ECE351: Signals and Systems - Dr. Thinh Nguyen
Midterm 2
Nov. 19, 2018

Instruction: Please write your work clearly. Credits will not be given to the correct answers without proper derivations. You are allowed a 2-sided 8.5×11" sheet of notes. No calculator is allowed. Answers should not contain the symbols for integration or sum. DO NOT use any Fourier representation pairs in the book appendix for your calculations. You have 50 minutes to do the exam.

1. **Problem 1 (30pts)**

   Determine $x[n]$ given its DTFS $X[k] = e^{-j\frac{\pi k}{2}} \sin\left(\frac{\pi k}{2}\right) + \cos\left(\frac{\pi k}{3}\right) + 1$.

2. **Problem 2 (30pts)**

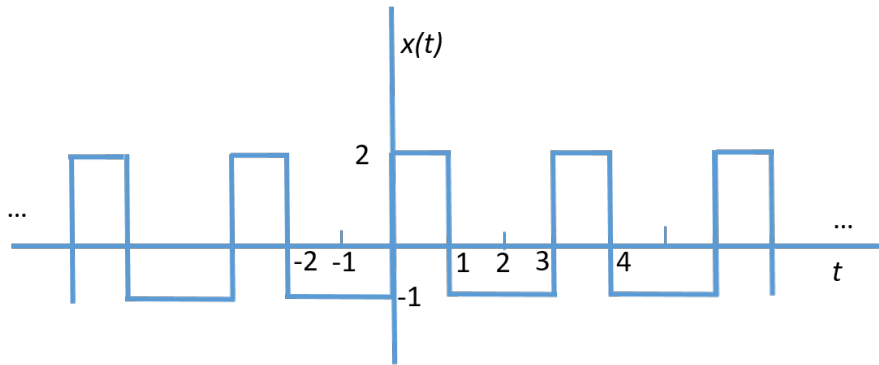 $x(t)$ is depicted in the Fig. 2. Determine the appropriate Fourier representation of $x(t)$.

Figure 1: Problem 2

3. **Problem 3 (40pts)**

   Let $x(t) = \cos^2\left(\frac{\pi t}{2}\right) + 1$ be the input signal to the LTI system with the impulse response:

   $$h(t) = e^{-t}u(t). \tag{1}$$

   (a) Determine the frequency response $H(j\omega)$ of the system. (10pts)

   (b) Determine the output signal $y(t)$ for the input $x(t)$. (20pts)

   (c) Suppose you input a DC signal (constant signal) to the system. Is the output a constant signal as well? If so, does the system amplify (increase), attenuate (decrease), or does nothing to the amplitude of the input signal. (10pts)