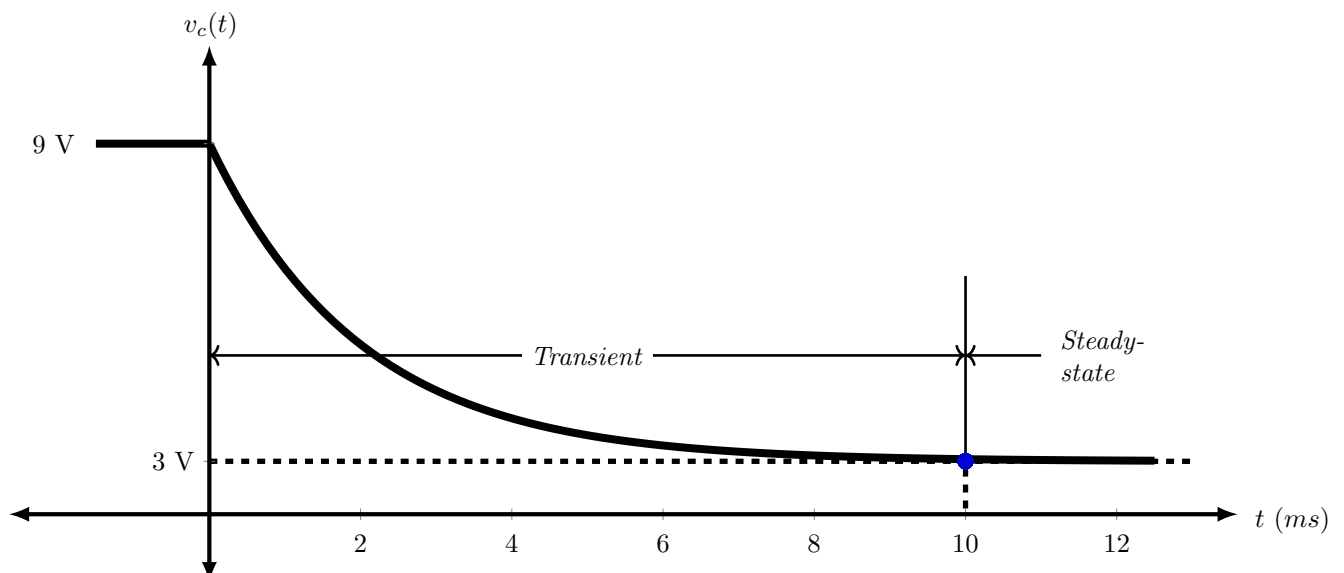
Consider the following circuit with open terminals **a** and **b**. Currently, no load is connected to the terminals.



- (a) [12 marks] Determine the value of  $R_L$  that will draw the **Maximum Power** from the circuit.
- (b) [8 marks] Determine the value of the **Maximum Power**.

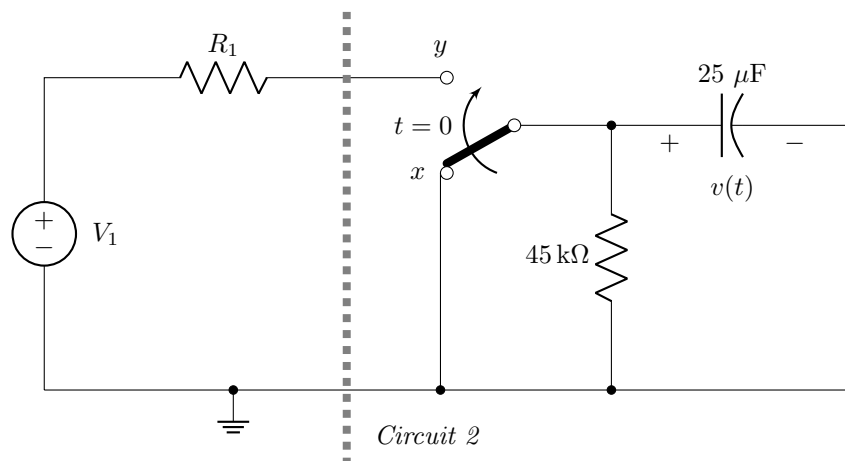
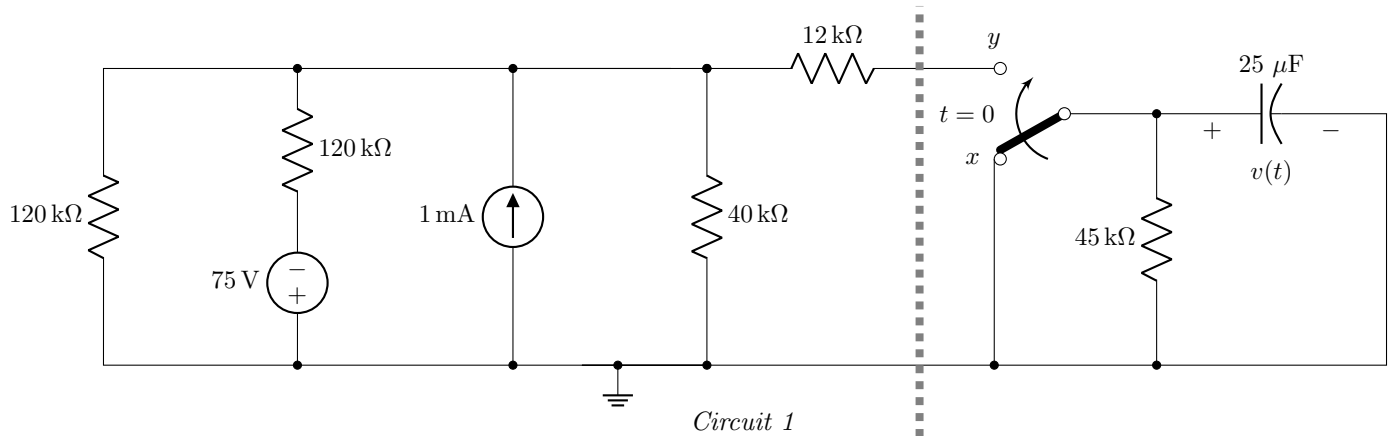
### ■ Question 2 of 3 [CO4 CO5] [20 marks]

- (a) The  $v_c(t)$  vs  $t$  plot below shows the voltage response of a capacitor ( $C$ ) in a series RC circuit to a sudden change in the DC voltage applied through an equivalent resistance of  $2\text{ k}\Omega$ .



- (i) [2 marks] **Determine** the approximate **Time Constant** from the figure. **Determine  $C$**  with appropriate unit.
- (ii) [1 mark] Write a mathematical expression of  $v_c(t)$  for  $t > 0$ .
- (iii) [2 marks] Predict and draw a circuit with appropriate switching mechanism that can generate the voltage response as shown in the plot.

(b) Consider the following circuits.



- (i) [7 marks] **Reduce** the left portion with respect to the dashed gray line of *Circuit 1* so that it takes the form of *Circuit 2* as shown. Write down the values of  $V_1$  and  $R_1$ .
- (ii) [8 marks] Now, **analyze the Transient Behavior** of the circuit assuming that the switch moves from position  $x$  to position  $y$  at  $t = 0$ . **Determine  $v(t)$**  for  $t > 0$ .

### ■ Question 3 of 3 [CO4 CO6] [15 marks]

**Determine  $v_x(t)$**  in the circuit shown below.

