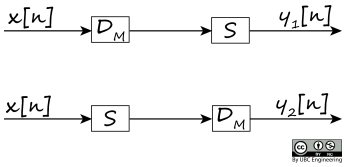
Somith Das
2019W2_ELEC_221_201
Assignment Problem_Set_7 due 03/20/2020 at 11:59pm PDT

JY Note Mar 10, 2020: A slight code change has been implemented to avoid the situation that some students had computing a trivial coefficient (which resulted in an incorrect answer). Apologies to anybody inconvenienced by this and thank you to the student who brought this to my attention. I've increased the number of attempts for this question to 20.

The input $x[n]$ to the discrete time system S produces an output $y[n] = x[n](-12g[n] - 11g[n-12])$



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.

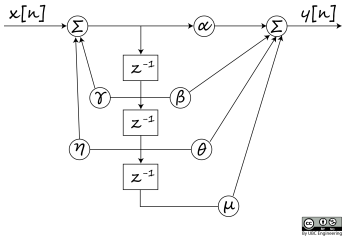
*Part **b** will only be marked correct if part **a** is correct. Part **d** will only be marked correct if part **c** is correct.*

Correct Answers:

- `x(n-M)*[(-23)*n-(-132)]`
- `x(n-M)*[(-23)*(n-M)-(-132)]`
- `No`
- `x(n-M)*(-23)*[1+(-1)^n]`
- `x(n-M)*(-23)*[1+(-1)^(n-M)]`
- `No`

JY Note Mar 9, 2020: I believe that the previous problems with this question are now resolved. Please notify me if you still believe that programming issues are being encountered.

Figure below shows the block diagram of a discrete-time LTI system. Assume the following values:· $\alpha = 3$· $\beta = -8.5$· $\eta = -2$· $\gamma = 3$· $\theta = 9$· $\mu = -6$



a) Write the difference equation that describes this system.

_____

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

b) Find the impulse response for $0 \le n \le 3$ and enter it in the table below.

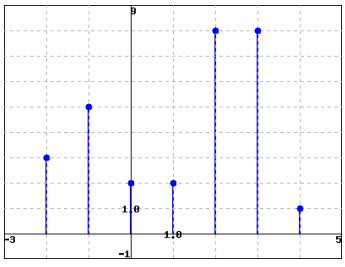
n	0	1	2	3
$h[n]$	____	____	____	____

Correct Answers:

- `y(n)-3*y(n-1)-(-2)*y(n-2) = 3*x(n)+(-8.5)*x(n-1)+9*x(n-2)+`
- `3`
- `0.5`
- `4.5`
- `6.5`

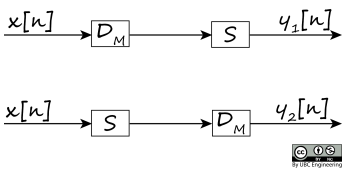
A discrete-time system is described by $y[n] = 3x[n] + 3(x[n+1])^2$

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



$y[n] =$ _____

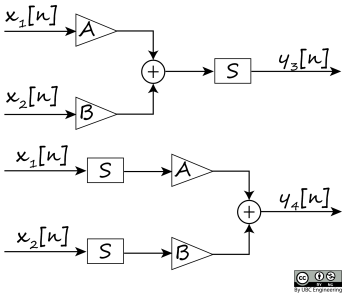
b) Given that D_M is a system that delays the input by M samples, find the outputs $y_1[n]$ and $y_2[n]$ as shown in the figures below.



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

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 $x_2[n]$.

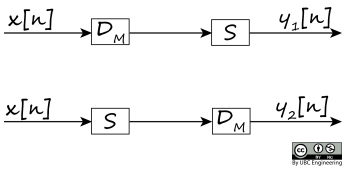
*Part **c** will only be marked correct if part **b** is correct. Part **e** will only be marked correct if part **d** is correct. Part **f** will only be marked correct if part **b** and **d** are correct.*

Correct Answers:

- `84, 27, 18, 198, 216, 27`
- `3*x(n-M)+3*[x(n+1-M)]^2`
- `3*x(n-M)+3*[x(n+1-M)]^2`
- `Yes`
- `3*[A*x1(n)+B*x2(n)]+3*[A*x1(n+1)+B*x2(n+1)]^2`
- `A*[3*x1(n)+3*[x1(n+1)]^2]+B*[3*x2(n)+3*[x2(n+1)]^2]`
- `No`
- `No`

A discrete-time system is described by $y[n] = 24x[-n]$.

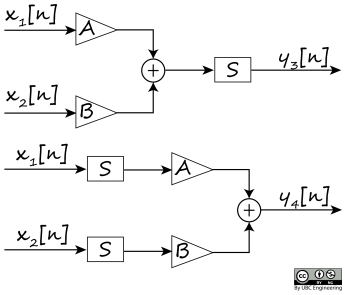
a) Given that D_M is a system that delays the input by M samples, find the outputs $y_1[n]$ and $y_2[n]$ as shown in the figures below.



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

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]

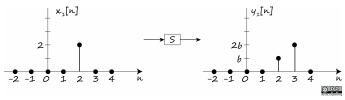
In your answers, enter $z(n)$ for a discrete-time function $z[n]$. WebWork is unable to parse a function that uses square brackets. Also, enter "x1(n)" for $x_1[n]$ and "x2(n)" for $x_2[n]$.

*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.*

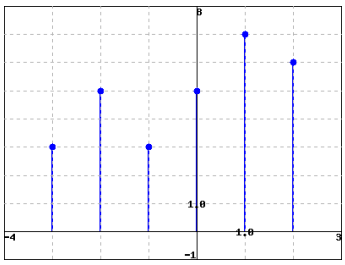
Correct Answers:

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

The system S 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 $b = 2$.



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:

- 11
- 13
- 11
- 17
- 20

An LTI system is represented by the difference equation $y[n] = 0.44y[n-1] + 6x[n]$.

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:

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

$y[n] =$ ___

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:

- `6*0.44^n*u(n)`
- `Yes`
- `6*[0.44^n*u(n)+0.44^(n-1)*u(n-1)+0.44^(n-2)*u(n-2)]`

The impulse response of a discrete-time LTI system is given by $h[n] = u[n] - u[n-4]$. Given that the input to the system is given by $x[n] = 5(u[n] - u[n-(N+1)])$ for a positive integer N:

a) If $N = 4$ what is the length of the output $y[n]$? ___

b) Find the output, $y[n]$ of the system for $N = 4$ 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:

- 8
- 5
- 10
- 15
- 20
- 20
- 15
- 10
- 5
- 0
- 0
- 0
- 0
- 0
- 0