ECE250: Signals and Systems

Quiz 6 (11/10/2022)
Max. Marks: 10

Note: Please Provide proper mathematical justifications with your answers. No marks will be awarded without a valid justification.

1. (CO3) (6 marks) A discrete-time periodic signal $x[n]$ is defined as below:

$$x[n] = sin\left[\frac{\pi(n-1)}{4}\right] \tag{1}$$

   (a) (1 Mark) Find the fundamental period of the signal x[n].

   (b) (5 Marks) Determine the Fourier series coefficients for x[n].

2. (C04) (4 marks) Let $x[n]$ be a discrete-time periodic signal with period N and Fourier series representation as given below:

$$x[n] = \sum_{k=<N>} a_k e^{jk(2\pi/N)n} \tag{2}$$

   Derive the expressions for the Fourier series coefficients of the following signals in terms of the coefficients a_k.

   (a) (2 Marks) $x[n] - x[n-1]$

   (b) (2 Marks) $x^*[-n]$, where $x^*[n]$ denotes the complex conjugate of the signal $x[n]$.