**EE3221 Homework 2**
**Dr. Prust**
**Assigned: 27 March 2020**
**Due: 3 April 2020 (1:00PM CDT**

---

**Note:** Problems from the course textbook (Ulaby and Yagle, 2018) are specified with the prefix "UY".

1. UY 7.1

   **ANSWERS:** Signal in part (a) is $\{\underline{1}, 1, 1\}$. Signal in part (b) is $\{\underline{0}, 1, 2, 3, 4\}$.

2. Consider the discrete-time signal $x[n] = \{1, \underline{1}, 1, 0.5\}$.

   (a) Make accurate sketches of $x[n-1]$, $x[-n]$, and $x[2-n]$.

   (b) The even part of a signal $x[n]$ is defined as $x_e[n] = \frac{1}{2}[x[n] + x[-n]]$. The odd part of a signal $x[n]$ is defined as $x_o[n] = \frac{1}{2}[x[n] - x[-n]]$. For the given signal, make accurate sketches of $x_e[n]$ and $x_o[n]$.

   (c) Using your sketches in the previous problem, show that $x_e[n] + x_o[n]$ equals the original signal $x[n]$.

   **ANSWERS:** $x[2-n] = \{\underline{0.5}, 1, 1, 1\}$, $x_e[n] = \{0.25, 1, \underline{1}, 1, 0.25\}$

3. UY 7.3

   **ANSWERS:** Signal in part (a) has fundamental frequency $\frac{2\pi}{25}$ rad/sample. Signal in part (c) has fundamental period 200 samples.

4. Let $x[n] = 0.7^n u[n]$.

   (a) Plot $x[n]$

   (b) Find $\sum_{n=-\infty}^{\infty} x[n]$

   (c) Find the energy in $x[n]$.

   **ANSWERS:**

   (a) Because of the $u[n]$, $x[n]$ is zero for $n < 0$. For $n \geq 0$, the function is a decaying exponential.

   (b) 10/3

   (c) 100/51

5. Consider the discrete-time signal $x[n] = \cos(\pi n/5) + \sin(\pi n/10)$.

   (a) Is $x[n]$ periodic? If so, determine its fundamental frequency $\Omega_0$.

   (b) Compute the average power of $x_1[n] = \cos(\pi n/5)$.

   (c) Compute the average power of $x_2[n] = \sin(\pi n/10)$.

   (d) Show that the average power of $x[n]$ is the sum of the power in $x_1[n]$ and $x_2[n]$.

   **ANSWERS:**

   (a) Yes. Fundamental period is 20 samples.

   (b) Power in $\cos(\pi n/5)$ is 1/2.

   (c) Power in $\sin(\pi n/10)$ is 1/2.