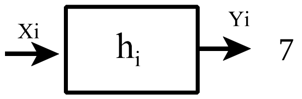
EE 432- 1 Digital Control Systems, Major-1

Wednesday, November 23rd, 2007, 11:00AM - 12:30 PM Dr. Ahmad A. Masoud

Q1:



a- (2 marks): the discrete system shown below has the discrete impulse response h_i and discrete input x_i. Compute its output y_i.

$$h_i = \begin{cases} i & i = 0,1,2 \\ 0 & elsewhere \end{cases} \qquad x_i = \begin{cases} 1 & i = 0,1 \\ 0 & elsewhere \end{cases}$$

b- (2 marks): consider the discrete system with the following difference equation:

$$y_i = 1.429 \cdot y_{i-1} - 0.571 \cdot y_{i-2} + .143 \cdot u_i$$

where y_i is the output of the system and u_i is its input. Assume that he input to the system is a discrete impulse (u_i=δ_i). Determine the output when the discrete time goes to infinity: $\lim_{i \to \infty} y_i$.

Q2: Let x_i = Z [X(Z)] be a Z-Transform pair,

a- (2 marks): for $X(Z) = \dfrac{10 \cdot Z + 5}{(Z-1)(Z-.2)}$ use long division to obtain the first three terms of x_i ,

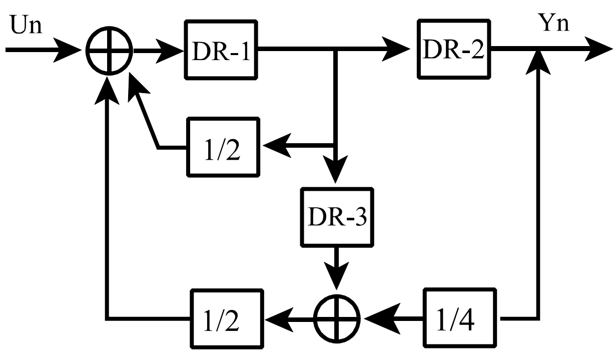
b- (2 marks): for $X(Z) = \dfrac{10 \cdot Z}{(Z-1)(Z-.2)}$ use long partial fraction to obtain a formula for x_i ,

c- (2 marks): use the Z-Transform pairs:

$$y_i = 5 \cdot \delta_i + 1.25 - 6.25 \cdot (0.2)^i \qquad Y(Z) = \frac{1}{Z^2 - 1.2Z + 0.2}$$

Find the inverse Z-Transform of : $Y(Z) = \dfrac{Z^2}{Z^2 - 1.2Z + 0.2}$

Q3: Consider the following simulation diagram with three delay registers (DR-1, DR-2, DR-3):



a- directly use the simulation diagram to write the discrete state space equations of the system shown above,

b- if the following numbers are initially stored in the delay registers: DR-1=1, DR-2=0, DR-3=1, and the input is zero (Un=0), compute Y_3.