

ID:

Name:

Brac University**Set: 1**

Semester: Fall 2022

Course No: CSE250

Course Title: CIRCUITS AND ELECTRONICS

Date: January 02, 2023

Final Exam

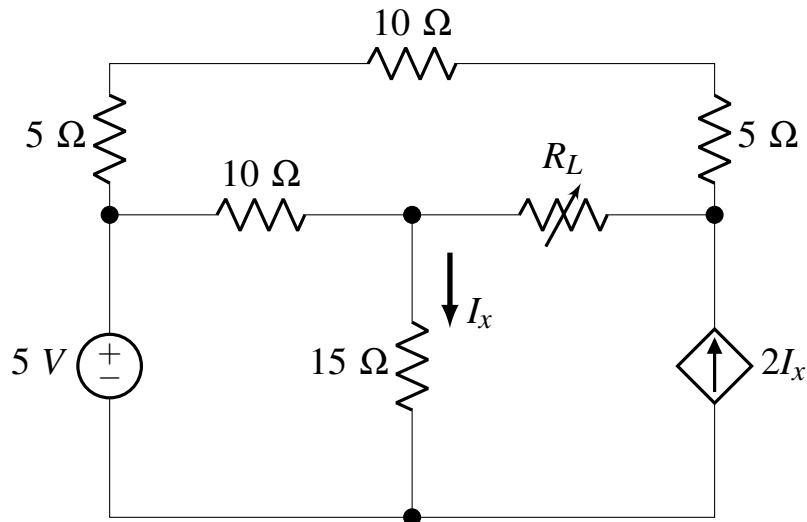
Full marks: 50 (+5 Bonus)

Duration: 2 hours

Questions 1 to 3 are mandatory. Numbers inside box brackets indicate marks.

Question 1 of 4 [15 marks] [CO2, CO3, CO4]

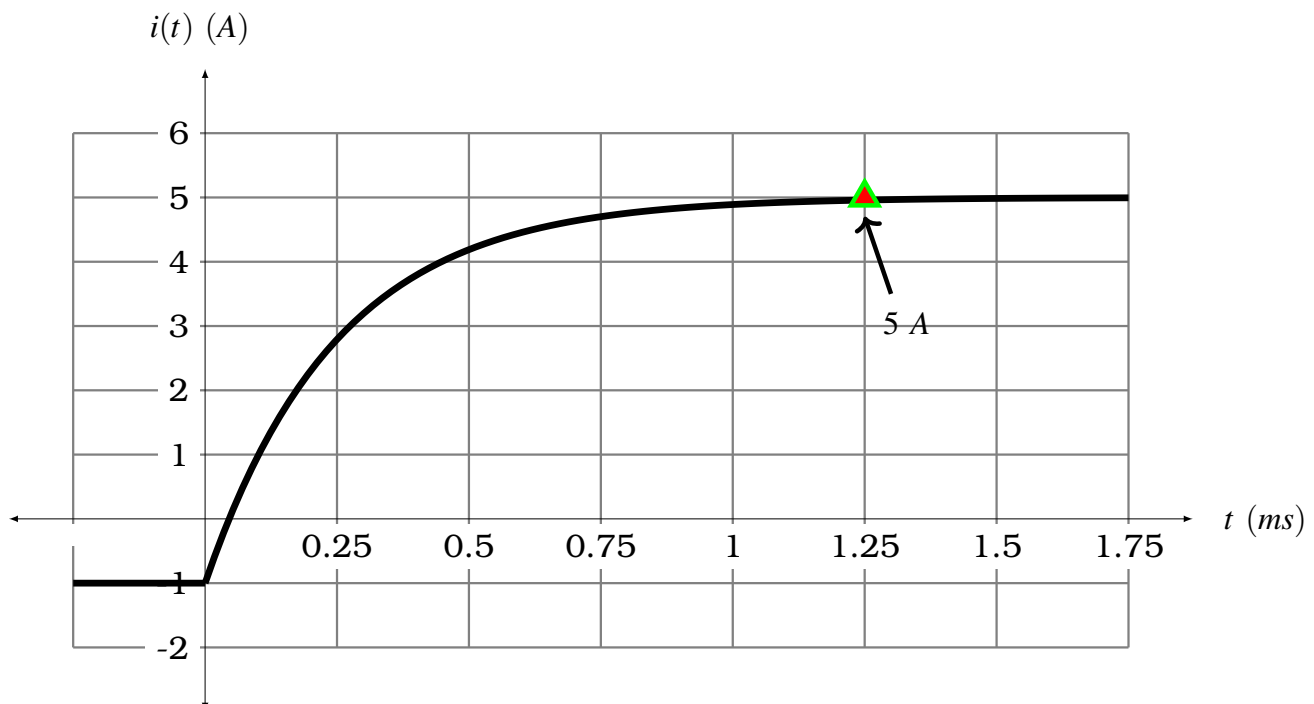
Consider the circuit show below.



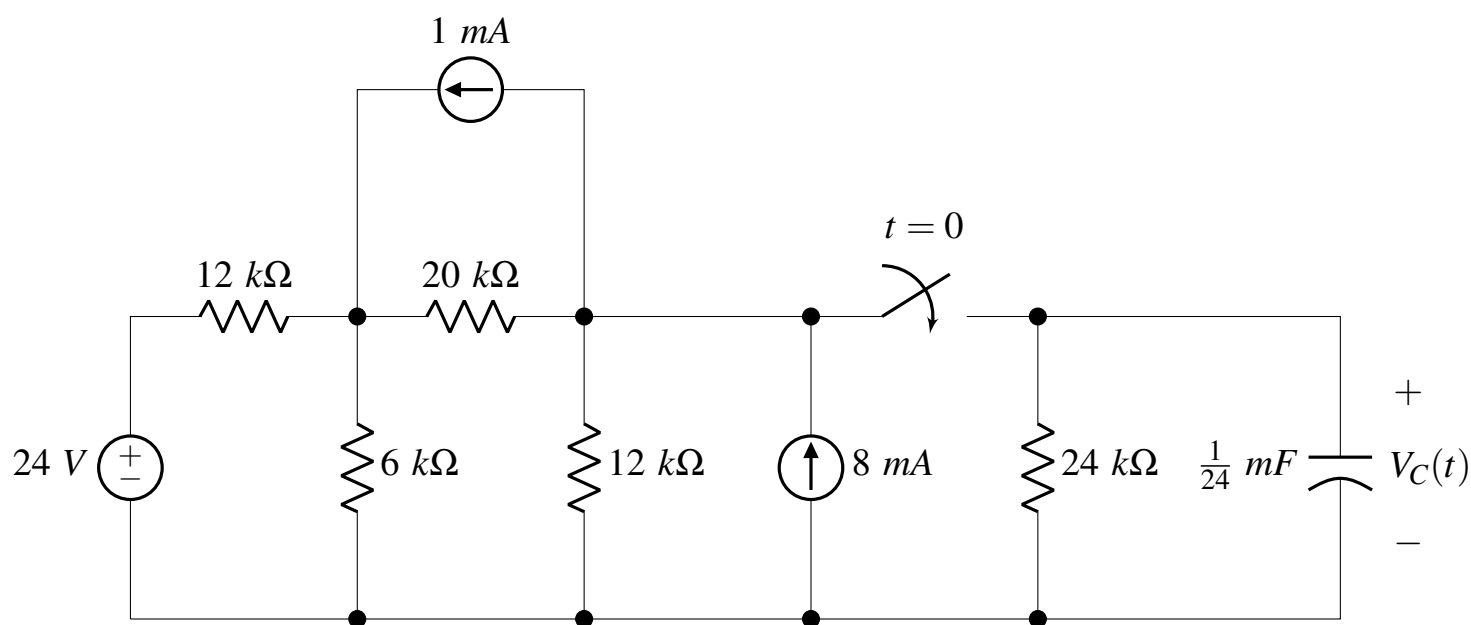
- (i) **Determine** the value of R_L that will draw **Maximum Power** from the rest of the circuit. [8]
- (ii) **Determine** that value of the **Maximum Power**. [7]

Question 2 of 4 [20 marks] [CO4, CO5]

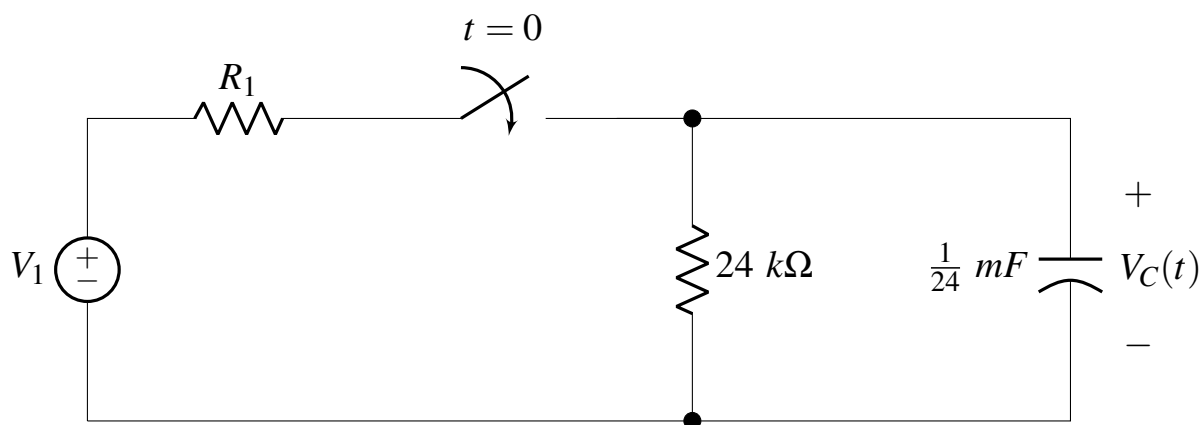
Part A: The figure below shows the current response of a series RL circuit to a sudden DC current applied through an equivalent resistance of $4\text{ k}\Omega$. **Determine** the approximate **time constant** from the figure. Also, **determine** the value of the **inductor**. **Write** the mathematical expression of $i(t)$ for $t > 0$. [Hint: The time it takes for an inductor to be fully charged is approximately five times the time constant]. [3]



Part B: Consider the circuits shown below.



Circuit 1



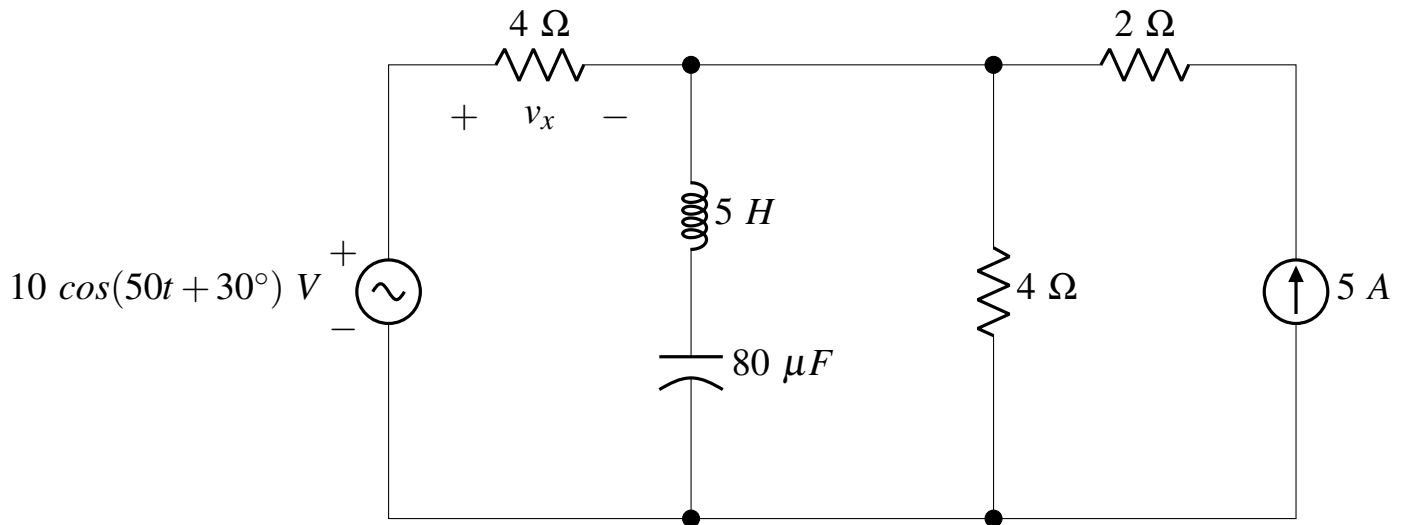
Circuit 2

- (i) **Reduce** the circuit 1 so that it takes the form of the circuit 2 as shown above. [8]
- (ii) **Perform** transient analysis to determine $V_C(0)$, $V_C(\infty)$, and $V_C(t)$ for $t > 0$. Also, determine the current through the capacitor at $t = 0.1\text{ s}$. [9]

Question 3 of 4 [15 marks] [CO4, CO6]

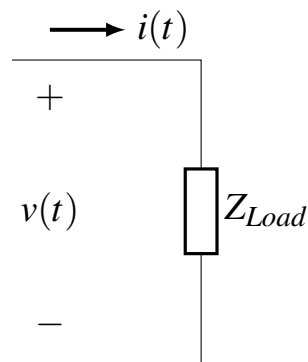
Find v_x in the circuit shown below [Hint: Use Superposition Principle].

[15]



Question 4 of 4 [Bonus] [5 marks] [CO6]

A series-connected load shown below draws a current $i(t) = -4 \sin(400t - 120^\circ) \text{ A}$ when the applied voltage is $v(t) = 100 \cos(400t - 60^\circ) \text{ V}$. **Determine** with appropriate units



- (i) **Complex Power** of the load, [2]
- (ii) **Power Factor** of the load, [1]
- (iii) **Real** and **Reactive Power** absorbed/supplied by the load. [2]