Problem:

A band limited periodic voltage waveform has only 3 harmonics in its Fourier series representation. The rms values of the harmonics are:

- Fundamental: 40 V
- Third harmonic: 20 V
- Fifth harmonic: 10 V

a) If this voltage waveform is applied across a 5Ω resistor, what is the average power dissipated in the resistor?

\[ P = \frac{V_{\text{rms}}^2}{\Omega} = 420 \text{ W} \]

b) If a dc component is added to the waveform and the measured dissipated power in the 5Ω resistor increases by 5%, then what is the value of the dc component?

Now \[ P = 1.05 \times 420 = 441 \text{ W} \]

\[ V_{\text{dc}} = 10.25 \text{ V} \]

Problem

\[ v(t) = 2 + 10 \cos 2t + 5 \cos 4t + 3 \cos 6t \text{ V} \]
\[ i(t) = 5 \cos (2t + 60°) + 2 \cos (6t + 30°) \text{ A} \]

\[ P_{\text{average}} = \frac{1}{2} \left[ 10 \times 5 \cos (0-60°) + 3 \times 2 \cos (0-30°) \right] \text{ W} \]

\[ i(t) = 3 + 5 \cos (2t + 30°) + 3 \cos (4t + 60°) + 1 \cos (6t + 75°) \text{ A} \]
\[ P_{\text{average}} = \text{?} \]
\[ = 2 \times 3 + \frac{1}{2} \left[ 10 \times 5 \cos(-30^\circ) + 5 \times 3 \cos(-60^\circ) \right. \]
\[ \left. \quad + 3 \times 1 \cos(-75^\circ) \right] \text{ W} \]