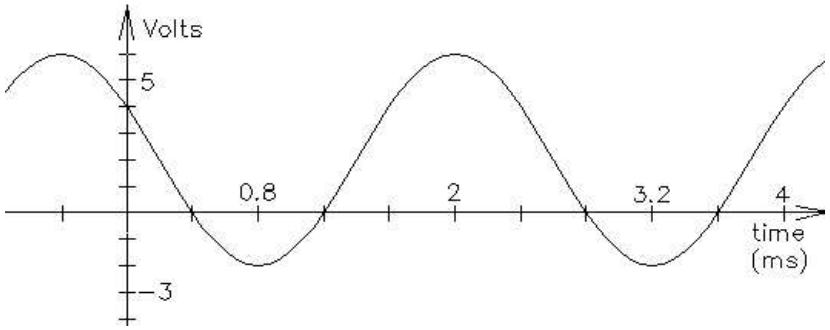
EE1050/60 Exam 2 given: Spring 00 (The space between problems has been removed.)

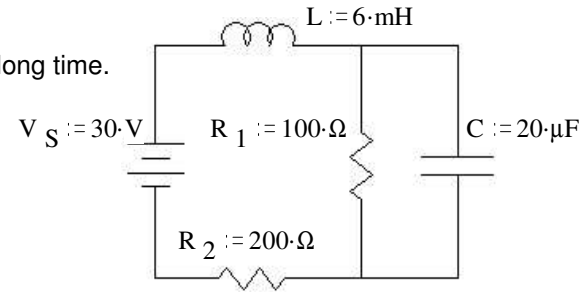
1. (31 pts) For the waveform shown, find:
   a) peak-to-peak voltage or current, V_{pp}
   b) amplitude, A
   c) period, T
   d) frequency f in cycles/sec or Hz
   e) average, V_{DC}, or V_{ave}
   f) the RMS value
   g) a complete expression for v(t), include numbers and units
   h) V(jω) , ignoring the DC



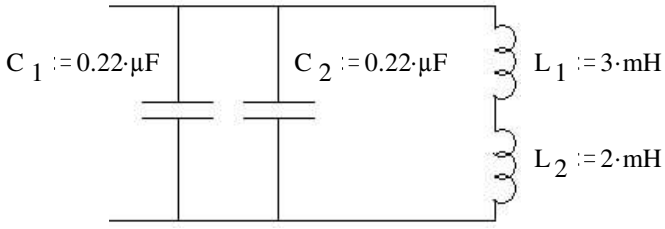
2. (12 pts) The following circuit has been connected as shown for a long time.

   Find the energy stored in the capacitor and the inductor.

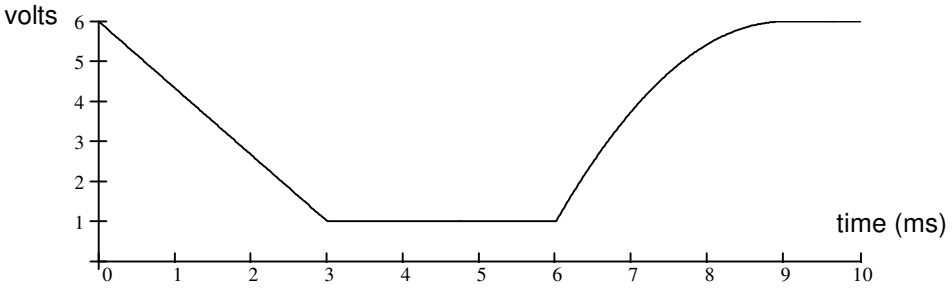
   Also show the values of the voltage(s) and current(s) necessary to answer this question.

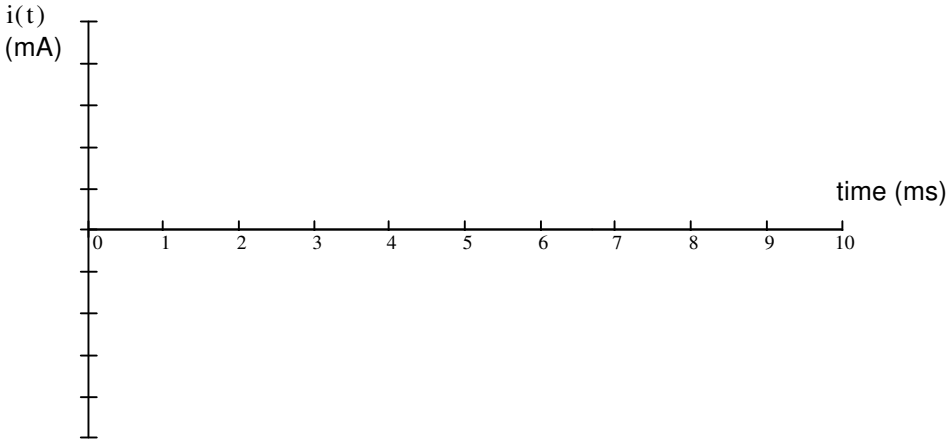


3. (9 pts) Find the resonant frequency (or frequencies) of the circuit below (in cycles/sec or Hz).

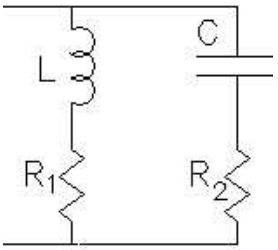


4. (15 pts) The voltage across a 3 µF capacitor is shown below. Make an accurate drawing of the capacitor current. Make reasonable assumptions where necessary. Label your graph.
   Note: You will be graded on the accuracy of your plot at 0, 3, 6, 9,and 10 ms, so calculate those values and plot them carefully. Between those points your plot must simply be the correct shape.





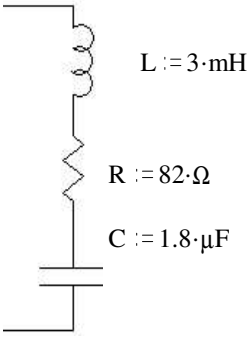
5. (6 pts) Write an expression $Z_{eq}(j\omega)$ for the circuit at right. Don't bother simplify your answer. Any correct expression of Z_{eq} will do.



6. (9 pts) Find Z_{eq} for the circuit at right. $\omega := 12000 \cdot \frac{rad}{s}$

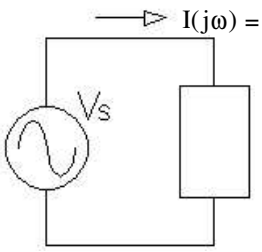
Express as:

Z_{eq} = (_____ + j _____)Ω in numbers.



7. (6 pts) Find V_S.

Express in simplest polar or rectangular form



8. (12 pts) Choose **one** of the two following problems...

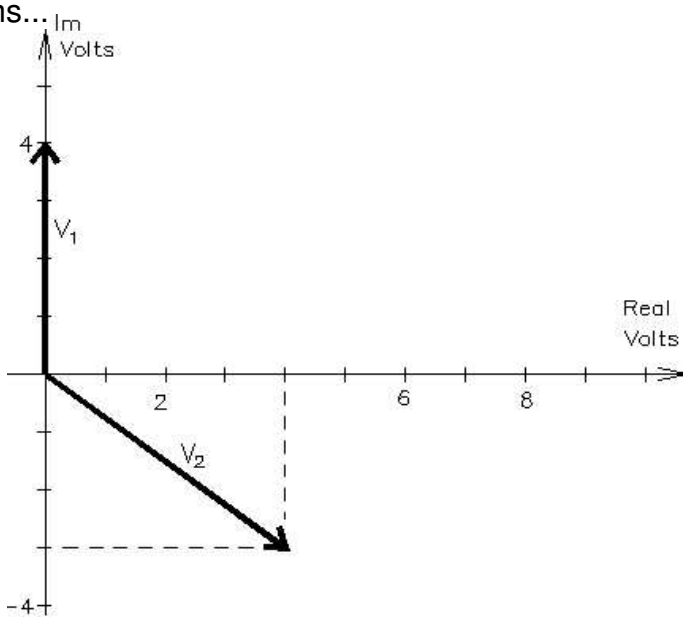
Do this

Choice 1) The two phasors shown represent two voltages, v_1 and v_2.

a) Draw the phasor representation for $v_3 = v_1 + v_2$

b) Find the magnitude of v_3.

c) Find the phase angle of v_3.



OR Do this

Choice 2) Add the sinusoidal voltages below.

$$v_1(t) = 4 \cdot \cos(\omega \cdot t + 90 \cdot deg)$$

$$v_2(t) = 5 \cdot \cos(\omega \cdot t - 36.87 \cdot deg)$$

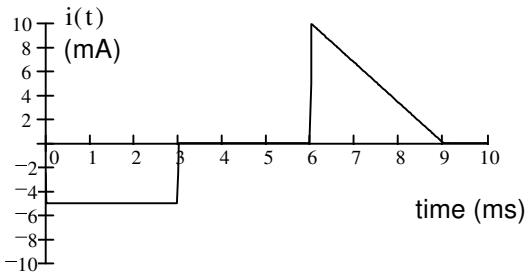
Find $v_3(t) = v_1(t) + v_2(t)$ and express it in the time-domain form, showing both the magnitude and phase angle of $v_3(t)$.

Answers

1. a) 8V b) 4V c) 2.4ms d) 417Hz e) 2V f) 3.46V g) 2618 rad/s h) $4 \cdot V \cdot e^{j \cdot 60 deg}$ OR: $2 \cdot V + j \cdot 3.46 \cdot V$

2. $I_L := 100 \cdot mA$ $W_L := 0.03 \cdot mJ$ $V_C := 10 \cdot V$ $W_C := 1 \cdot mJ$ 3. $f_o := 3393 \cdot Hz$

4.

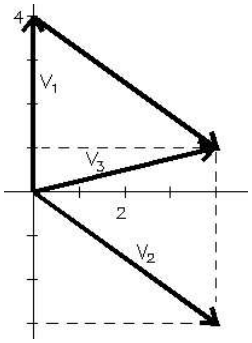


5. $$\frac{1}{\left(\frac{1}{j \cdot \omega \cdot L + R_1}\right) + \left(\frac{1}{\frac{1}{j \cdot \omega \cdot C} + R_2}\right)}$$

6. 82 Ω - 10.3j Ω

7. $1.5 \cdot V \cdot e^{j \cdot 30 deg}$

8. a)



b) 4.12V

c) 14.0°

OR: $v_3(t) = 4.12 \cdot V \cdot \cos(\omega \cdot t + 14 \cdot deg)$