ECE250: Signals and Systems
Assignment 3

Issued on: October 19, 2023

Max Marks: 10

Due by: October 27,2023 (6:00 pm)

Guidelines for submission

- Use Matlab or python to solve the programming problems.
- For your solutions, you need to submit a zipped file on Google classroom with the following:
  - program files (.m) or (.ipynb) with all dependencies.
  - a report (.pdf) with your coding outputs and generated plots. The report should be self-complete with all your assumptions and inferences clearly specified.
- Before submission, please name your zipped file as: "A3 RollNo Name.zip". • Codes/reports submitted without a zipped file or without following the naming convention will NOT be checked.

Programming Problems (10 points)

[CO3] **Q1.**

1. Given a discrete-time signal $x[n]$:

[6 Points]

$$x[n] = \begin{cases} 1 & for\ -N_1 \le n \le N_1, N_1 = 2 \\ 0 & for\ N_1 < |n| \le \frac{(N-1)}{2} \end{cases}$$

Compute the Fourier series for the following cases and give the inference.

(a) N $=4N_1 + 1$
(b) N $=8N_1 + 1$
(c) N $=10N_1 + 1$

[CO3] **Q2.** A periodic function is defined by:

[4 Points]

$f(x) = x + \pi, \qquad -\pi \le x < \pi$

$f(x + 2\pi) = f(x)$

(a) Sketch the graph of $f(x)$ for three periods.
(b) Find the Fourier series of $f(x)$ on the interval $-\pi < x < \pi$.

Hint: To simulate continuous signals use appropriate discretization (wherever required).