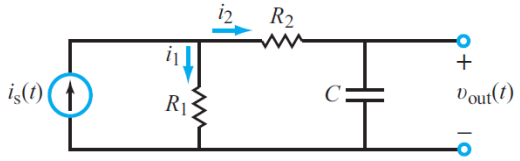
ELCT 222
Signals and Systems
Computer Assignment 9

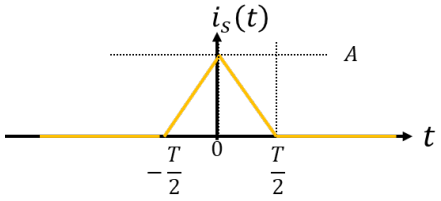
Notes:

- 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:



where the input current source is given by



a) (20 pts) Derive the Fourier transform of the source $i_s(t)$ for $A = 5$ mA and $T = 3$ s

b) (20 pts) Determine the transfer function $H(\omega) = \frac{V_{out}(\omega)}{I_s(\omega)}$ for $R_1 = 0.5$ kΩ, $R_2 = 2$ kΩ, $C = \frac{1}{3}$ mF

c) (20 pts) Obtain $v_{out}(t)$ by using Fourier analysis (an analytical expression with inverse Fourier transform is sufficient)

d) (20 pts) Plot $i_s(t)$ and $v_{out}(t)$ by using $I_s(\omega)$ and $V_{out}(\omega)$ with a numeric integration from -inf to inf in MATLAB
(Hint 1: integral(@(omega) 1/2/pi*f(omega).*exp(1i*omega*t),-inf,inf))
(Hint 2: $i_s(t)$ should be the triangular function above after numeric integration)

e) (20 pts) Plot the one-sided energy spectral density of $v_{out}(t)$ in MATLAB.