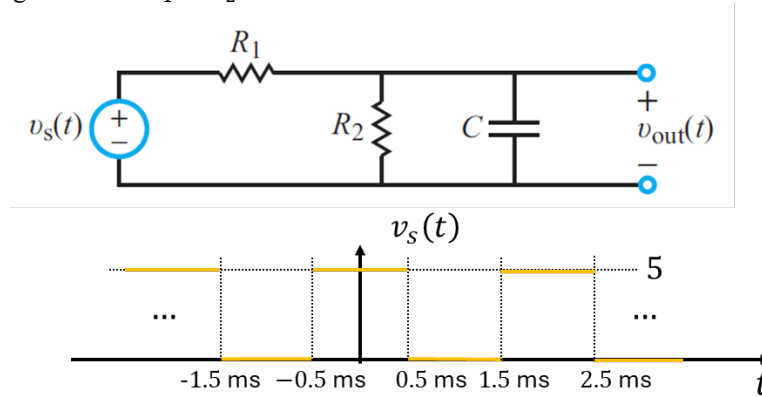


ELCT 222
Signals and Systems
Computer Assignment 8

Notes:

- Unclear or illegible work will not receive full credit.
- Label all sketches and plots completely and clearly.
- Where appropriate, “box in” your final answer.

Consider the following circuit for $R_1 = R_2 = 2k\Omega$ and $C = 125nF$:



- a) (25pts) Derive the Fourier series representation of the source $v_s(t)$ by using complex exponentials
 - a. Plot $v_s(t)$ in MATLAB by using 100 harmonics.
 - b. Plot the magnitude spectrum of $v_s(t)$ from -10000π to 10000π
- b) (25pts) Derive the Fourier series representation of the source $v_{out}(t)$ by using complex exponentials
 - a. Plot $v_{out}(t)$ in MATLAB by using 100 harmonics.
 - b. Plot the magnitude spectrum of $v_{out}(t)$ from -10000π to 10000π
- c) (25pts) Determine the transfer function in the phasor domain $H(\omega) = \frac{V_{out}}{V_s}$ where V_{out} and V_s are the phasors for $v_{out}(t)$ and $v_s(t)$ (Hint: page 213 in the book)
- d) (25pts) By comparing the magnitude spectrum of $v_s(t)$ and $v_{out}(t)$, interpret the behaviour of this circuit. Is it a high-pass filter (i.e., a filter that filters of sinusoids that has low frequencies). Why? Why not?