EE 3015 Midterm 1 exam Friday Feb 28th. 2020

Duration 50 Minutes, One Crib sheet (8 x 11 inches) allowed – calculator allowed no use of cell phone. Close book and notes.

Problem 1 (25 pts.)

Given an input x(t) = u(t) – u(t-3) to a LTI system with impulse response h(t) = u(t) – u(t-2) , Obtain the output of this system y(t) utilizing convolution method. Show all steps in obtaining the results.

Problem 2. (25pts)

Given the impulse response of a discrete time LTI system: h(n) with h(n) = [1 1 1 1 -1 -1 0] Obtain the output of this discrete system y(n) using the convolution method when the input sequence is given by

x(n) = [0 0 1 0 -1 0].

(hint: assume the first element starts at n = 0 index point).

You can use either graphical method or analytical method however you must show all your steps in computation.

Problem 3 (30 pts.)

The Fourier transform of a signal x(t) is given by the following expression:

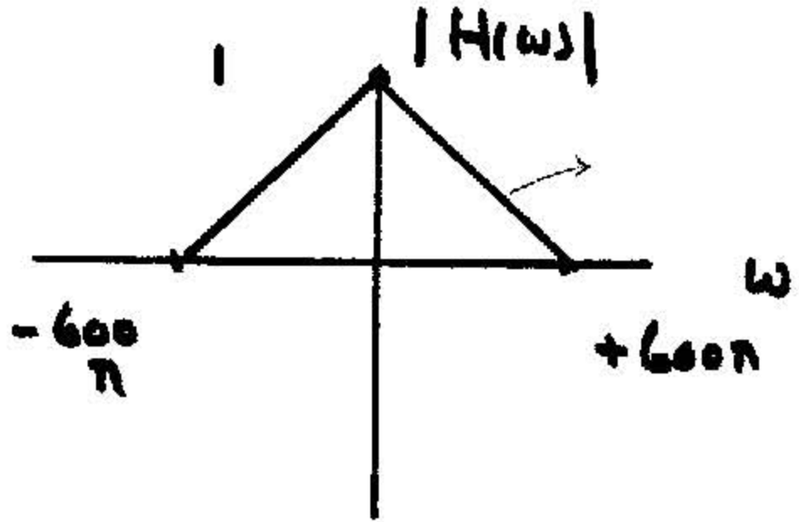
$$X(\omega) = Y(\omega) \cdot e^{(-j2\omega)}$$

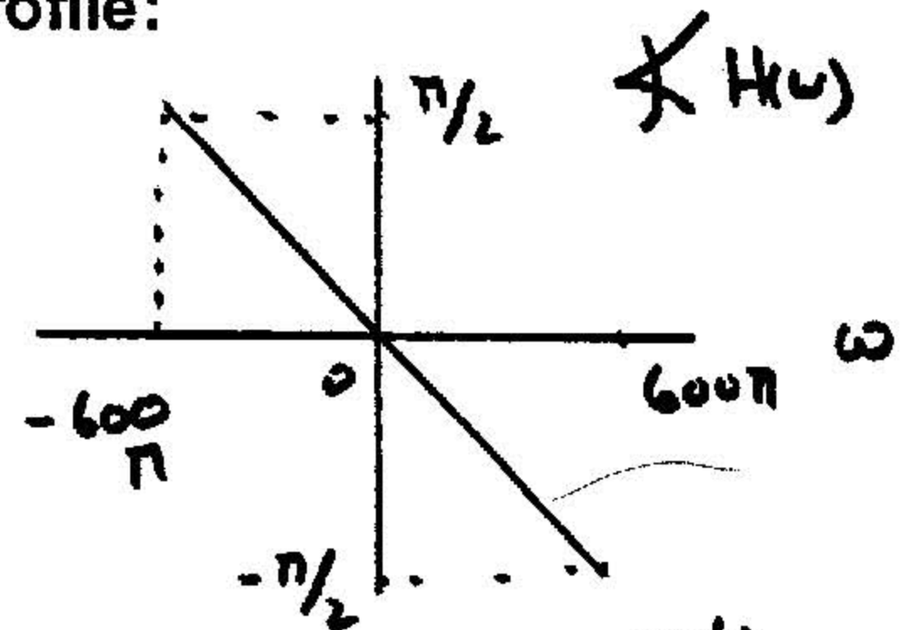
where $Y(\omega) = 2$ for $-2 < \omega < 0$ and $Y(\omega) = -2$ for $0 < \omega < 2$

Find time domain representation of x(t).

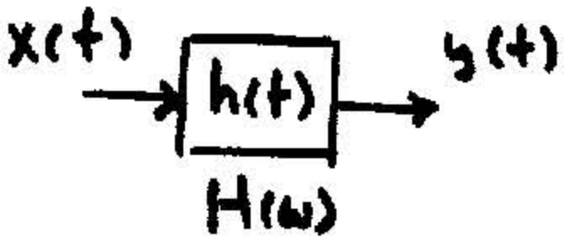
Problem 4. (20 pts.)

The frequency response of a continuous time LTI system is given by the following magnitude and phase profile:





What is the steady state time domain output y(t) for input



$$x(t) = \cos(1000\pi t) + 2\cos(\omega_0 t) + 3\cos(500\pi t)$$

$\omega_0 = 50\pi$