

Name: *Solution*

EE3221 Digital Signal Processing  
Homework/Quiz 3  
Dr. Prust

Homework Score	/ 5
Quiz Score	/ 5
Total	/ 10

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1. (a) Consider a moving average (MA) discrete-time LTI system having impulse response

$$h[n] = \{0.5, 1, 0, -1\}$$

Find the difference equation for the system.

*Since system is MA, can get difference equation by inspection:*

$$y[n] = 0.5x[n] + x[n-1] - x[n-3]$$

- (b) Is the system causal? **You must justify your answer.**

*Yes.  $h[n] = 0$  for  $n < 0$*

- (c) Suppose the signal  $x[n]$  given below is the system input.

$$x[n] = \{-1, 0, 2\}$$

Find the system output  $y[n]$ . **You must show your work. To earn full credit, the work shown must be consistent with your final result.**

$$x[n] = \{-1, 0, 2\} = -\delta[n+1] + 2\delta[n-1]$$

$$\therefore y[n] = -h[n+1] + 2h[n-1]$$

$$= -\{0.5, 1, 0, -1\} + 2\{0, 0.5, 1, 0, -1\}$$

$$= \{-0.5, -1, 0, 1\} + \{0, 1, 2, 0, -2\}$$

$$= \{-0.5, -1, 1, 3, 0, -2\}$$

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1. (a) Consider a moving average (MA) discrete-time LTI system having impulse response

$$h[n] = \{-1, 0, 2, 0.5\}$$

Find the difference equation for the system.

*Since system is MA, can get difference equation by inspection:*

$$y[n] = -x[n] + 2x[n-2] + 0.5x[n-3]$$

- (b) Is the system causal? **You must justify your answer.**

*Yes.  $h[n] = 0$  for  $n < 0$*

- (c) Suppose the signal  $x[n]$  given below is the system input.

$$x[n] = \{-1, 0, 2\}$$

Find the system output  $y[n]$ . **You must show your work. To earn full credit, the work shown must be consistent with your final result.**

$$x[n] = \{-1, 0, 2\} = -\delta[n+1] + 2\delta[n-1]$$

$$\therefore y[n] = -h[n+1] + 2h[n-1]$$

$$= -\{-1, 0, 2, 0.5\} + 2\{0, -1, 0, 2, 0.5\}$$

$$= \{1, 0, -2, -0.5\} + \{0, -2, 0, 4, 1\}$$

$$= \{1, 0, -4, -0.5, 4, 1\}$$