

SIMON FRASER UNIVERSITY  
SCHOOL OF ENGINEERING SCIENCE

Spring 2008  
ENSC 320: ELECTRIC CIRCUITS II

Midterm Examination No. 1

Wednesday, February 13, 2008

*Duration: 50 minutes. Attempt all four problems. Questions are **not** equally weighted. Closed book and closed notes. Calculators, PDAs, laptops, and wireless phones are not permitted.*

1. **(30 points)**

Find the response  $v_{out}(t)$  for the ideal op amp circuit shown in Figure 1:

- Find the response  $v_{out}(t)$  in terms of  $v_{in}(t)$ ,  $R$ , and  $C$ .
- Based on your response, state the function that this circuit realizes.
- Suppose that  $v_{in}(t) = \cos(250t)$ ,  $R = 4k\Omega$ , and  $C = 1\mu F$ . The circuit is initially relaxed. Find  $v_{out}(t)$ .

2. **(30 points)**

A series RLC circuit is shown in Figure 2.

- Write the state equation in matrix form.
- Find the natural frequencies of the circuit.
- State three possible cases of the voltage/current waveforms depending on the values of circuit parameters.

3. **(20 points)**

Find Laplace transform of the signal sketched in Figure 3.

4. **(20 points)**

Find the inverse Laplace transform of the following function of  $s$ :

$$F(s) = \frac{3s + 1}{(s + 2)(s^2 + 4s + 8)}.$$

(Use simplifications and the transform properties to simplify calculations.)

Figure 1:

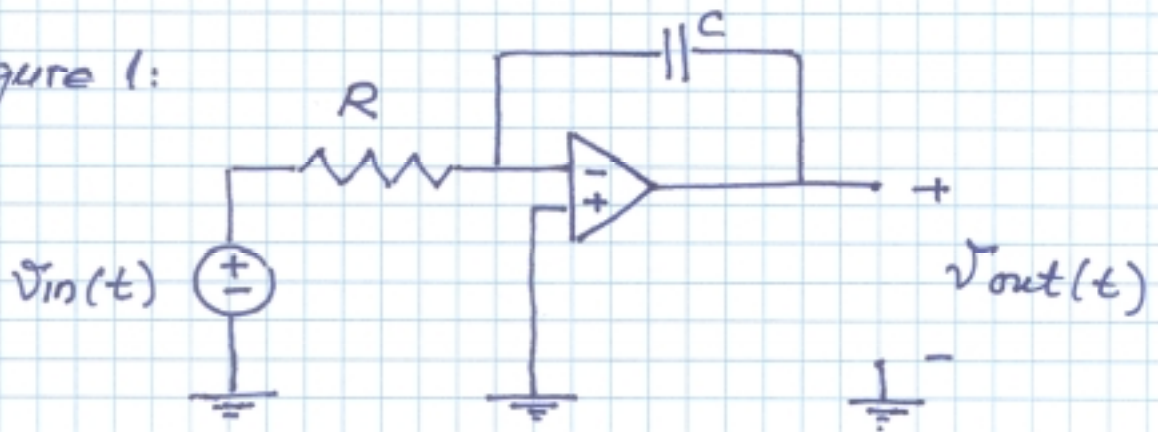


Figure 2:

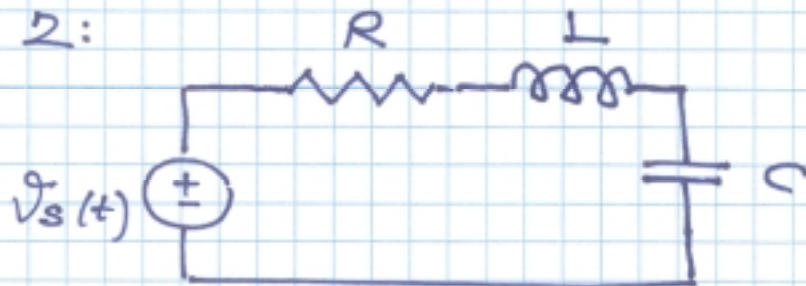


Figure 3:

