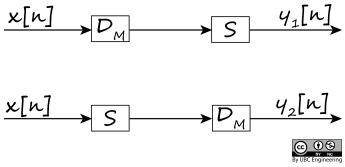
Ayden Chow

Assignment Problem_Set_7 due 03/13/2019 at 11:59pm PDT

JY Note Apr 18: Replaced question corrected.

The input $x[n]$ to the discrete time system S produces an output $y[n] = x[n](5g[n] + 4g[n-16])$



a) Given that D_M is a system that delays the input by M samples, find the outputs $y_1[n]$ and $y_2[n]$ as shown in the figure when $g[n] = n$.

$y_1[n] =$ _____ $y_2[n] =$ _____

b) Is the system in part **a** time-invariant? [?/Yes/No]

c) Find an expression for the non-zero values of $y_1[n]$ and $y_2[n]$ shown in the figure below if $g[n] = 1 + (-1)^n$

$y_1[n] =$ _____ $y_2[n] =$ _____

d) Is the system in part **c** time-invariant? [?/Yes/No]

In your answers, enter $z(n)$ for a discrete-time function $z[n]$. WebWork is unable to parse a function that uses square brackets.

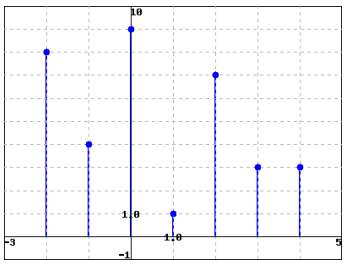
*Part **b** will only be marked correct if part **a** is correct. Part **d** will only be marked correct if part **c** is correct.*

Correct Answers:

- `x(n-M)*(9*n-64)`
- `x(n-M)*[9*(n-M)-64]`
- `No`
- `x(n-M)*9*[1+(-1)^n]`
- `x(n-M)*9*[1+(-1)^(n-M)]`
- `No`

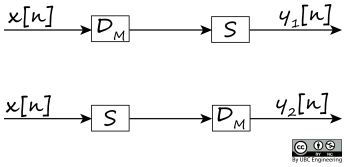
A discrete-time system is described by $y[n] = 7x[n] + 3(x[n+1])^2$

a) Find the output of the system, $y[n]$, for $-2 \leq n \leq 3$, given the input signal shown in the figure below. Enter your answer as a list, separated by commas.



$y[n] =$ _____

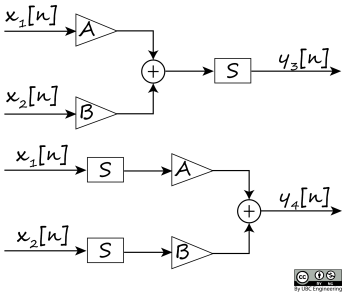
b) Given that D_M is a system that delays the input by M samples, find the outputs $y_1[n]$ and $y_2[n]$ as shown in the figures below.



$y_1[n] =$ _____ $y_2[n] =$ _____

c) Is the system time-invariant? [?/Yes/No]

d) Find the outputs $y_3[n]$ and $y_4[n]$ as shown in the figures below.



$y_3[n] =$ _____ $y_4[n] =$ _____

e) Is the system linear? [?/Yes/No]

f) Is the system causal? [?/Yes/No]

In your answers, enter $z(n)$ for a discrete-time function $z[n]$. WebWork is unable to parse a function that uses square brackets. Also, enter "x1(n)" for $x_1[n]$ and "x2(n)" for $x_2[n]$.

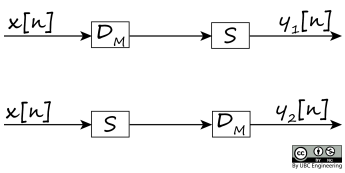
*Part **c** will only be marked correct if part **b** is correct. Part **e** will only be marked correct if part **d** is correct. Part **f** will only be marked correct if part **b** and **d** are correct.*

Correct Answers:

- `104, 271, 66, 154, 76, 48`
- `7*x(n-M)+3*[x(n+1-M)]^2`
- `7*x(n-M)+3*[x(n+1-M)]^2`
- `Yes`
- `7*[A*x1(n)+B*x2(n)]+3*[A*x1(n+1)+B*x2(n+1)]^2`
- `A*[7*x1(n)+3*[x1(n+1)]^2]+B*[7*x2(n)+3*[x2(n+1)]^2]`
- `No`
- `No`

A discrete-time system is described by $y[n] = 29x[-n]$.

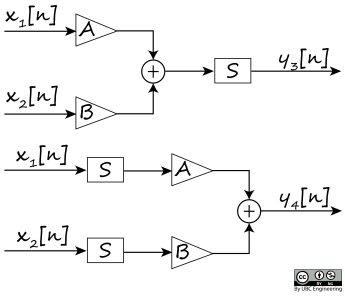
a) Given that D_M is a system that delays the input by M samples, find the outputs $y_1[n]$ and $y_2[n]$ as shown in the figures below.



$y_1[n] =$ _____ $y_2[n] =$ _____

b) Is the system time-invariant? [?/Yes/No]

c) Find the outputs $y_3[n]$ and $y_4[n]$ as shown in the figures below.



$y_3[n] =$ _____ $y_4[n] =$ _____

d) Is the system linear? [?/Yes/No]

e) Is the system causal? [?/Yes/No]

f) Is the system memoryless? [?/Yes/No]

g) Is the system stable? [?/Yes/No]

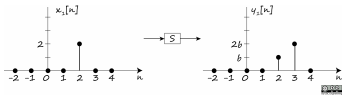
In your answers, enter $z(n)$ for a discrete-time function $z[n]$. WebWork is unable to parse a function that uses square brackets. Also, enter "x1(n)" for $x_1[n]$ and "x2(n)" for $x_2[n]$.

*Part **b** will only be marked correct if part **a** is correct. Part **d** will only be marked correct if part **c** is correct. Part **e** to **g** will only be marked correct if both **a** and **c** are correct.*

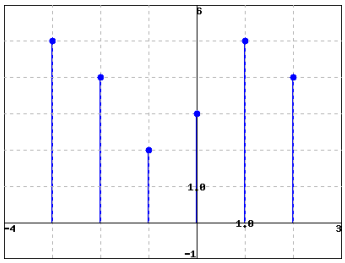
Correct Answers:

- `29*x(-M-n)`
- `29*x(M-n)`
- `No`
- `29*[A*x1(-n)+B*x2(-n)]`
- `29*[A*x1(-n)+B*x2(-n)]`
- `Yes`
- `No`
- `No`
- `Yes`

The system T represented in the figure below is known to be time-invariant. When the input signals are $x_1[n]$ and $x_2[n]$, the outputs are $y_1[n]$ and $y_2[n]$. Assume that the system is linear and $b = 6$.



Find the output signal $y_2[n]$ for $-2 \le n \le 2$ when the input signal is $x_2[n]$, shown in the figure below.



n	-2	-1	0	1	2
$y_2[n]$	____	____	____	____	____

Correct Answers:

- `42`
- `30`
- `21`
- `33`
- `42`

An LTI system is represented by the difference equation $y[n] = 0.66y[n-1] + 5x[n]$.

a) Find the impulse response of the system and enter it as a simplified expression in terms of the discrete unit-step function, $u[n]$.

$h[n] =$ ___

b) Is the system BIBO stable? [?/Yes/No]

c) Determine the response of the system, $y[n]$, to the input:

$$x[n] = \begin{cases} 1 & if \\ 0 \leq n \leq 2 & \\ 0 & if \\ otherwise & \end{cases}$$

$y[n] =$ ___

In your answers, enter $z(n)$ for a discrete-time function $z[n]$. WebWork is unable to parse a function that uses square brackets.

*Part **b** will only be marked correct if part **a** is correct.*

Correct Answers:

- `5*0.66^n*u(n)`
- `Yes`
- `5*[0.66^n*u(n)+0.66^(n-1)*u(n-1)+0.66^(n-2)*u(n-2)]`

The impulse response of a discrete-time LTI system is given by $h[n] = u[n] - u[n-6]$. Given that the input to the system is given by $x[n] = 7(u[n] - u[n-(N+1)])$ for a positive integer N:

a) If $N = 6$ what is the length of the output $y[n]$? ___

b) Find the output, $y[n]$ of the system for $N = 6$ and enter it in the table below.

n	0	1	2	3	4	5	6
$y[n]$	___	___	___	___	___	___	___

n	7	8	9	10	11	12	13
$y[n]$	___	___	___	___	___	___	___

Correct Answers:

- `12`
- `7`
- `14`
- `21`
- `28`
- `35`
- `42`
- `42`
- `35`
- `28`
- `21`
- `14`
- `7`
- `0`
- `0`