EE 206: Homework #11

Superposition with Phasors. Due Monday, November 23rd

Please make the subject "EE 206 HW#11" if submitting homework electronically to lauren.n.singelmann@ndsu.edu (or on blackboard)

Problem 1) Assume Vin is a 0V / 10V square wave at 500 rad/sec.

$$V_{in} = \begin{cases} 10V & \sin(500t) > 0 \\ 0V & otherwise \end{cases}$$

Determine V1 using CircutitLab

- DC value (average)
- AC value (peak-to-peak)

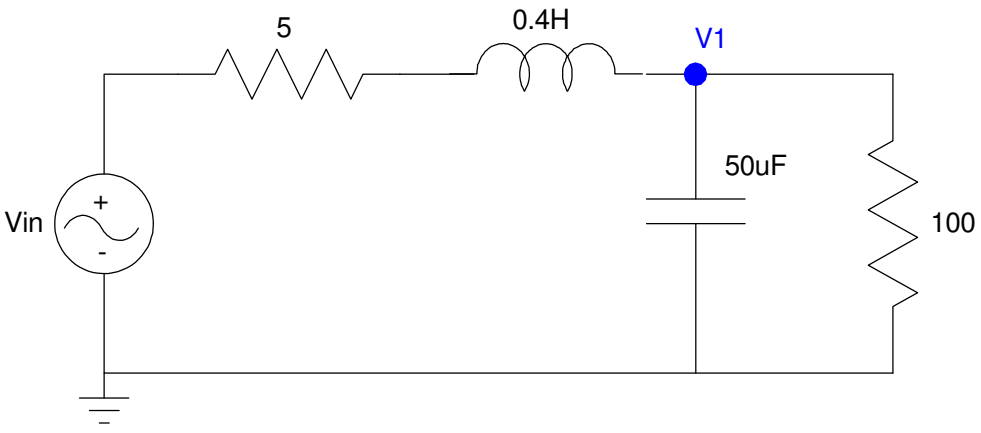
Problem 2) Assume Vin is

$$V_{in} \approx 5 + 5\cos(500t)$$

Determine V1(t) using phasor analysis and superposition.

- How does your answer for problem #2 compare to the simulation results for problem #1?

note: this is similar to problem #1. This Vin has the same DC value, the same Vpp, and the same frequency as problem #1



Problem 1-2

Problem 3) Assume Vin is a 0V / 10V square wave at 500 rad/sec.

$$V_{in} = \begin{cases} 10V & \sin(500t) > 0 \\ 0V & otherwise \end{cases}$$

Determine V1 using CircutiLab

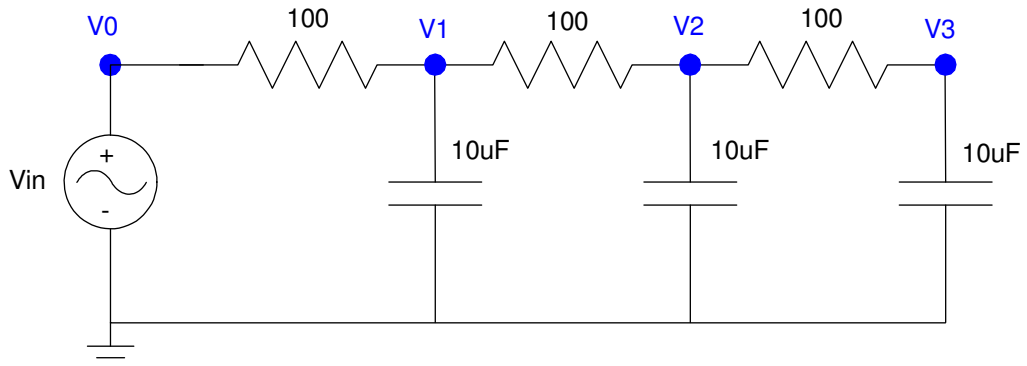
- DC value (average)
- AC value (peak-to-peak)

Problem 4) Assume Vin is

$$V_{in} \approx 5 + 5\cos(500t)$$

Determine V1(t) using phasor analysis and superposition.

- How does your answer for problem #4 compare to the simulation results for problem #3?



Problem 3 - 4

Fourier Transform

Problem 5) Let

$$x(t) = 7\sin(t)$$

Let y(t) be x(t), clipped at + /- 5V

$$y(t) = \begin{cases} +5 & x(t) > +5 \\ x(t) & -5 < x(t) < +5 \\ -5 & x(t) < -5 \end{cases}$$

Find the Fourier Transform for x(t) and out to it's 3rd harmonic

$$x(t) \approx a_0 + a_1\cos(t) + b_1\sin(t) + a_2\cos(2t) + b_2\sin(2t) + a_3\cos(3t) + b_3\sin(3t)$$

$$y(t) \approx a_0 + a_1\cos(t) + b_1\sin(t) + a_2\cos(2t) + b_2\sin(2t) + a_3\cos(3t) + b_3\sin(3t)$$