ECE 398GG Prof. George Gross
Spring 2023

Homework 7 on Lectures on AC Analysis and Complex Power Flow

Date due: Friday, April 11, 2023

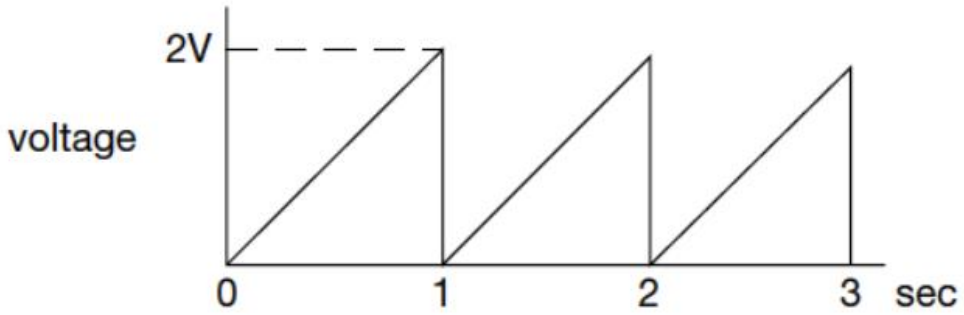
1. **Convert** the following instantaneous currents to phasors, using as $cos(\omega t)$ the reference. **State** your answers in polar form.

(i) $i(t) = 400\sqrt{2}\cos(\omega t - 30°)$

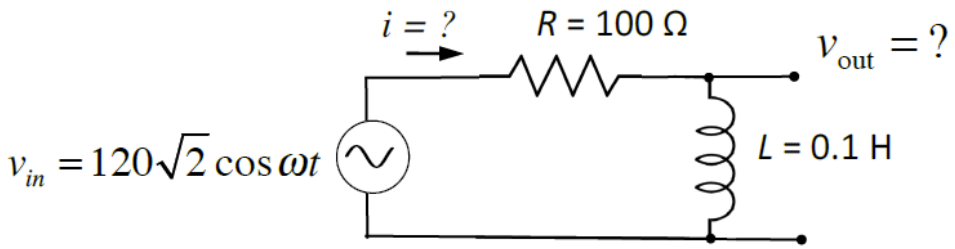
(ii) $i(t) = 5\,sin\,(\omega t + 15°)$

(iii) $i(t) = 4\cos(\omega t - 30°) + 5\sqrt{2}\sin(\omega t + 15°)$

2. **Detemine** the r.*m.s.* value of voltage for the sawtooth waveform below.



3. For the following 120-*V*, 60-*Hz* circuit, perform the following:



(i) **Determine** the reactance and the impedance of the inductor?

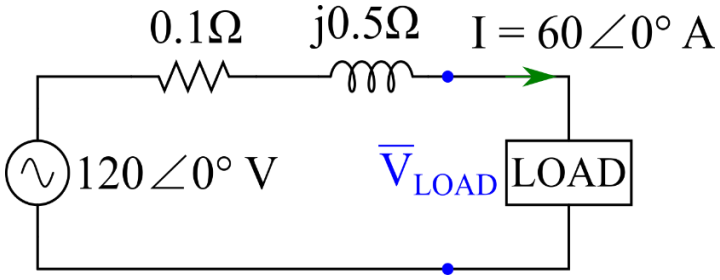
(ii) **Express** the impedance of the combination of *R* and *L* in both polar coordinates and rectangular $Z = R + jX$ form.

(iii) **Determine** the current expressed as a phasor and as a function of time.

(iv) **Determine** the power factor of the circuit.

(v) **Calculate** the output voltage expressed as a phasor and as a function of time.

4. For the circuit shown below, perform the following:



(i) **Compute** the voltage across the load terminals

(ii) **Determine** the real power delivered to the load in terms of the voltage and current phasors at the load.

(iii) **Calculate** the real power delivered to the load via the power flow equation derived in class, under the assumption of a lossless transmission line.

(iv) **Comment** on the differences, if any, between the results in (ii) and (iii).