CENG 384 - Signals and Systems for Computer Engineers
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Homework 2

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Answer 5

$$y[n] = \frac{1}{5}y[n-1] + 2x[n-2]$$

a)

Feeding the system y[n] with unit impulse signal:

$$y[n] \rightarrow h[n] \textbf{ for } x[n] \rightarrow \delta[n]$$

$$h[n] = \frac{1}{5}h[n-1] + 2\delta[n-2]$$

System is initially at rest: $h[0] = 0$

By using the recursive method, we can obtain the impulse response.

$$h[0] = 0$$

$$h[1] = \frac{1}{5}h[0] + 2\delta[-1] = 0$$

$$h[2] = \frac{1}{5}h[1] + 2\delta[0] = 2$$

$$h[3] = \frac{1}{5}h[2] + 2\delta[1] = (\frac{1}{5})(2)$$

$$h[4] = \frac{1}{5}h[3] + 2\delta[2] = (\frac{1}{5})^2(2)$$

$$h[5] = \frac{1}{5}h[4] + 2\delta[3] = (\frac{1}{5})^3(2)$$

$$\ldots$$

$$h[n] = (\frac{1}{5})^{n-2}(2)$$

$$\text{for } n > 1$$

$$h[n] = (\frac{1}{5})^{n-2}(2)\mu[n-2]$$

b)