

Homework 2

On campus: Due by 5:00pm on Monday, September 15

1. Compute the amplitudes and signs of the first 20 harmonic components for the waveform in Figure P3-3(a) on page 59 of the Mohan text book. Compute the true RMS current and fundamental frequency RMS current. Assume $A = 10A$ and $\omega = 2 * \pi * 10Hz$.
2. Compute the amplitudes and signs of the first 20 harmonic components for the waveform in Figure P3-3(b) on page 59 of the Mohan text book. Compute the true RMS current and fundamental frequency RMS current. Use $A = 10A$, $u_1 = u_2 = 10^\circ$, and $\omega = 2 * \pi * 10Hz$.
3. A load draws the harmonic currents listed in Table I when operating at $240V_{rms}$, $250kW$, and a displacement power factor of 0.9 lagging. Assume that the voltage source is a perfect cosine wave.

Do the following:

- (1) Compute complex power draw by the load (S).
- (2) Compute reactive power Q
- (3) Compute the true power factor.
- (4) Compute the total harmonic distortion
- (5) Compute the true RMS current and compare it to the fundamental frequency RMS current
- (6) Does $S = \sqrt{P^2 + Q^2}$? Explain your answer.

Table I: Input Current Harmonics

h	3	5	7	9	11	13
$\left(\frac{I_h}{I_1}\right) \%$	3.0	19.0	14.0	1.0	31.0	7.0