EE 311 **January 26, 2018**
In Class

1. The figure below shows a typical stair stepped output from a D to A converter. What is the width of each step and how is this width determined?

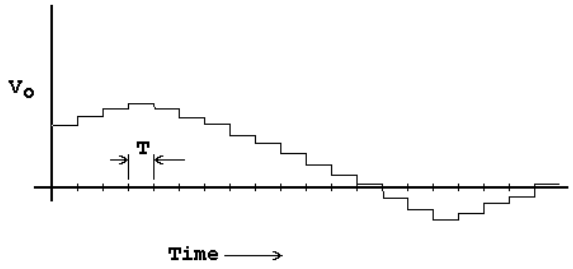

Figure P2
Stair step output from a D to A converter.

2. Find the general expression for the impulse response for the FIR filter shown in Figure below. Show that this response is always finite in length and has a length no greater than n+1.

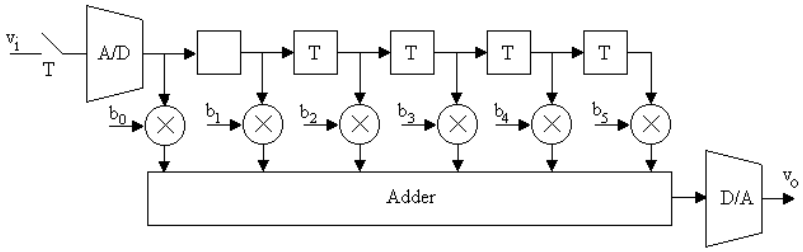

Figure P2
FIR filter diagram.

3. What is the difference between the transient response and the sinusoidal steady state response of a digital filter.

4. Show that the difference equation below is causal only if $N \geq M$.

$$y_{k+N} + a_1 y_{k+N-1} + a_2 y_{k+N-2} + \cdots + a_N y_k = b_0 u_{k+M} + b_1 u_{k+M-1} + \cdots + b_M u_k$$

5. How does the frequency spectrum of the following signals differ?

$$f_1(t) = Sin(2t) + Sin(5t) + Sin(9t) \qquad f_2(t) = Cos(2t) + Cos(5t) + Sin(9t)$$

6. Show that the inverse z transform of transfer function is the impulse response of the system.

7. Plot the magnitude of the sinusoidal steady state frequency response for

$$H(z) = \frac{z-1}{z^2 + 1.6z + .89}$$

8. a) If a unit impulse is applied to the input of an ideal integrator what is the response in time? b) Use the results of part a to find the z-transform for the transfer function for an ideal integrator.

9. A unit step is applied to a digital filter. After the initial transient has passed the output goes to a d.c. level of 4.0 volts. What characteristics can you imply about this filter from these observations?