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Date: __/__/__

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Subject: Signal & System

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Module: 4th Sem

Q No. 1

Ans. 1

Part(a)

Systems with and without Memory:-

Momoryless System:

Def →:

A system is said to be memory less if its output for each value of independent variable at a given time is dependent only on the input

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at that same time.

Example —:-

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

The above system is memory-less system as the value of $y[n]$ at any particular time no depends only and value of $x[n]$ at that time.

2. A resistor is a memoryless system.

Let

$x(t)$ = Input taken as the current

$y(t)$ = voltage taken as output.

Then i/o relationship of a resistor is

$$y(t) = Rx(t).$$

3. An identity system is a simple memoryless system.

System with memory:-

Def:-

Memory in a system corresponds to the presence of a mechanism in a system that retain and stores of information about input values at times other than current times.

Example:-

1. Accumulator or Summer:-

Accumulator or Summer is a discrete time system with memory.

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

Q1 Part (b)

Deterministic & Random Signal

A signal is deterministic if it is completely known and can be described mathmatically.

Random signal can be discribed as and by terms of probabilistic decaiption ~~x~~ distribution, mean value, std.

Q No. 2

Ans No. 2

Part (b)

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

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

i) $y[n] = x^2[n]$ is non-~~time~~ invertible because it does not apply superposition. $[x_2 + n] = +x[n]$ or $-x[n]$

System (i) is also not linear.

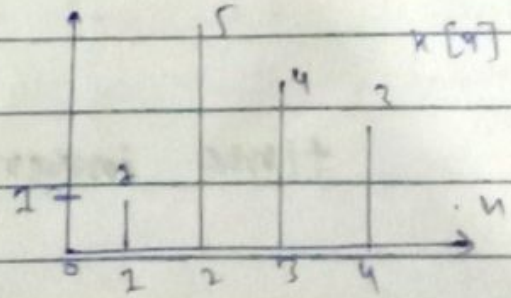
ii) $y[n] = x[n+8]$

It is not causal system or non-causal system.

Q No. 3

Ans. 3.

(i) x[n+5]



u[n+5] signal shifted by 5 to left.

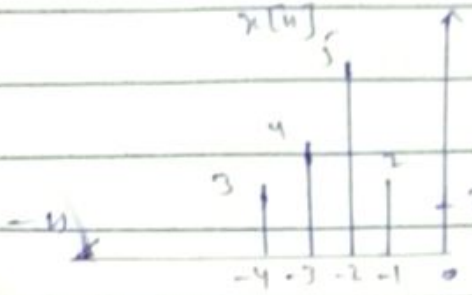
$x[n] = 0 \quad \forall \{n < 1 \text{ and } n > 4\}$

$\Rightarrow x[n+5] = 0 \quad \forall \{n+5 < 1 \text{ and } n+5 > 4\}$

$x[n+5] = 0 \quad \forall \{n < -5+1 \text{ and } n > 4-5\}$

$x[n+5] = 0 \quad \forall \{n < -4 \text{ and } n > -1\}$

$x[n+5] = 0 \quad \forall \{n < -4 \text{ and } n > -7\}$



Q No 4

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 **time invariant.**

Q No. 2

Ans. 2

Sketch the transform version for the signal x(t)

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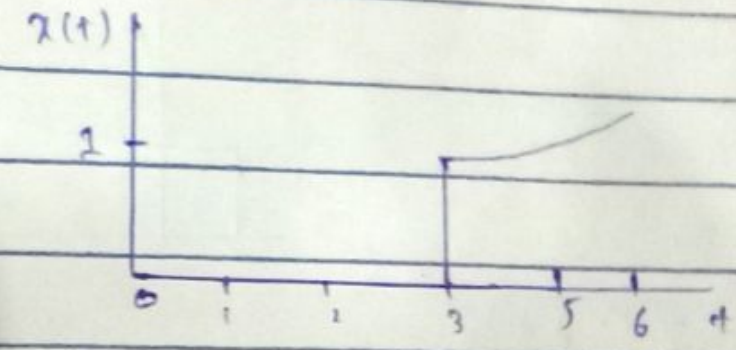
i) $x(t+4)$ and $x(2t)$

ii) $x(t/5)$ and $x(t-3)$



(i) $x(t+4)$

(a) At $t=3$ $x(t) = 1$

$\Rightarrow$ At $t+4=3$ $x(t+4) = 1$

$t = -1$

(b) At $t=4$ $x(t) = 1$

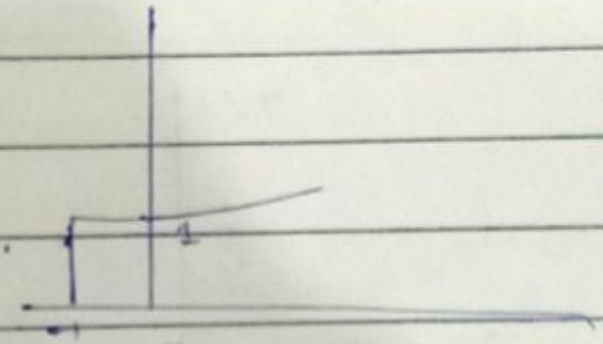
$\Rightarrow$ At $t+4=4$ $x(t+4) = 1$

$t = -0$

(c) At $t = 5$ $x(t) = 1$

At $t+4 = 5$ $x(t+4) = 1$

$t = +1$



$x(2t)$

(a) At $t = 3$ $x(t) = 1$

At $2t = 3/2$ $x(2t) = 1$

$t = 3/2$

(b) At $t = 4$ $x(t) = 1$

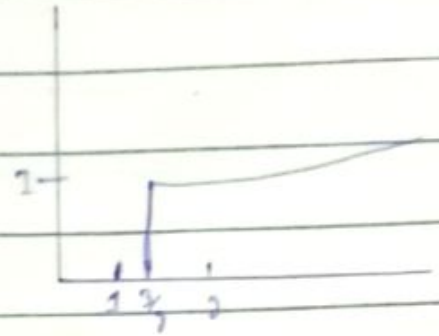
At $2t = 4/2$ $x(t) = 1$

$t = 4/2$

(c) At $t = 5$ $x(t) = 1$

At $2t = 5$ $x(t) = 1$

$t = 5/2$

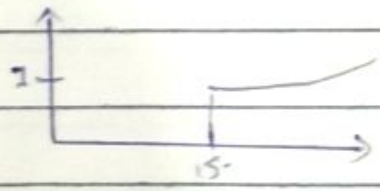


(ii) $x(t/5)$ and $x(t-3)$

At $t = 3$ $x(t) = 1$

At $t/5 = 3$ $x(t) = 1$

$t = 15$



(iii) $x(t-3)$

At $t = 3$ $x(t) = 1$

$t - 3 = 3$ $x(t) = 1$

$t = 0$