

Solution to ECE 315 Test #2

1. (1 pt) When a DT signal is compressed by the transformation, $n \rightarrow Kn$, where K is a positive integer greater than 1, some values of the function are lost. This effect is called decimation.

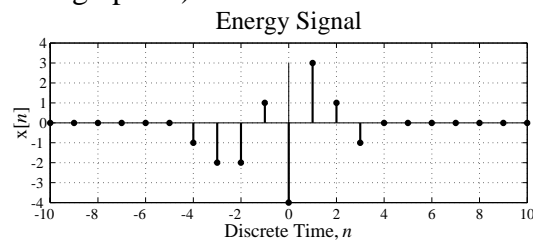
2. (1 pt) The unit sequence function is the accumulation of the unit DT impulse function. (I also accepted the answer “summation” although “accumulation” is preferred. I did not accept the answer “sum”. That is too general.)

3. (1 pt) In the DT sinusoid form, $A \cos(2\pi Kn + \theta)$, the sinusoid is periodic if K is a rational number. (Because of the wording I also accepted “integer”, although that is not the most general answer.)

4. (2 pts) Complete the equation, $\sum_{n=-\infty}^{\infty} A \delta[n - n_0] x[n] = A x[n_0]$

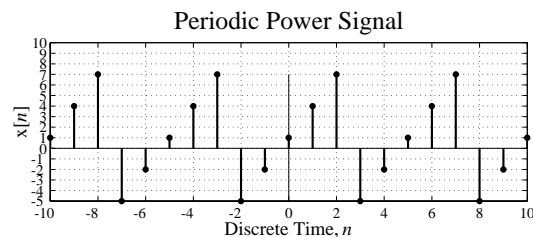
(This is the sampling property of the DT impulse.)

5. (4 pts) Find the numerical value of the signal energy of this DT energy signal. (Assume that each signal is zero outside the range of n graphed.)



$$E_x = \sum_{n=-\infty}^{\infty} |x[n]|^2 = (-1)^2 + (-2)^2 + (-2)^2 + 1^2 + (-4)^2 + 3^2 + 1^2 + (-1)^2 = 37$$

6. (4 pts) Find the numerical value of the average signal power of this periodic DT power signal.



$$P_x = \frac{1}{N_0} \sum_{n=\langle N_0 \rangle} |x[n]|^2 = \frac{1}{5} [(-5)^2 + (-2)^2 + 1^2 + 4^2 + 7^2] = \frac{95}{5} = 19$$

(Note that the period is 5, not 4 or 6. Several people got the period wrong.)