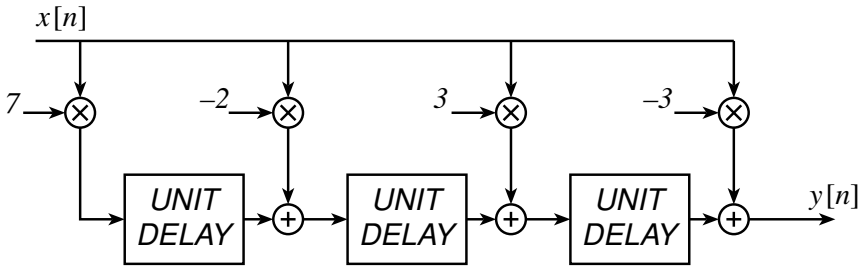
PROBLEM:

The following signal flow graph structure defines a linear time-invariant system:



(a) Write a simple formula for the the difference equation defined by the signal flow graph.

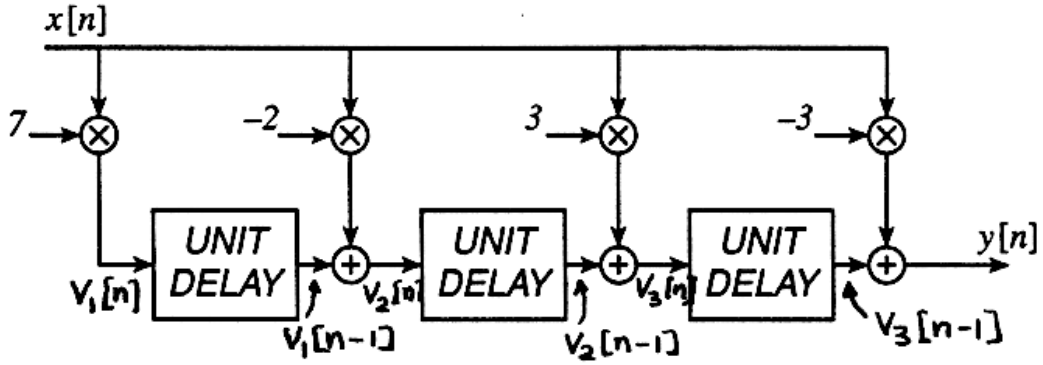
(b) For the following difference equation, draw a representation of this filter in a signal flow graph structure.

$$y[n] = 2x[n] + 4x[n-1] - 3x[n-2] + 3x[n-3] - 4x[n-4] - 2x[n-5]$$

McClellan, Schafer and Yoder, *Signal Processing First*, ISBN 0-13-065562-7.
Prentice Hall, Upper Saddle River, NJ 07458.

SOLUTION

The following signal flow graph structure defines a linear time-invariant system:



(a) $V_1[n] = 7x[n]$

$V_2[n] = V_1[n-1] - 2x[n]$

$\Rightarrow V_2[n] = 7x[n-1] - 2x[n]$

$V_3[n] = V_2[n-1] + 3x[n]$

$y[n] = V_3[n-1] - 3x[n]$

$\Rightarrow y[n] = V_2[n-2] + 3x[n-1] - 3x[n]$

$y[n] = 7x[n-3] - 2x[n-2] + 3x[n-1] - 3x[n]$

$\therefore \{b_k\} = \{-3, 3, -2, 7\}$

(b) Note filter coeffs are backwards in the structure drawn above. Therefore use the structure. Let $\rightarrow$[D]$\rightarrow$ be delay.