

Signals and Systems ECE 202

Assignment 7

Generate and publish a MATLAB document for the following exercises. Submit your MATLAB html folder and original MATLAB code (m files).

- Using MATLAB plot each sum of complex sinusoids over the time period indicated.

(a)

$$x(t) = \frac{1}{10} \sum_{k=-30}^{30} \text{sinc}\left(\frac{k}{10}\right) e^{j200\pi kt}$$

for $-15 \text{ ms} < t < 15 \text{ ms}$.

(b)

$$x(t) = \frac{j}{4} \sum_{k=-9}^9 \left[\text{sinc}\left(\frac{k+2}{2}\right) - \text{sinc}\left(\frac{k-2}{2}\right) \right] e^{j10\pi kt}$$

for $-200 \text{ ms} < t < 200 \text{ ms}$.

- Using MATLAB plot this product over the time ranges indicated and observe in each case that the net area under the product is zero

$$x(t) = -3 \sin(16\pi t) \times 2 \cos(24\pi t)$$

(a) $0 < t < \frac{1}{4}$

(b) $0 < t < 1$

(c) $-\frac{1}{16} < t < \frac{3}{16}$

- Use MATLAB to plot the following Fourier series. Use the smallest number of harmonics consistent with a good representation of the signal.

$$x(t) = \frac{8}{\pi^2} \sum_{k=1,3,5,\dots} X[k] \sin(2\pi kft)$$

where $f = 1/T$ and

$$X[k] = \frac{(-1)^{(k-1)/2}}{k^2}$$

- Use MATLAB to plot the following Fourier series. Use the smallest number of harmonics consistent with a good representation of the signal. Identify the meaning of the parameter c where $c < T/2$.

$$x(t) = \frac{4}{T} \sum_{k=1}^{\infty} X[k] \sin(2\pi kft)$$

where $f = 1/T$ and

$$X[k] = \sin(k\pi/2) \text{sinc}(kc/T)$$