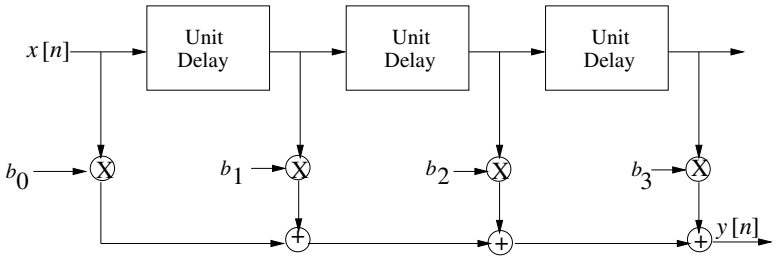
PROBLEM:

The following problem considers three different discrete-time systems. In each case, the input is $x[n]$ and the output is $y[n]$.

(a) If an LTI system has impulse response $h[n] = \frac{1}{2}\delta[n] - 2\delta[n-1] + \frac{1}{3}\delta[n-2]$, determine the difference equation that relates $x[n]$ and $y[n]$.

$y[n] =$

(b) If an LTI system is described by the block diagram below



where $b_0 = 1$, $b_1 = \frac{1}{3}$, $b_2 = 0$, $b_3 = \frac{2}{3}$, determine its impulse response $h[n]$.

$h[n] =$

(c) If a system is defined by the relation

$$y[n] = x[n^2] + (x[n-1])^2,$$

indicate which of the statements below is true or false by circling the appropriate T or F.

i. This system is NOT linear. T or F

ii. This system is NOT time-invariant. T or F

iii. This system is NOT causal. T or F