**CMPE 352 – Signal Processing & Algorithms**

**Problem Session 10   
15 April 2019**

**Problem 1**

A sinusodial signal x(t) = sin2 (t in seconds) is input to a system with frequency response:

What signal y(t) is observed at the output?

**Problem 2**

The inverse Fourier transform of a system frequency response is given by . The signal is input to the system ( in seconds).

(a) What is the expression of the signal at the system output?

(b) What is the power attenuation in dB caused by the system?

(c) Defining the “essential bandwidth” of the system as the frequency band over which the magnitude frequency response is not less than 1% of its value at the origin, what is the essential bandwidth of this system in Hz?

**Problem 3**

A speech signal of power 10 mW extends from 0 to 4 kHz. This signal is subject to a noise (due to the environment, microphone parasitics, etc.) of 1 mW that is constant in spectrum from 0 to 10 kHz.

An ideal low-pass filter with a cutoff frequency of 3.4 kHz is used to filter this noisy signal. What is the ratio of signal-power to noise-power at the input and at the output of the filter, assuming that 90% of the signal power is found in the frequency band of 0 to 3.4 kHz?