

School of Science and Engineering

EE 240 Circuits-I

ASSIGNMENT 4

Due Date: 1 pm, Tuesday, December 3, 2024.

Format: 5 problems, for a total of 100 marks

Instructions:

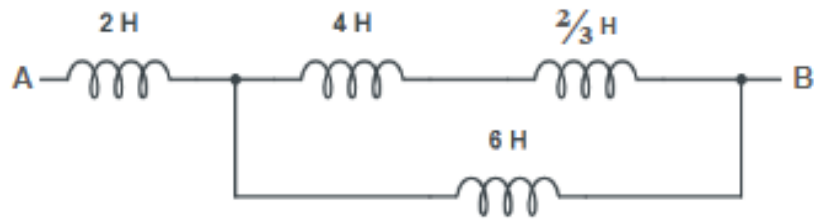
- You are allowed to collaborate with your peers but copying your colleague's solution is strictly prohibited. This is not a group assignment. Each student must submit his/her own assignment.
- Solve the assignment on blank A4 sheets and staple them before submitting.
- Submit in-class or in the dropbox labeled 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.

- You represent the most competent individuals in the country, do not let plagiarism come in between your learning. In case any instance of plagiarism is detected, the disciplinary case will be dealt with according to the university's rules and regulations.
- We require you to acknowledge any use or contributions from generative AI tools. Include the following statement to acknowledge the use of AI where applicable.

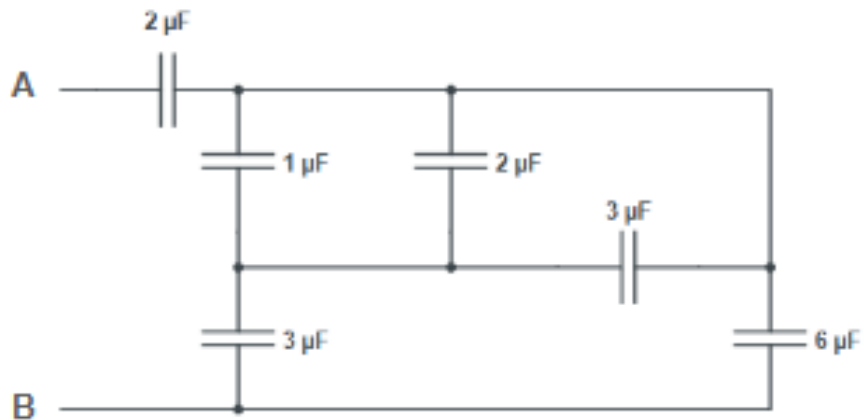
I have used [insert Tool Name] to [write, generate, plot or compute; explain specific use of generative AI] [number of times].

Problem 1 (10 marks)

- (a) [5 marks] Determine the equivalent inductance across terminals A and B.

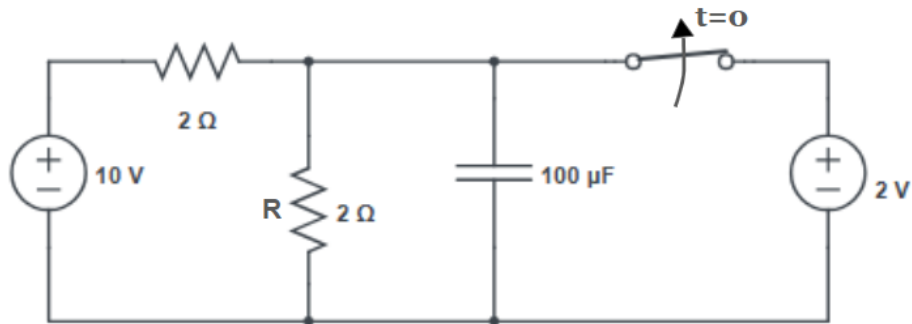


- (b) [5 marks] Determine the equivalent capacitance across terminals A and B.

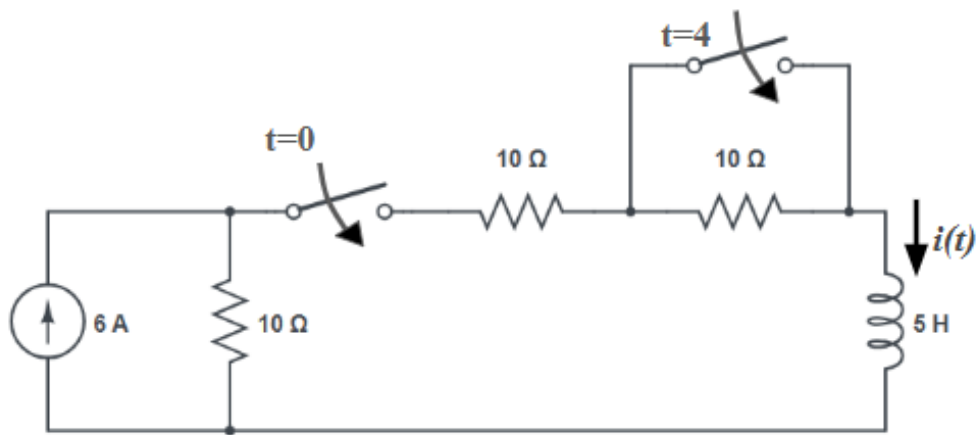


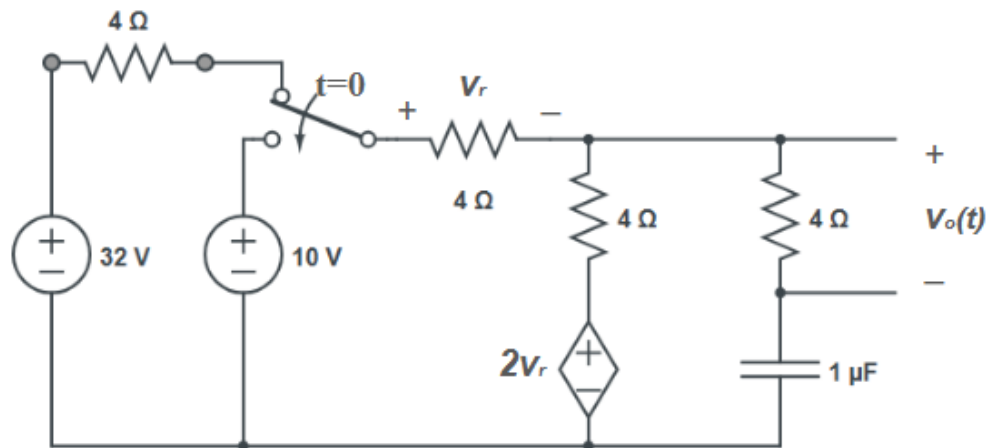
Problem 2 (35 marks)

- (a) [15 marks] Find and plot the voltage across the resistor R for all time. Find the time at which the voltage across the resistor $R = 4\text{V}$.



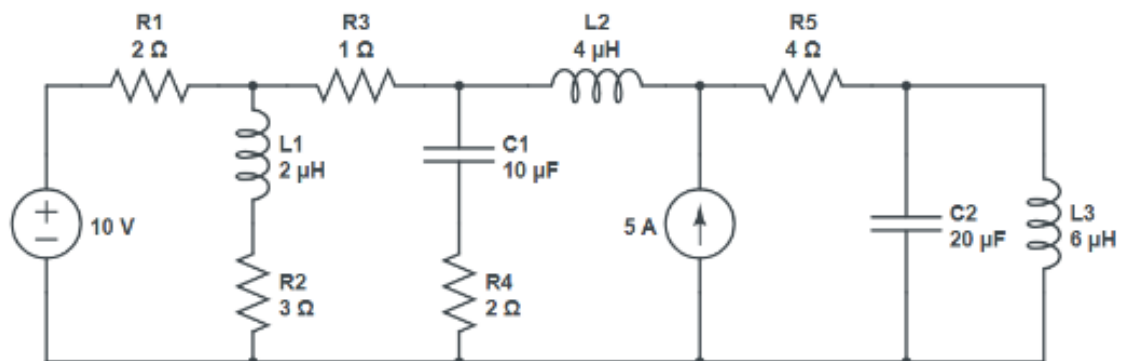
- (b) [20 marks] Calculate $i(t)$ for all t using Step by Step Analysis technique.



Problem 3 (20 marks)Find $V_o(t)$ for $t > 0$.**Problem 4** (10 marks)

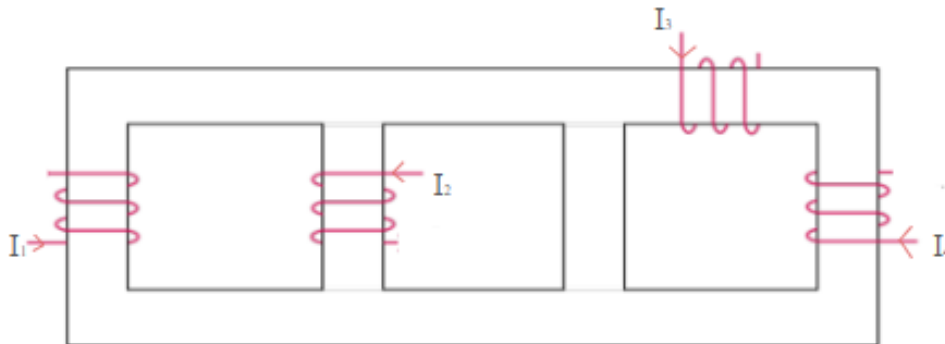
The circuit given below is in a steady state.

- (a) [3 marks] Find the energy stored in inductors L_1 , L_2 , and L_3 .
- (b) [2 marks] Find the energy stored in capacitors C_1 and C_2 .
- (c) [5 marks] Find the power dissipated in resistors R_1 , R_2 , R_3 , R_4 , and R_5 .



Problem 5 (25 marks)

- (a) [10 marks] Indicate the polarity of the coils on the flux-conducting core using different symbols. Use dots to represent the polarity at the appropriate ends of the windings.



- (b) [15 marks] For the circuit given below, apply Loop Analysis to obtain the complete set of loop equations. Make sure to adhere to the dot convention.

Mutual Inductances: L_1 and $L_3 = M_a$, L_1 and $L_4 = M_b$, L_2 and $L_4 = M_c$.

All loops should be defined in the clockwise direction. You are only required to formulate the loop equations. You do not need to solve.

