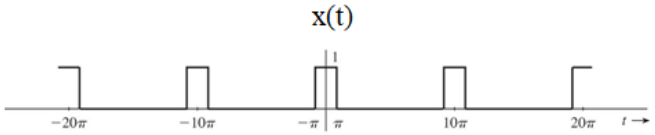
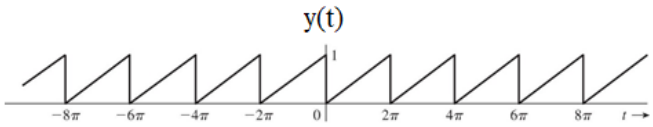
ENGR 3323: Signals and Systems

HW 9_Ch6

Q1) For the periodic signals $x(t)$ and $y(t)$ shown below:





a) Find the exponential Fourier series for $x(t)$ and $y(t)$.
b) Sketch the amplitude and phase spectra for signal $x(t)$.
c) Use Parseval's theorem to approximate the power of the periodic signal $x(t)$ by calculating the power of the first N^{th} harmonics, such that the strength of the N^{th} harmonic is 10% or more of the power of the DC component.

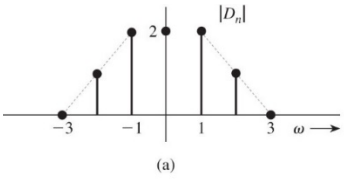
Q2) The exponential Fourier series of a certain function is given as

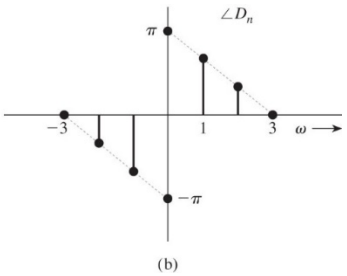
$$x(t) = (2 + j2)e^{-j3t} + j2e^{-jt} + 3 - j2e^{jt} + (2 - j2)e^{j3t}$$

a) Sketch the exponential Fourier spectra.
b) By inspection of the spectra in part (a), sketch the trigonometric Fourier spectra for $x(t)$. Find the compact trigonometric Fourier series from these spectra.
c) Show that the trigonometric series found in part (b) is equivalent to the exponential series for $x(t)$.
d) Find the signal bandwidth.

Q3) Figure below shows the exponential Fourier spectra of a periodic signal $x(t)$.

a) By inspection of the Figure find the exponential Fourier series representing $x(t)$.
b) By inspection of the Figure, sketch the trigonometric Fourier spectra for $x(t)$.
c) By inspection of the trigonometric Fourier spectra found in part (b), find the trigonometric Fourier series for $x(t)$.
d) Show that the series found in parts (a) and (c) are equivalent.

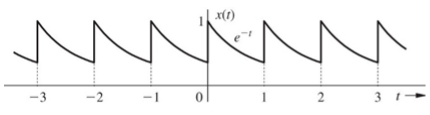


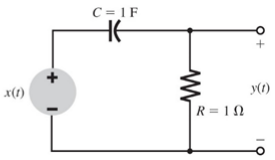


Q4)Find the response of an LTIC system with transfer function $H(s) = \frac{s}{s^2+2s+3}$ to the periodic input

$$x(t) = (2 + j2)e^{-j3t} + j2e^{-jt} + 3 - j2e^{jt} + (2 - j2)e^{j3t}$$

Q5) Find the exponential Fourier series for a periodic signal $x(t)$ shown in Figure below





The signal $x(t)$ is applied at the input of an LTIC system shown above. Find the expression for the output $y(t)$.