EE1101: Circuits and Network Analysis

Assignment - 06

Handed out: 13 - Sep - 2024 **Due : 23 - Sep - 2024 (before 5 PM)**

Instructions :

1. Please upload your assignment solutions to the course page on the Canvas platform. Only solutions submitted through canvas will be reviewed. For specific guidelines, refer to the instructions provided on the course page.
2. It is suggested that you attempt all the problems. However, it is sufficient to submit solutions for problems that total 10 points.
3. Submissions received after the deadline will attract negative marking. Ensure that your submissions are named in the following format: RollNo-Assignment-06.pdf.

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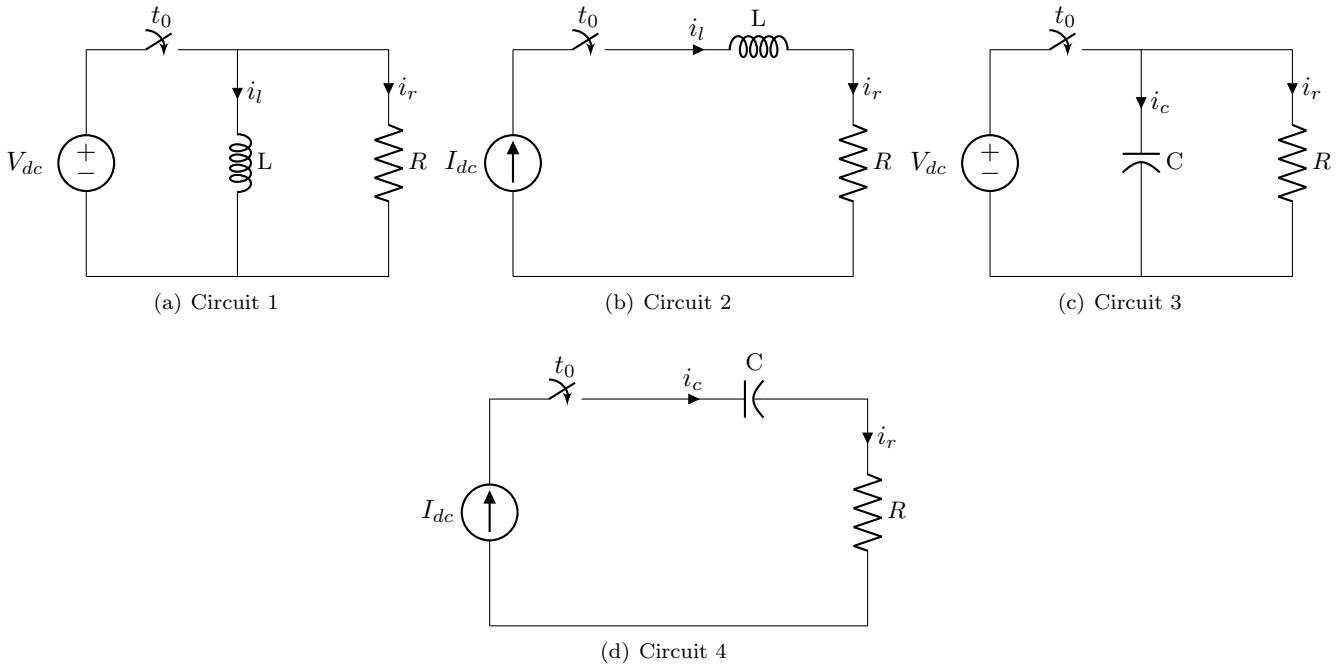
1. (8 points) Consider the first-order circuits shown in Fig. 1.
   (a) (2 points) Compute the source current and inductor current for the circuit shown in Fig. 1(a).
   (b) (2 points) Compute the voltage across the resistor and the inductor current for the circuit shown in Fig. 1(b).
   (c) (2 points) Compute the source current and capacitor current for the circuit shown in Fig. 1(c).
   (d) (2 points) Compute the voltage across the resistor and the capacitor current for the circuit shown in Fig. 1(d).



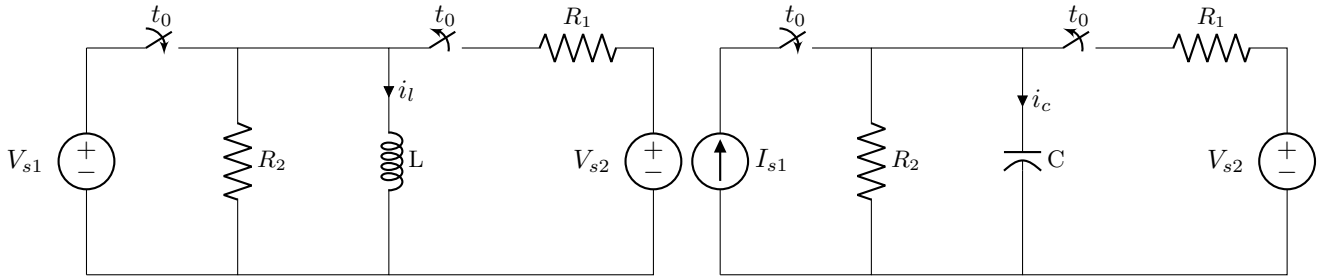
(a) Circuit 1 (b) Circuit 2 (c) Circuit 3

(d) Circuit 4

Fig. 1: Simple first order circuits (Question 1)

Compute the rise time and the settling time associated with various responses. Further, for each circuit compute the energy stored in the inductor/capacitor in steady state.

2. (8 points) Consider the circuits shown in Fig. 2.



(a) Circuit 1 (b) Circuit 2

Fig. 2: Simple first order circuits (Question 2)

(a) (4 points) Compute the inductor current for the circuit shown in Fig. 2(a).

(b) (4 points) Compute the voltage across the capacitor for the circuit shown in Fig. 2(b).

Assume that t_0 is large enough so that the circuit reaches steady state prior to t_0.

3. (4 points) Consider the Op-Amp circuit shown in Fig. 3. Derive the expression for load voltage $v_l(t)$, assuming the Op-Amp to be ideal.

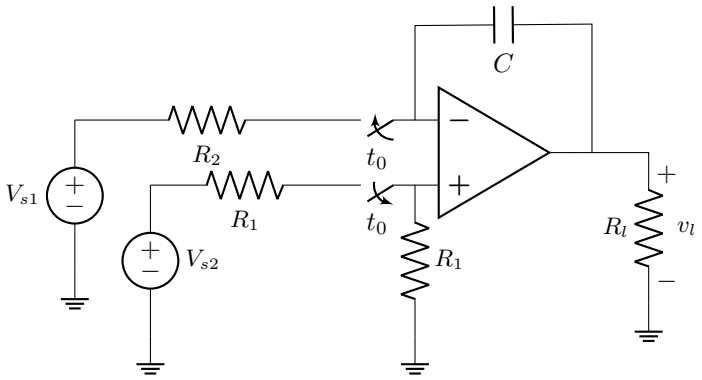


Fig. 3: Circuit with Op-amp (Question 3)

4. (4 points) For the circuit shown in Fig. 4, derive an expression for output voltage. Further, assess, the nature of output voltage if the inductance is much larger than the resistors R_1 and R_2.

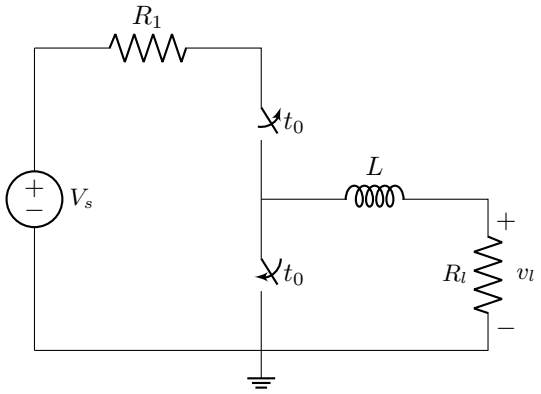


Fig. 4: Circuit with complementary switches (Question 4)