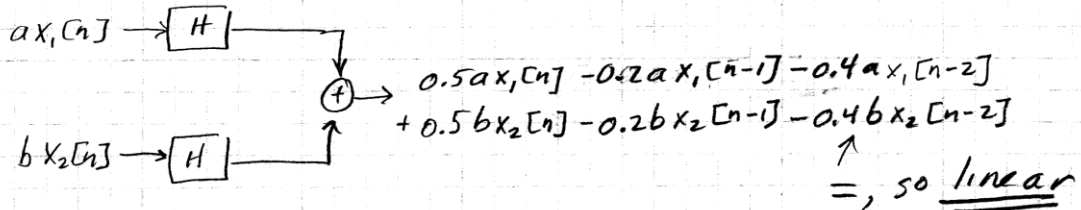


① Text, 4.6d

$$y[n] = 0.5x_1[n] - 0.2x_1[n-1] - 0.4x_1[n-2]$$



$$a_1x_1[n] + b_1x_2[n] \rightarrow [H] \rightarrow 0.5(a_1x_1[n] + b_1x_2[n]) - 0.2(a_1x_1[n-1] + b_1x_2[n-1]) - 0.4(a_1x_1[n-2] + b_1x_2[n-2])$$

② Text, 4.9

(a)  $y[n] = \frac{1}{3}(x[n] + x[n-1] + x[n-2])$

non recursive -  $b_0 = b_1 = b_2 = 1/3, a_0 = 1$

(b)  $y[n] = x[n] + 0.2y[n-1]$

recursive -  $b_0 = 1, a_1 = -0.2, a_0 = 1$

$n$	$x[n]$	$0.2y[n-1]$	$y[n] = h[n]$
0	1	0	1
1	0	0.2	0.2
2	0	$(0.2)^2$	$(0.2)^2$
3	0	$(0.2)^3$	$(0.2)^3$
4	0	$(0.2)^4$	$(0.2)^4$

$h[n] = (0.2)^n u[n]$

(c)  $y[n] = x[n] - 0.4x[n-1] - 0.5y[n-1]$

recursive  $a_0 = 1, a_1 = 0.5, b_0 = 1, b_1 = -0.4$

$n$	$x[n]$	$-0.4x[n-1]$	$-0.5y[n-1]$	$y[n] = h[n]$
0	1	0	0	1
1	0	-0.4	-0.5	-0.9
2	0	0	0.45	0.45
3	0	0	-0.225	-0.225
4	0	0	0.1125	0.1125

③ Text, 4.10b Find  $y[n]$  for the given input.

$$y[n] = 0.6y[n-1] + x[n]$$

2 ways to find this - find  $h[n]$  and convolve with  $x[n]$   
or find these values recursively (table)

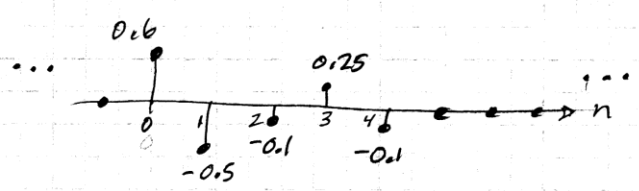
$n$	$x[n]$	$0.6y[n-1]$	$y[n]$
0	1	0	1
1	0	0.6	0.6
2	3	0.36	3.36
3	2	2.016	4.016
4	1	2.4096	3.4096
5	0	2.0458	2.0458
6	0	1.2275	1.2275
7	0	0.7365	0.7365
8	0	0.4419	0.4419
9	0	0.2651	0.2651

④ Text, 4.12

$$y[n] = 0.3x[n] - 0.25x[n-1] + 0.1x[n-2], \quad x[n] = 2\delta[n] - \delta[n-2]$$

$$= 0.3(2\delta[n] - \delta[n-2]) - 0.25(2\delta[n-1] - \delta[n-3]) + 0.1(2\delta[n-2] - \delta[n-4])$$

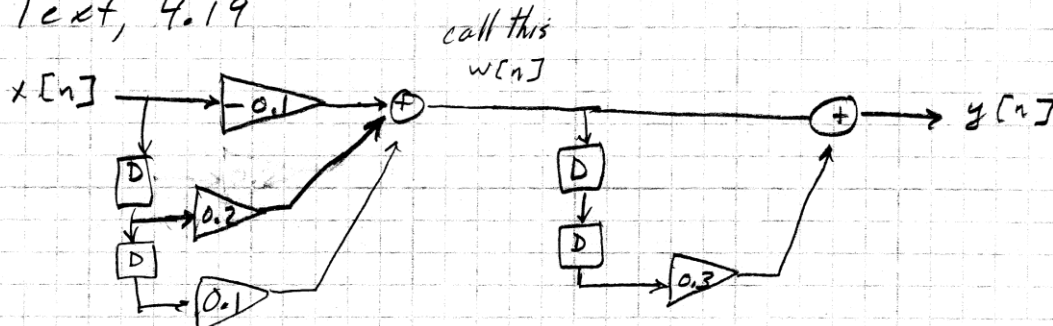
$$= 0.6\delta[n] - 0.5\delta[n-1] - 0.1\delta[n-2] + 0.25\delta[n-3] - 0.1\delta[n-4]$$



⑤ Text, 4.16

$$y[n] = 1.2x[n] - 0.6x[n-1] + 0.3x[n-2] + 0.5y[n-2]$$

⑥ Text, 4.19



$$w[n] = -0.1x[n] + 0.2x[n-1] + 0.1x[n-2]$$

$$y[n] = w[n] + 0.3w[n-2]$$

$$= -0.1x[n] + 0.2x[n-1] + 0.1x[n-2] + 0.3(-0.1x[n-2] + 0.2x[n-3] + 0.1x[n-4])$$

$$y[n] = -0.1x[n] + 0.2x[n-1] + 0.07x[n-2] + 0.06x[n-3] + 0.03x[n-4]$$

⑦ Text, 4.24

$$h[n] = 0.5\delta[n] + 0.4\delta[n-1] + 0.3\delta[n-2] + 0.2\delta[n-3]$$

$$y[n] = 0.5x[n] + 0.4x[n-1] + 0.3x[n-2] + 0.2x[n-3]$$

⑧ Text, 4.30  $h[n] = 4\delta[n] + 3\delta[n-1] + 2\delta[n-2] + \delta[n-3]$

(a) Since the impulse response is provided, the system response to an impulse is its impulse response.

(b)  $x[n] = 0.8\delta[n] + 0.5\delta[n-1]$

$$\begin{aligned} \text{so } y[n] &= h[n] * x[n] \\ &= 4x[n] + 3x[n-1] + 2x[n-2] + x[n-3] \end{aligned}$$

$$\begin{aligned}y[n] &= 4(0.8\delta[n] + 0.5\delta[n-1]) \\ &\quad + 3(0.8\delta[n-1] + 0.5\delta[n-2]) \\ &\quad + 2(0.8\delta[n-2] + 0.5\delta[n-3]) \\ &\quad + 1(0.8\delta[n-3] + 0.5\delta[n-4])\end{aligned}$$

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$$y[n] = 03.2\delta[n] + 4.4\delta[n-1] + 3.1\delta[n-2] + 1.8\delta[n-3] + 0.5\delta[n-4]$$