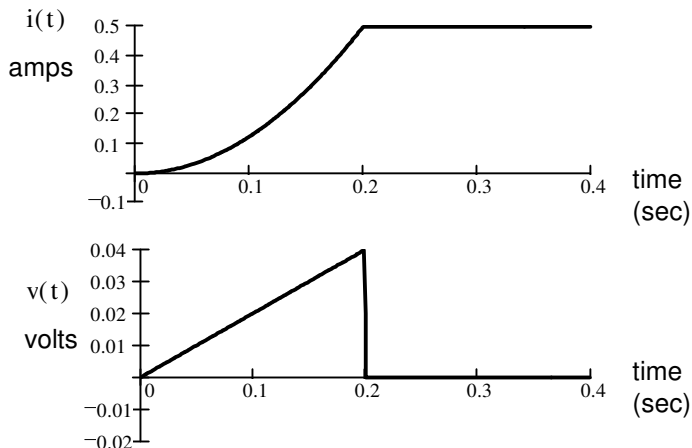


ECE1050/60 Exam 2 given: Spring 04

(The space between problems has been removed.)

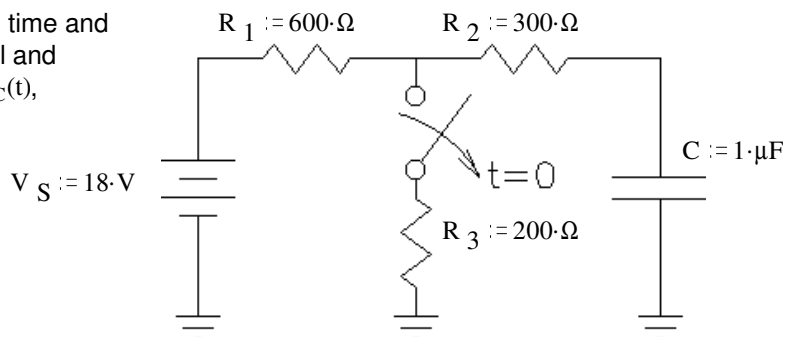
1. (13 pts) The current through and the voltage across an unknown component are shown below.

a) What type of component is it?
Give a good reason for your choice.



b) What is the value of the component?

2. (27 pts) a) The switch has been closed for a long time and is opened (as shown) at time $t = 0$. Find the initial and final conditions and write the full expression for $v_C(t)$, including all the constants that you find.



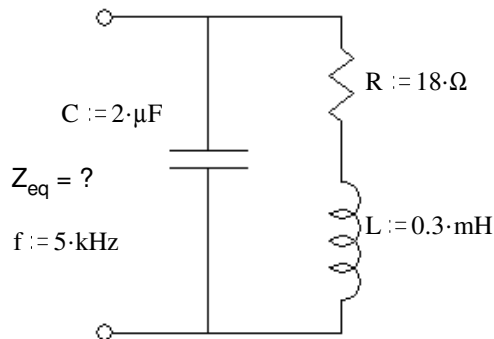
b) What is v_C at 1.1ms?

c) At time $t = 1.1\text{ms}$ the switch is closed again. Find the complete expression for $v_C(t')$, where t' starts when the switch closes. Be sure to clearly show the time constant.

3. (22 pts) Z_{eq} is the total impedance between the two terminals

a) Find an expression for Z_{eq} without any numbers, just in terms of j , ω , L , C , & the R s.

b) Find Z_{eq} in numeric form (polar or rectangular). For partial credit, you must show work and/or intermediate results.

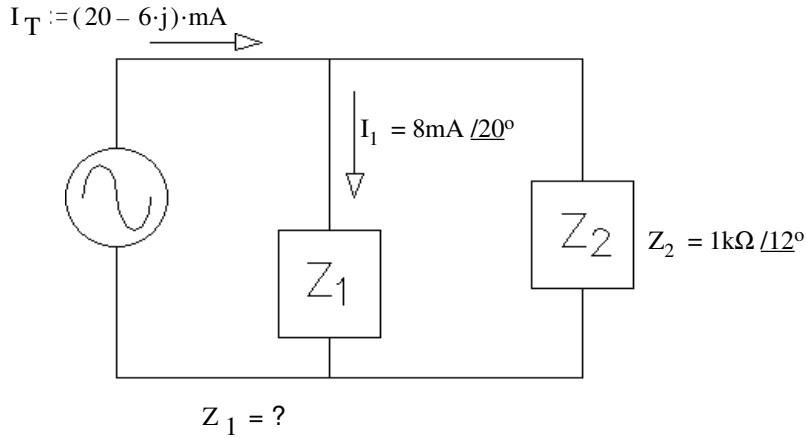


c) If you applied a sinusoidal voltage to this impedance:
(Circle 1)

- i) The current would lead the voltage
- ii) The voltage would lead the current

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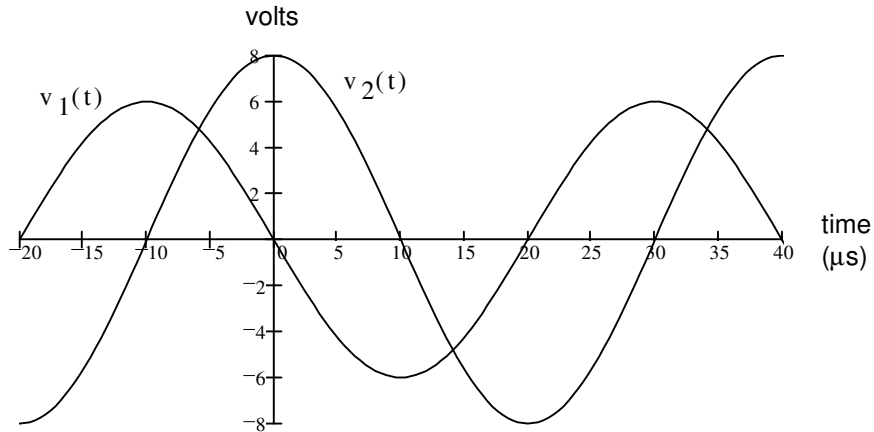
4. (21 pts) a) Find Z_1 . For partial credit, you must show work and/or intermediate results.



b) To make Z_1 in the simplest way, what part(s) would you need? Just circle the needed part(s), don't find the values.

- resistor capacitor inductor power supply current source
 Thevenin resistor Ideal transformer voltmeter ammeter scope

5. (17 pts) Two voltage waveforms are shown below, $v_1(t)$ and $v_2(t)$. Find the sum of the two ($v_3(t) = v_1(t) + v_2(t)$), and express it as a cosine wave with the correct amplitude and phase angle. You do not need to determine ω , just use the symbol ω .



Answers

1.a) inductor: $v(t) := L \cdot \frac{d}{dt} i(t)$ This fits the graphs, $v(t)$ corresponds to slope of $i(t)$
 Besides, capacitor voltage can't change instantly. b) 8·mH

2.a) $18 \cdot V - 13.5 \cdot V \cdot e^{-\frac{t}{0.9 \cdot ms}}$ b) 14·V c) $4.5 \cdot V + 9.5 \cdot V \cdot e^{-\frac{t}{0.45 \cdot ms}}$

3.a) $Z_{eq} := \frac{1}{\frac{1}{R + j \cdot \omega \cdot L} + j \cdot \omega \cdot C}$ b) $(12.5 - 11.4 \cdot j) \cdot \Omega$ c) i

4. $1905 \Omega / -43^\circ$

5. a) $10 \cdot V \cdot \cos(\omega \cdot t + 36.9 \cdot \text{deg})$

b) Z_1 has a negative phase angle of less than 90° ,
 so you need: resistor & capacitor

ECE 1050/60 Exam 2

Name _____

Scores:

Page 1&2 _____ of a possible 40 pts

Page 3&4 _____ of a possible 43 pts

Page 5 _____ of a possible 17 pts

Total _____ of a possible 100 pts