

ECE 211: Homework #6

Capacitors, Inductors, Complex Numbers, Phasors

Capacitors

- 1) Find the differential equations which describes the following circuit
- 2) Using Matlab and numerical integration, determine the voltages for $0 < t < 100\text{ms}$
 - Set the simulation step size to $100\mu\text{s}$ (1000x smaller than the simulation time)
- 3) Using CircuitLab, determine the voltages for $0 < t < 100\text{ms}$

Lab (part 2)

- 4) Build this circuit with your lab kit
 - Include a photo of your circuit in your homework solution

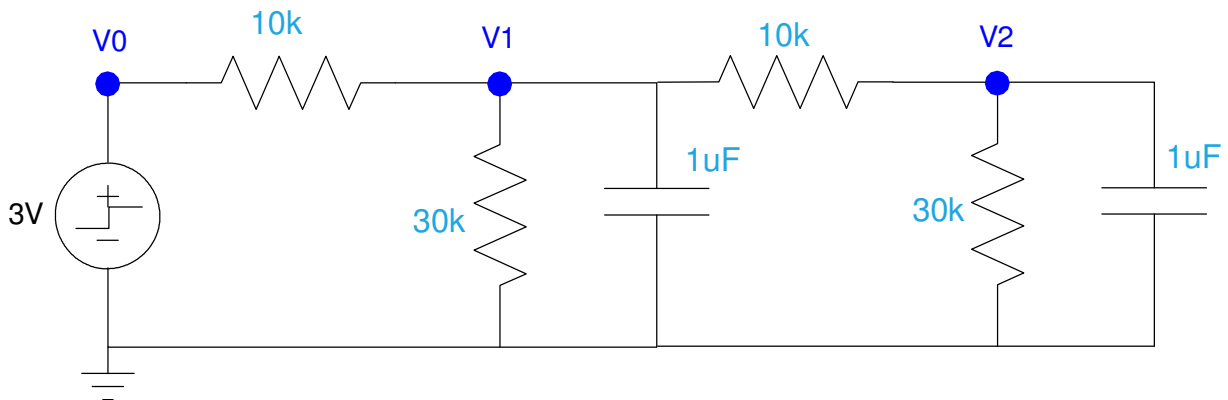
Apply a 3V square wave to V0

- Use your FNRSI meter as a signal generator
- Output a 3V square wave with frequency of 5Hz

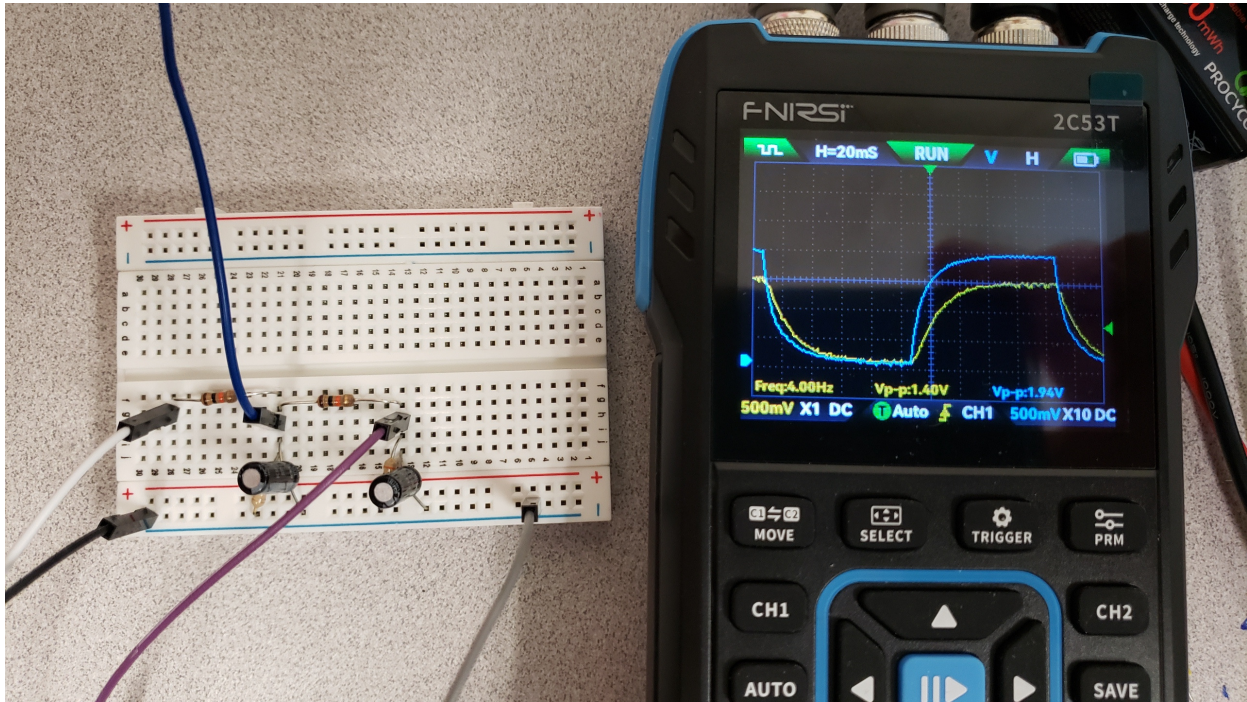
Measure the voltage at V1 and V2

- Use your FNRSI meter as an oscilloscope
- Include a photo of your FNRSI meter's display in your homework set

Note whether the signal at V2 matches your results from problems 5-7



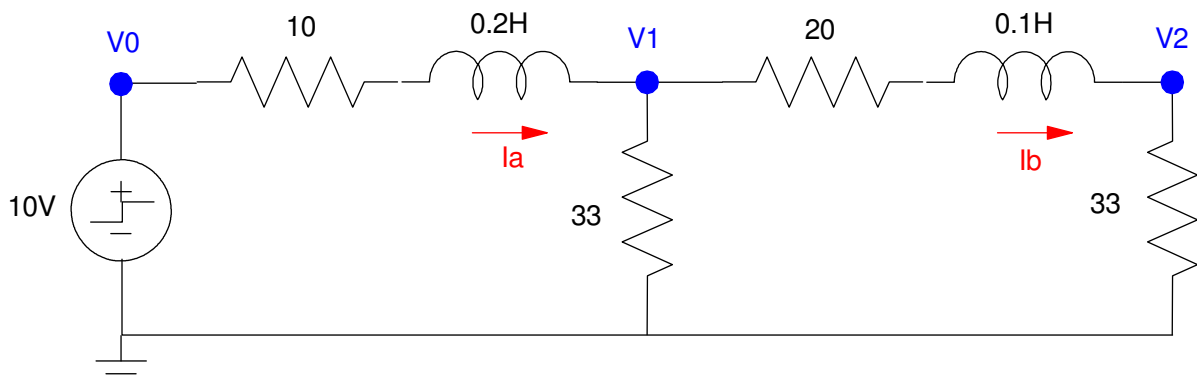
Problem 1-4



Problem Example of a circuit. The FNRSI meter supplies the 3V 5Hz square wave

Inductors

- 5) Find the differential equation which describes the following circuit
- 6) Using Matlab and numerical integration, determine the currents $\{I_a, I_b\}$ for $0 < t < 100\text{ms}$
- 7) Using CircuitLab, determine the currents $\{I_a, I_b\}$ for $0 < t < 100\text{ms}$



Problem 5-7

Complex Numbers

8) Find y

$$Y = \left(\frac{(2+3j)(6-5j)}{(8+2j)} \right)$$

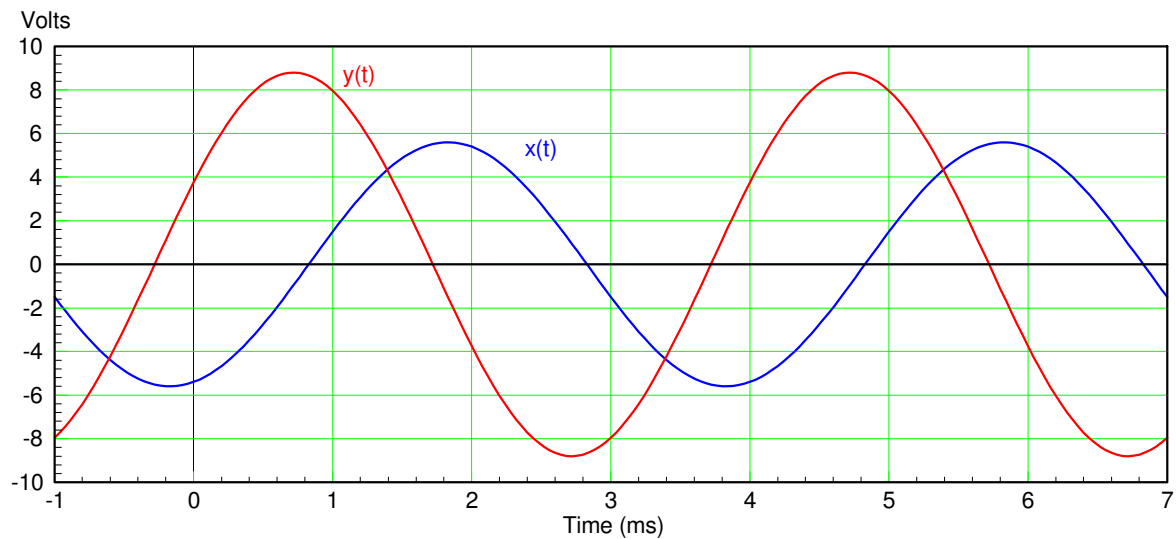
9) Find the partial fraction expansion

$$\left(\frac{10(x+2)(x+3j)(x-3j)}{x(x+1)(x+2+j)(x+2-j)} \right) = \left(\frac{a}{x} \right) + \left(\frac{b}{x+2+j} \right) + \left(\frac{c}{x+2-j} \right)$$

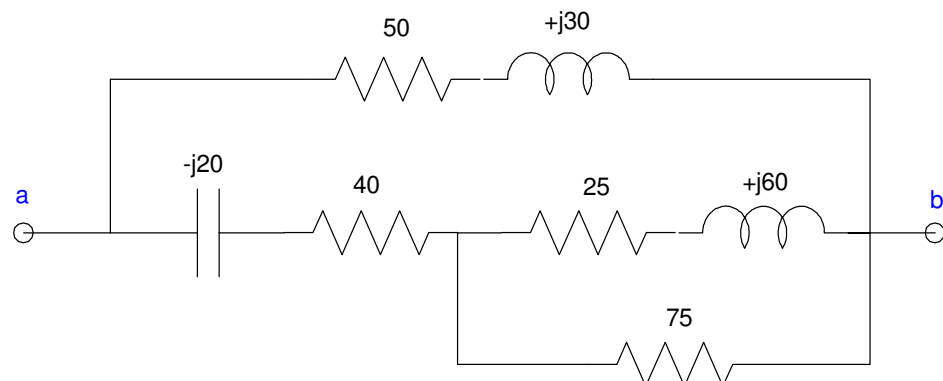
Phasors

10) Express $x(t)$ and $y(t)$ in phasor form

- If $x(t)$ is voltage and $y(t)$ is current in mA, what is the phasor impedance?



11) Find the impedance Z_{ab}



12) Find the impedance Z_{ab}

