ELEC-E8412 **Power Electronics**
Exercise No 01 28.09.2023

Problem 1:

A sinusoidal voltage source of $v(t) = 40\cos(2\pi 50t)$ V is applied to a nonlinear load, resulting in a non-sinusoidal current which is expressed in Fourier series as;

$$i(t) = 3 + 7\cos(2\pi 50t + 20°) + 4\cos(6\pi 50t + 15°) + 3\cos(8\pi 50t + 25°)\ \text{A.}$$

Determine

a) power absorbed by the load,
b) power factor of the load
c) total harmonic distortion of the load current.

Problem 2:

The voltage and current for a circuit element are;

$$v(t) = 3 + 5\cos(2\pi 60t + 15°) + 2\cos(4\pi 60t)\ \text{V}$$

$$i(t) = 2 + 7\cos(2\pi 60t + 45°) + 3\cos(6\pi 60t + 25°)\ \text{A.}$$

Determine

a) rms values of voltage and current.
b) power absorbed by the element.
c) total harmonic distortion of the load current.

Problem 3:

The voltage across a 10Ω resistor is $v(t) = 170\ \text{Sin}(377t)$

Determine

a) instantaneous power.
b) average power.
c) peak power.

Problem 4:
The voltage and current of a circuit is given by;

$$v(t) = 3 + 5\ \text{Cos}(2\pi 60t + 15°) + 2\ \text{Cos}(4\pi 60t)$$

$$i(t) = 2 + 7\ \text{Cos}(2\pi 60t + 45°) + 3\ \text{Cos}(6\pi 60t + 25°)$$

Determine

a) rms values of voltage and current.
b) power absorbed by the element.
c) power factor of the load.