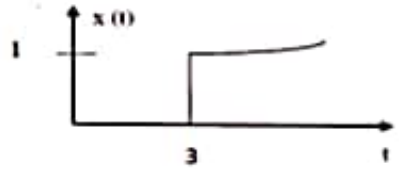
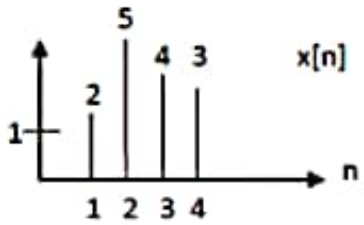
Department of Electrical Engineering
Mid term exam
Date: 19/08/2020

Course Details

Course Title: Signals & Systems **Module:** 04
Instructor: _____ **Total Marks:** 30

Student Details

Name: _____ **Student ID:** _____

Q1.	(a)	Differentiate between systems with & without memory using examples.	Marks 05+04
	(b)	Identify the basic difference between a deterministic and a random signal.	CLO 1
Q2.	(a)	Sketch the transformed versions for the signal x (t) mentioned in i. and ii.  	Marks 08+06 CLO 1
	i.	x (t + 4) and x (2t)	
	ii.	x (t/5) and x(t-3)	
	(b)	Outline the given system as invertible or non-invertible, linear or non-linear, causal or non-causal. Give the reason for you answers too.	
	i.	$y[n] = x^2[n]$	
	ii.	y[n] = x[n + 2]	
Q3.		Let x[n] be a signal with x [n] = 0 for n < 1 and n>4. For the signal given below, determine value of "n" for which the signal is guaranteed to be zero.  	Marks 04 CLO 1
	i.	x[n+5]	

Q4.		State the correct answer. If a time shift in the input signal does not result in an identical time shift in the output signal, the system is said to be _____	Marks 03 CLO 1

Name Yasir Ahmad

ID 13788

Signal and System

Summer 2020

Between System with Memoryless system.

Definition.

system is said to be memoryless if its output for each value of the independent variable at a given time is dependent variable at a given time. is dependent only on the input at same time.

Example of Memoryles system.

1) $y[n] = (2x[n] - x^2[n])^2$

The above system is a memory less system as the Nalue of y[n] at any particular time no depends only on the Nulue of x[n] at that time.

2) A Resistor Is A Memory less system.

Lets,

x(t) = In put taken as the Current.
y(t) = Voltage taken as output

Then input-output relationship of a resistor ie.

$$y(t) = R\,x(t)$$

where, R is the resistance

3) Identity System.

Identity system

An identity system is a simple memoryless system. It output is identical to its input. The input-output Relationship for an identity system is given by.

For continuous time Identity system.

$$y(t) = x(t)$$

For Discrete-time Identity system.

$$y[n] = x[n]$$

System with Memory.

Memory in a system corresponds to the presence of a mechanism in the system that retains or stores information

about input values at times other than the current time".

Examples of Systems with Memory:

1) Accumulator or Summer:-

Accumulator or Summer is a discrete time system with memory

$$y[n] = \sum_{K=-\infty}^{n} x[K]$$

An accumulator must "remember" or store information about past inputs. The accumulator computes the running sum of all inputs upto the current time, and thus, at each instant of time, the accumulator must add the current input value.

Q1 b)

Difference b/w a deterministic and a random signal.

Deterministic

signal is determine if it is comptitively known and can be described mathematically.

Random signal

Random signal can be described only by term of probabilistic Deccription

For example

distribution, means value, ~~std dev~~ standard deviations.

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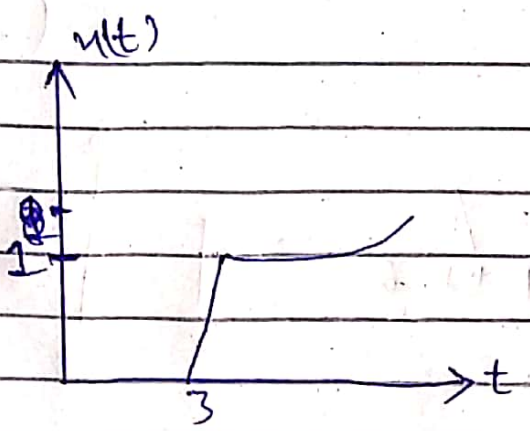
Q2(a)



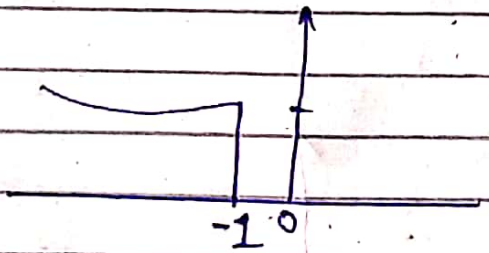
$u(t+4)$

At $t=3$, $u(t) = 1$

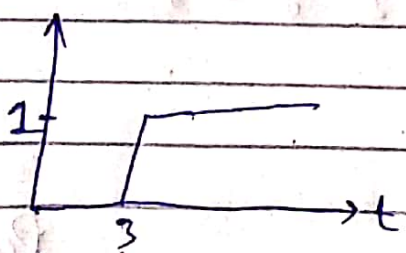
$t+4 = 3$, $u(t+4) = 1$

$t = 3-4$

$t = -1$



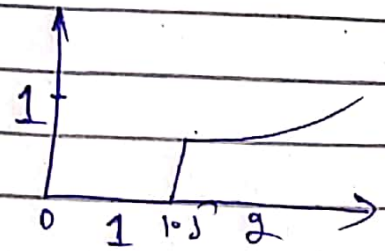
$u(2t)$



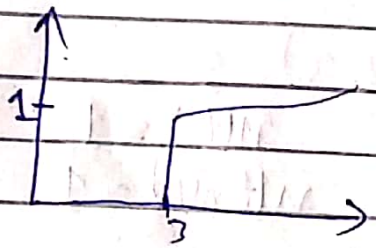
At $t=3$, $u(t) = 1$

$2t = 3$, $u(2t) = 1$

$t = \frac{3}{2} = 1.5$



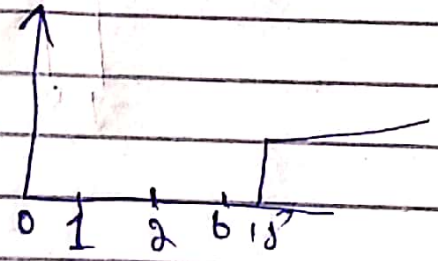
(ii) $u(t/5)$



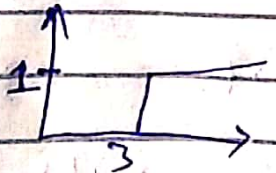
At $t=3$, $u(t)=1$

$\frac{t}{5}=3$, $u\left(\frac{t}{5}\right)=1$

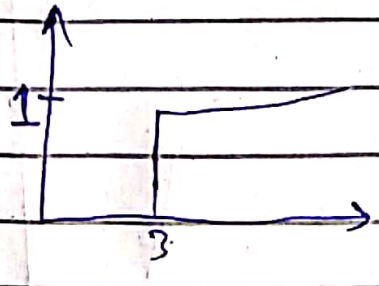
$t=1.5$



$u(t-3)$



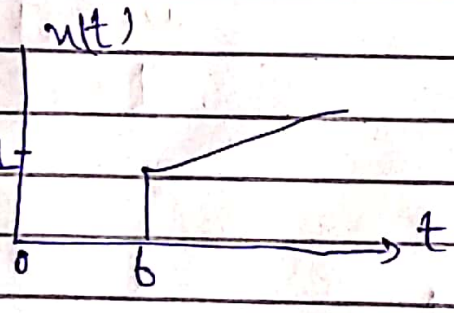
At $(t-3)$



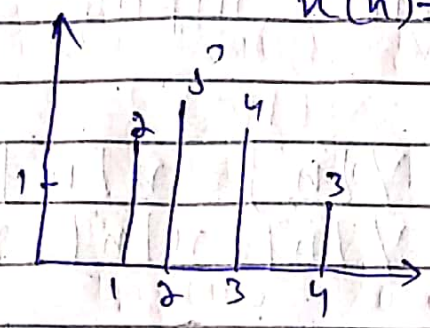
At $t=3$ $\quad u(t)=1$

$t-3=3$ $\quad u(t-3)=1$

$t=6$



Q3 $x(n) = 0$ for $n < 1, n > 4$



$x(n+y)$

At $n = 1$, $x(n) 2$

$n + y = 1$, $x(n+y) = 2$

$n = 1 - y$

$n = -4$

At $n = 2$ $x(n) = y$

$n + y = 2$ $x(n+y) = y$

$n = 2 - y$

$n = -3$

At

$n = 3$ $x(n) \leq 4$

$n + y = 3$ $x(n+y) = 4$

$n = 3 - y$

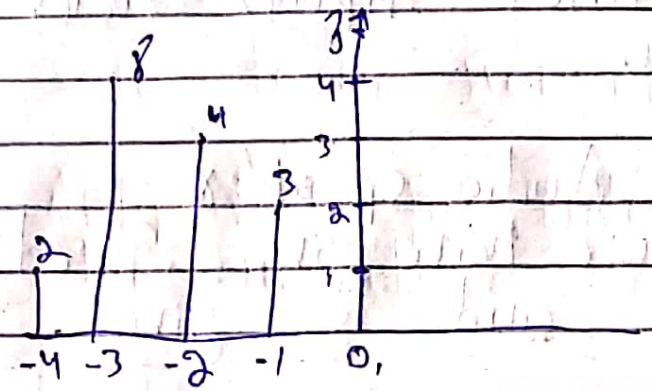
$n = -2$

At $n=4$ $\quad x(n)=3$

$n+3=4 \quad x(n+3)=3$

$n=4-3$

$n=-1$



Q6. invertible and Non invertible

System is said to be invertible if distinct input, load to distinct outputs,

e.g Audio speaker
we have give Electronical Energy and its give Sound.

A system in which we can not determine the sign of the output if said to be non-invertible system.

$$y(n) = x^2[n]$$

This Term non in-invertible.

Causes and Non

Causes and non-Causes System.

System is said to be causal if the output at Anytime depends only on the present and past

Causes of the input:

Example:

(i) $y[n] = x[n]$

(ii) $y[n] = x[n] + x[n-2]$

System is said to be non-causal if it of Antipcaties the future value of the input.

Example

$y[n] \neq x[n] + x[n+1]$

$y[n] = x[n+2]$.

Q4

If a time shift in the input signal does not result in an identical Time shift in the output signal,

The system is said to EVEN.