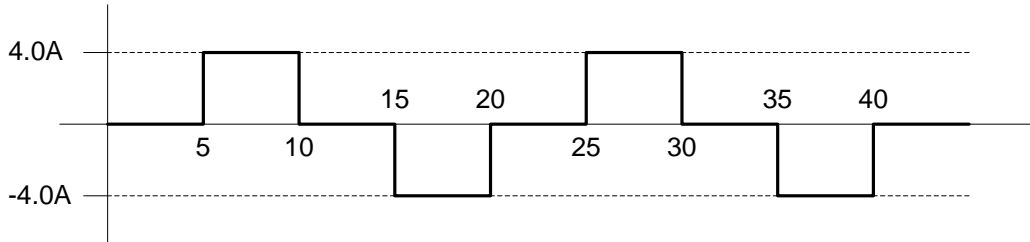


1. (40 points) A portion of a repetitive current waveform is shown below. Values on the time axis are in milliseconds.



- (5 pts) What is the waveform's fundamental frequency?
 - (5 pts) What is its RMS value?
 - (30 pts) Calculate the Fourier series coefficients for this waveform, accurate to two significant figures, for all components up to and including the 17th harmonic. You may move the time axis to simplify the calculations if you wish.
2. (25 points) A balanced three-phase linear load operates at 12.47kV (phase-to-phase), consuming a total of 2MW at a lagging power factor of 0.74. The series impedance of the distribution line supplying the load is $0.5 + j4.8 \Omega$ per phase. A 1200kVAR (total 3-phase capacitance) capacitor bank is installed at the load end of the line. Adjustments are made at the sending end so that the voltage at the load end is still 12.47kV line-to-line.
- (5 pts) What is the power factor of the combined load and capacitor?
 - (10 pts) What is the magnitude of the line current before and after the capacitor bank is installed.
 - (10 pts) How much total real power is dissipated in the distribution line before and after the capacitor bank is installed.
3. (15 points) Determine the symmetrical components of the three line currents: $I_a=10A @ 0 \text{ deg.}$, $I_b = 10A @ 235 \text{ deg.}$, and $I_c=10A @ 125 \text{ deg.}$
4. (20 points) In the circuit below $V_s = 100\sin(\omega t)$ volts, $R= 1\Omega$, $L = 26\text{mH}$, and $C = 30\mu\text{F}$.
- (16 pts) Plot the magnitude of the current in the circuit below as a function of frequency for frequencies from 50Hz to 400 Hz.
 - (2 pts) What is the maximum current magnitude in this frequency range?
 - (2 pts) At what frequency, to two decimal places, does the maximum current occur?

