MATHEMATICAL QUESTIONS

Question 1

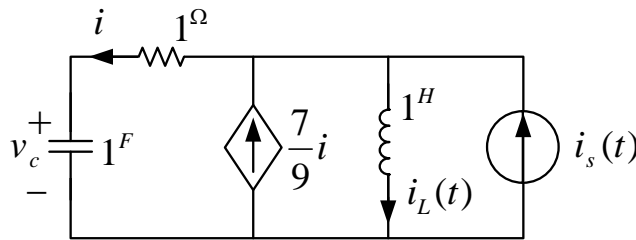**Find the step and impulse responses of the current $i(t)$ in Fig. 1.**

Figure 1: An LTI RLC circuit with dependent source.

Question 2

Find an expression for the zero-input response of $v_1(t)$ in Fig. 2 valid for $t > 0$ if $v_1(0^+) = V_1$ and $v_2(0^+) = V_2$.
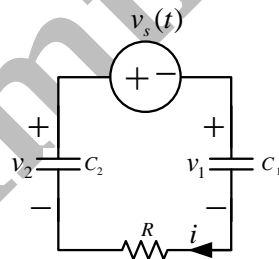

Figure 2: A circuit with two capacitors.

Question 3

Calculate $i_L(t), t > 0$ in Fig. 3, where

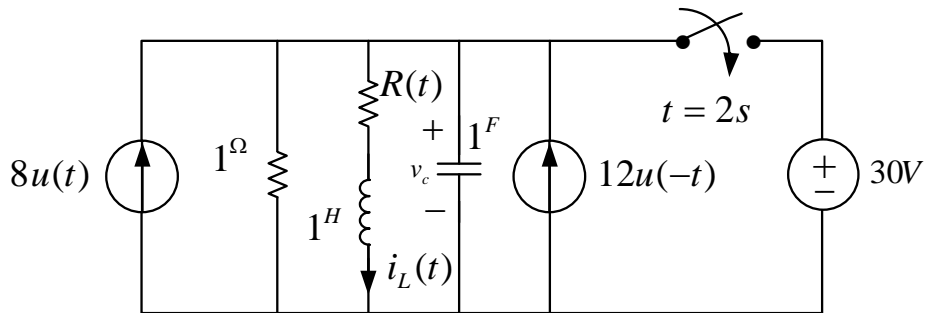$$R(t) = \begin{cases} 2, & t < 0 \\ 1, & 0 < t < 2 \\ 3, & t > 2 \end{cases}$$

Question 3 continued on next page…   Page 1 of 4

.

Figure 3: A second-order time-variant circuit.

Question 4

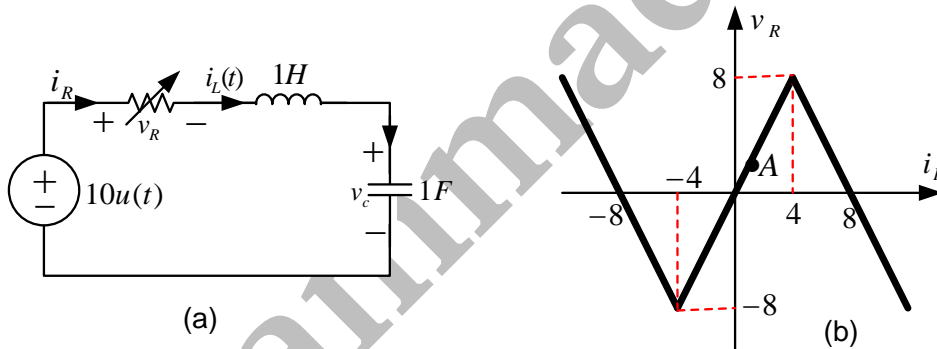**Let $v_c(0^-) = 2$ V and $i_L(0^-) = 1$ A and find $v_c(t), t > 0$ in Fig. 4.**

Figure 4: A nonlinear second-order circuit.

SOFTWARE QUESTIONS

Question 5

Consider the parallel RLC circuit shown in Fig. 5. Use PSpice transient simulation to plot the step responses of $v_c(t)$, $i_L(t)$, $i_R(t)$, and $i_c(t)$ for $L = 1$, $C = 1$, and $R = 0.25, 0.5, 1, 1000$.
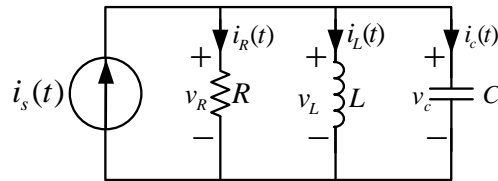
Figure 5: A parallel RLC circuit.

BONUS QUESTIONS

Question 6

Return your answers by filling the LATEXtemplate of the assignment.

EXTRA QUESTIONS

Question 7

Feel free to solve the following questions from the book *"Engineering Circuit Analysis"* by W. Hayt, J. Kemmerly, and S. Durbin.

1. **Chapter 9, question 13.**

2. **Chapter 9, question 14.**

3. **Chapter 9, question 20.**

4. **Chapter 9, question 26.**

5. **Chapter 9, question 35.**

6. **Chapter 9, question 37.**

7. **Chapter 9, question 39.**

8. **Chapter 9, question 48.**

9. **Chapter 9, question 50.**

10. **Chapter 9, question 51.**

11. **Chapter 9, question 53.**

12. **Chapter 9, question 61.**

13. **Chapter 9, question 65.**