ID:	Name:

Set **B**

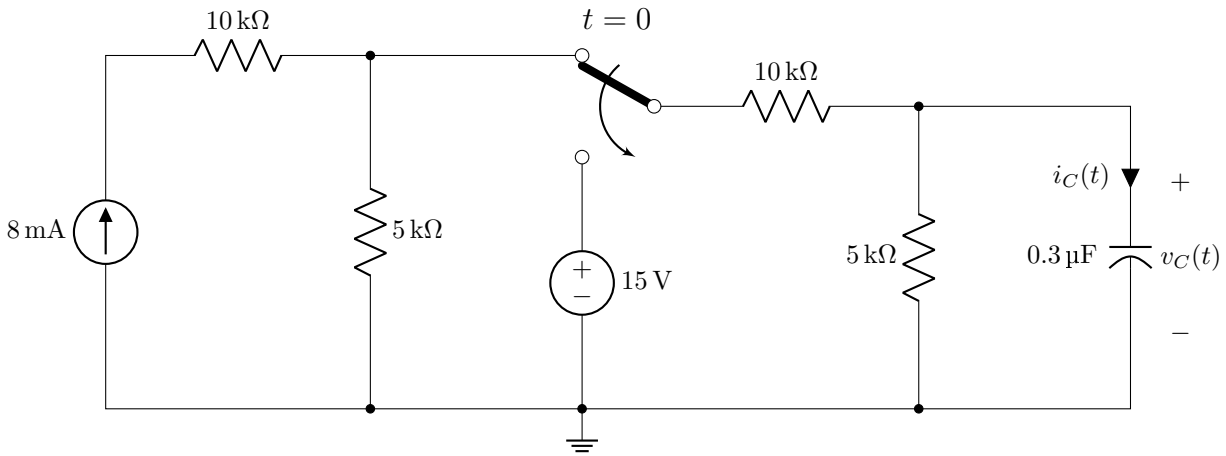
Brac University
Semester: Summer 2024
Course Code: CSE250
Circuits And Electronics

Assessment: *Final Exam*
Duration: 1 hour 15 minutes
Date: October 7, 2024
Full Marks (incl. bonus 5): 50

- ✓ 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 plots for the questions **1(c)** and **2(b)** in the grids provided on the question paper.
- ✓ Symbols have their usual meanings.

■ Question 1 of 4 *[CO3] [16 marks]*

The switch in the following circuit shifts at $t = 0$.

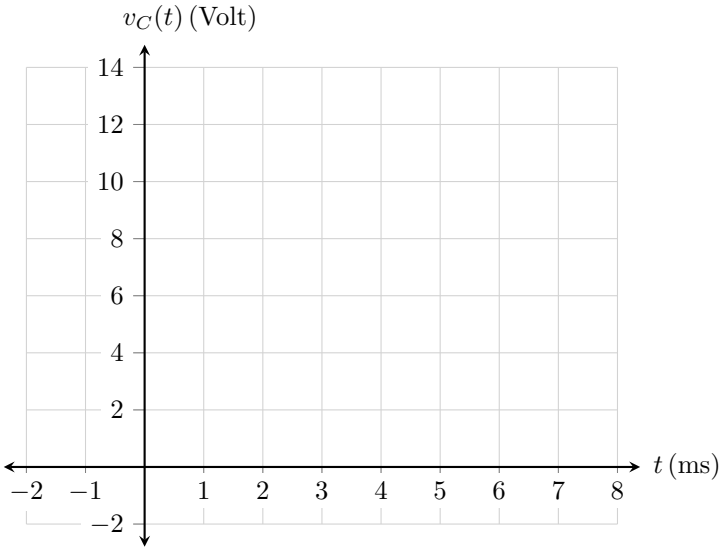


Analyze the Transient Behavior to answer the following questions–

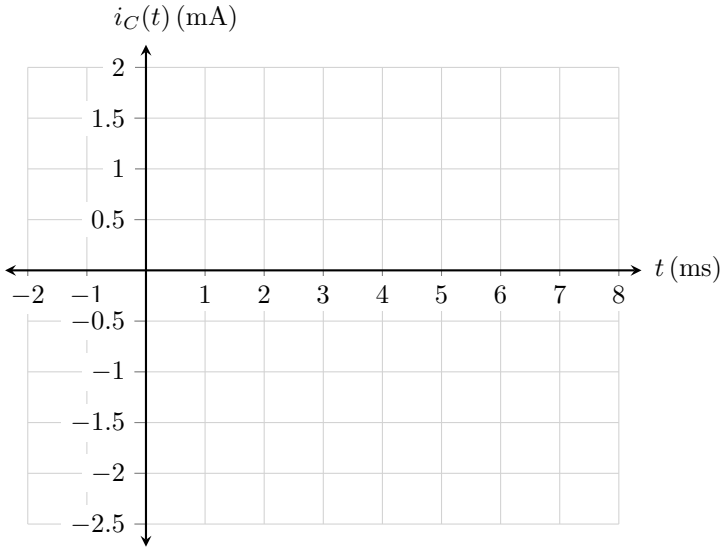
(a) ***[10 marks]*** Determine the voltage response of the capacitor $v_C(t)$ as a function of time for $t > 0$.

(b) ***[3 marks]*** Determine the current $i_C(t)$ through the capacitor for $t > 0$.

(c) ***[3 marks]*** On the grids provided below, approximately draw the $v_C(t)$ and $i_C(t)$ found in (a) and (b) respectively.



Grid for $v_C(t)$



Grid for $i_C(t)$

■ Question 2 of 4 *[CO3] [10 marks]*

When a voltage $V = 5\,\text{V}$ is applied between terminals a and b of a linear two terminal circuit 'X', the circuit draws a current $I = 2\,\text{A}$ as shown in *Figure 1* below. When the terminals are shorted, 3 A current flows as shown in *Figure 2*.

(a) ***[2 marks]*** Derive a relationship between I and V.

(b) ***[2 marks]*** Draw the relationship found in (a) on the grid provided below.

(c) ***[6 marks]*** If the circuit in *Figure 3* is an alternative version of the circuit 'X', determine the voltage V' and the resistance R'.

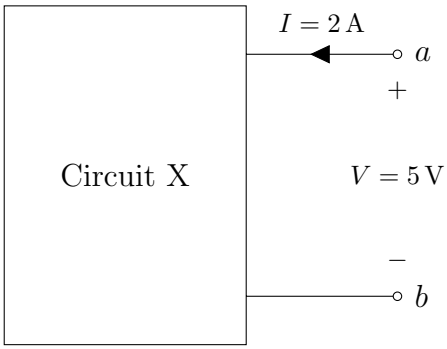


Figure 1

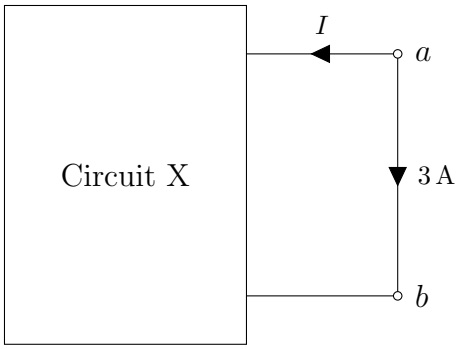


Figure 2

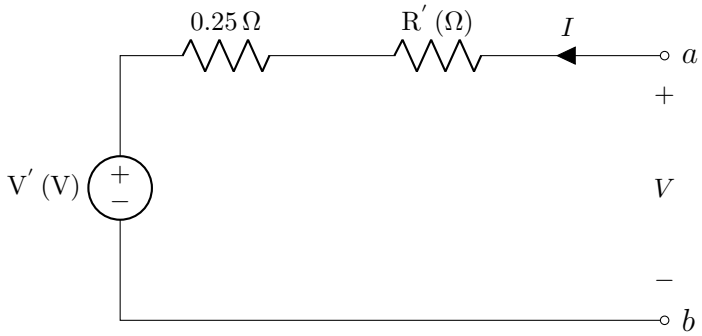
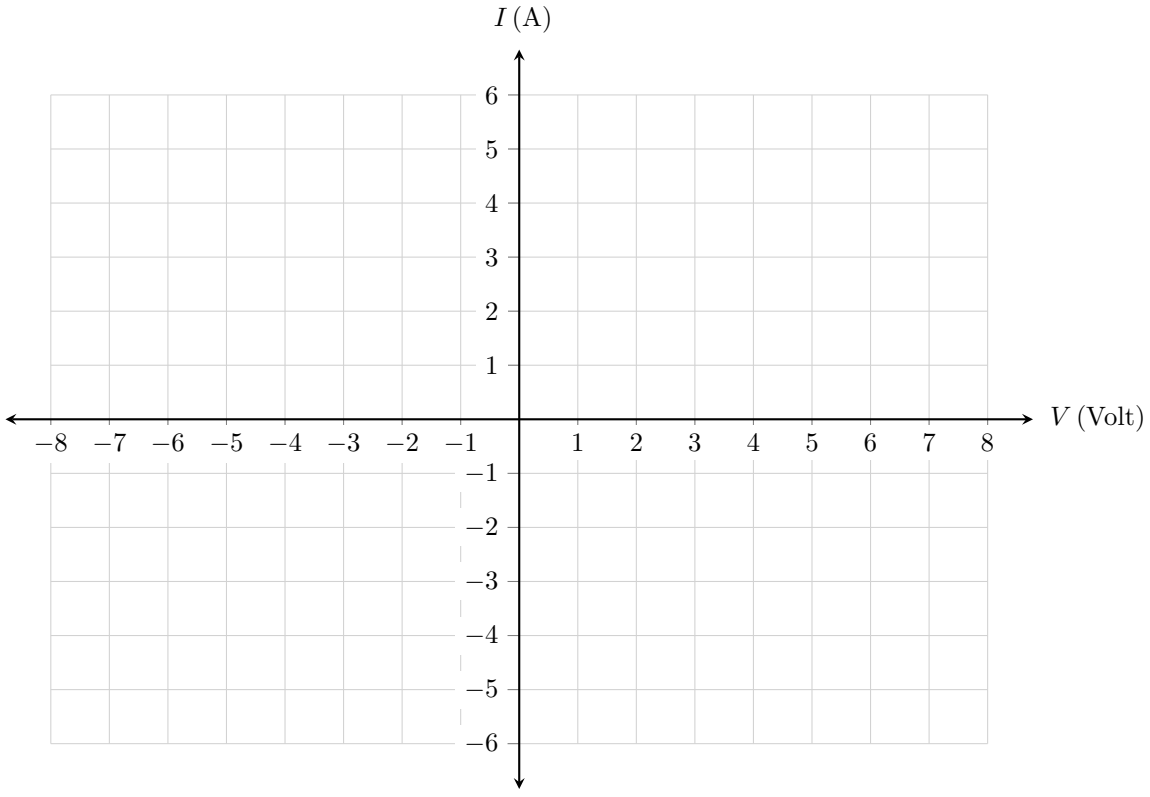
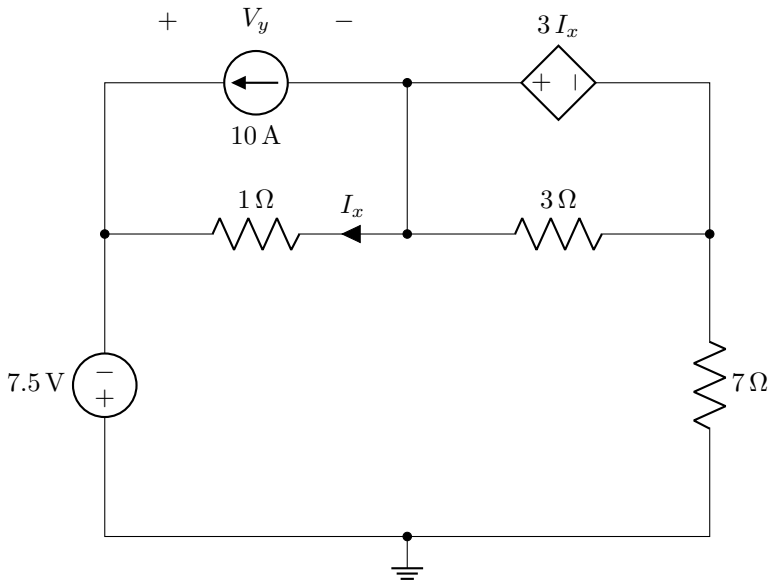


Figure 3



■ Question 3 of 4 *[CO3] [16 marks]*



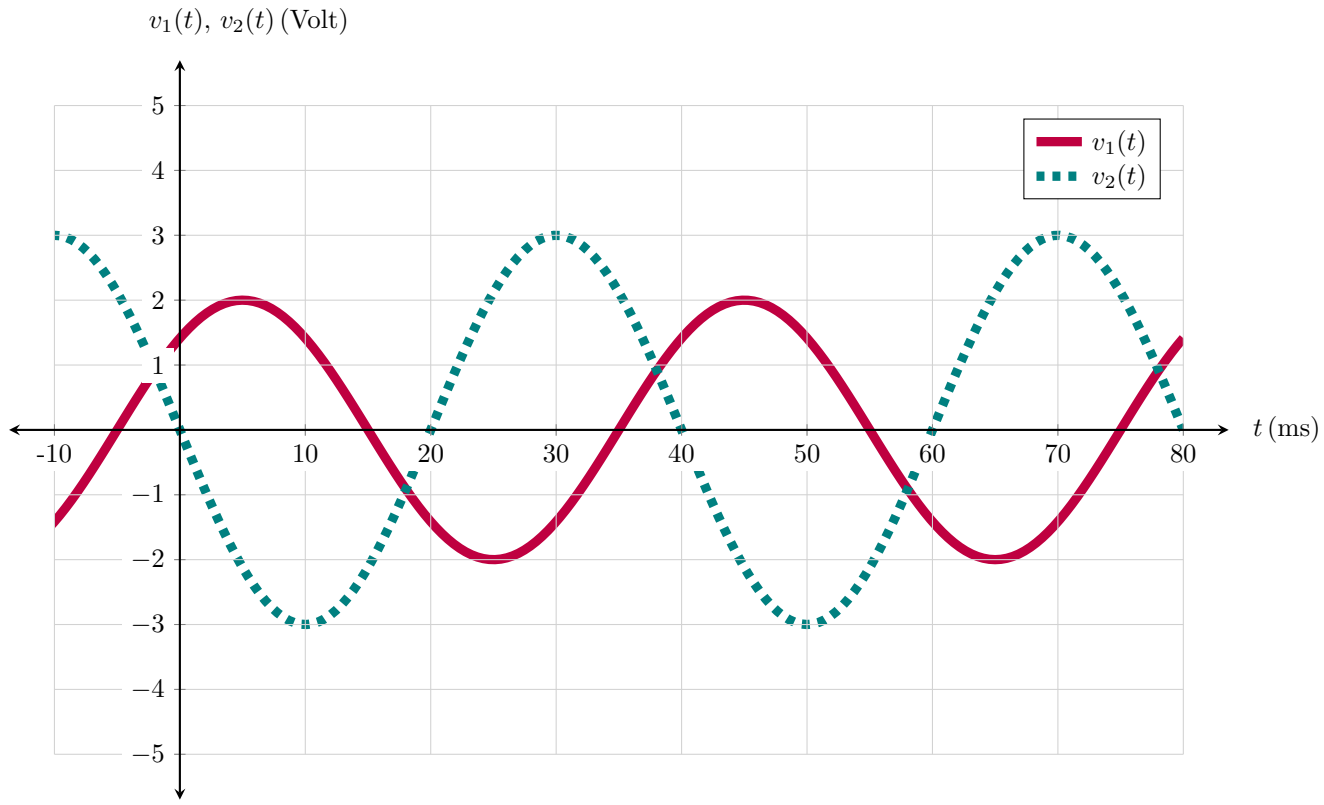
From the above circuit, answer the following questions-

(a) ***[13 marks]*** Find V_y using **Superposition principle**.
After applying Superposition principle you may use any analysis technique you prefer (Nodal, Mesh, Src Tx etc.).

(b) ***[3 marks]*** Find the **power consumed/supplied** by the **current source** (with proper ± sign and unit).

■ Question 4 of 4 *[CO3] [8 marks]*

Two ac voltage waveforms $v_1(t)$ and $v_2(t)$ from a circuit are plotted below as a function of time t.



(a) ***[4 marks]*** Determine the phase difference between the two and specify which one is leading.

(b) ***[4 marks]*** Write analytical expressions for both $v_1(t)$ and $v_2(t)$. From the expressions, verify the fact found in (a).