LUMS
A Not-for-Profit University

Department of Electrical Engineering
School of Science and Engineering

# EE240 Circuits I - Fall 2022

# ASSIGNMENT 4

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Due Date: 4:30pm, Monday. December 12, 2022 (Submit in the Dropbox located outside 9-251)

Format: 5 problems, for a total of 100 marks

Instructions:

- You are allowed to collaborate with your peers but copying your colleague's solution is strictly prohibited. This is not a group assignment. Each student must submit his/her own assignment.
- Solve the assignment on blank A4 sheets and staple them before submitting.
- Submit in-class or in the drop box labelled EE-240 outside the instructor's office.
- Write your name and roll no. on the first page.
- Feel free to contact the instructor or the teaching assistants if you have any concerns.

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Course Learning Outcomes Covered:

- Analyze first and second order switched circuits for their initial and final condition, transient response etc.
- Solve switched linear networks up to second order using initial conditions

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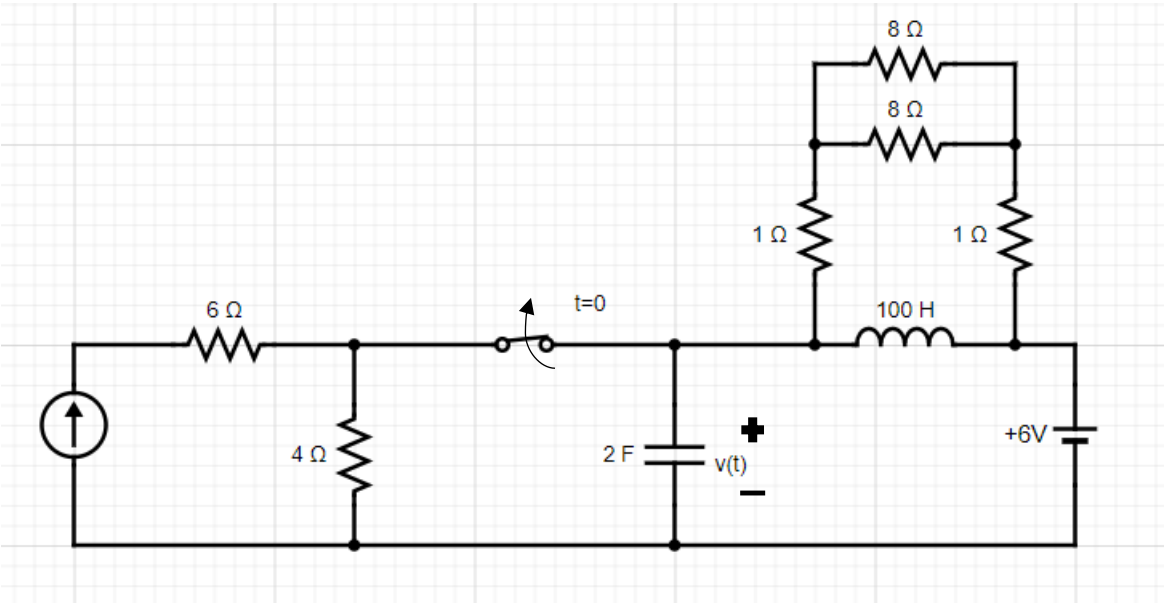
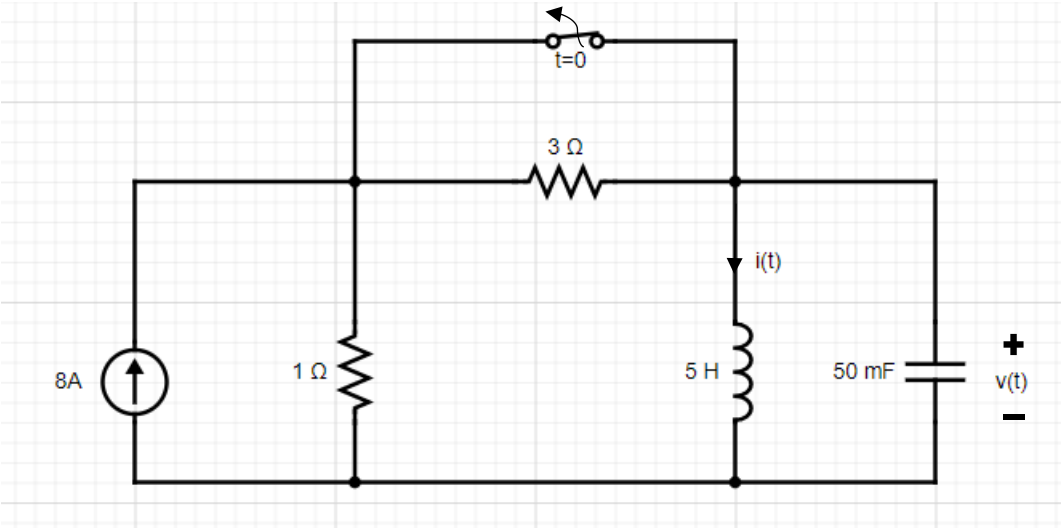
Q1) The circuit contains a 2A current source. The switch is opened at t=0.




i) Draw how the circuit looks at $t=0^-$ and determine the initial conditions of the capacitor and inductor. [3 marks]

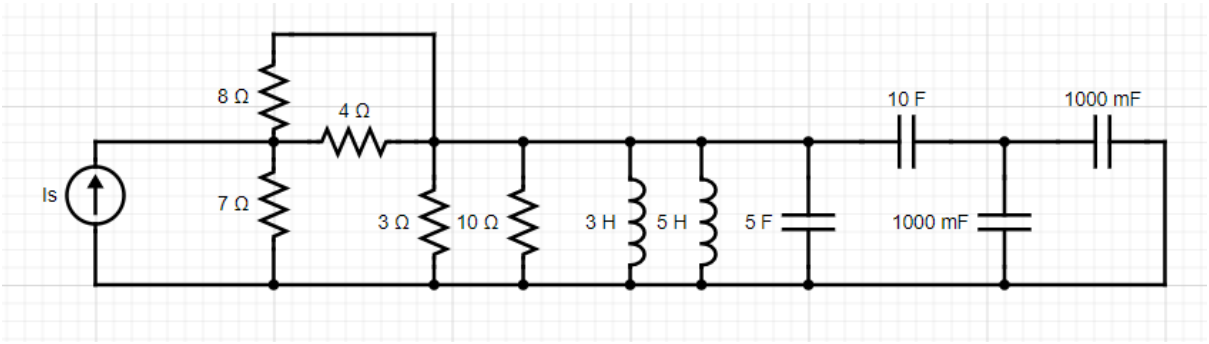
ii) Determine v(t) for the circuit at t > 0. [7 marks]

Q2) Determine i(t) in the circuit shown below for t > 0. [10 marks]

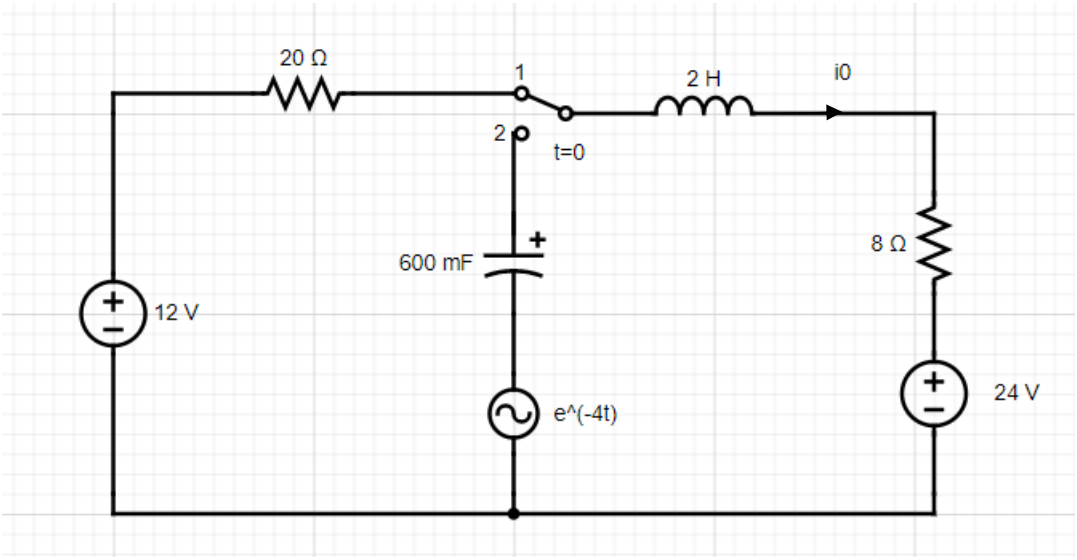


Q3) For the following circuit, compute its:

i) Resonant Frequency [2 marks]
ii) Bandwidth [2 marks]
iii) Quality factor [1 mark]




Q4) In the following circuit, the switch is moved from position 1 to position 2 at t = 0. Determine $i_0(t)$ for t >= 0. [15 marks]




Q5) The current flowing through a series RLC circuit driven by a voltage source is given by for t>0:

$$Ze^{-4t} - 30e^{-6t} - 5e^{-2t} + 20e^{-5t}$$

where Z is an unknown constant. The voltage source is given by:

$$V(t) = (5e^{-2t} + 3e^{-5t})u(t)$$

The inductance is L = 0.5H.

i) Find the corresponding value of R and C and draw the circuit. [4 marks]
ii) Determine the value of Z. [4 marks]
iii) Derive an expression for voltage across inductor $v_L(t)$ and find $v_L(t)$ at inductor voltage at t = 1s. [2 marks]