COURSE TITLE :- SIGNALS AND SYSTEMS.

MODULE :- 4th

INSTRUCTOR :- ENGR. MUJTABA IHSAN

-: STUDENT DETAILS :-

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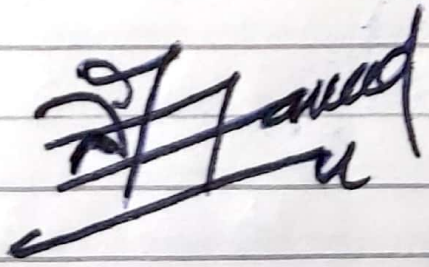
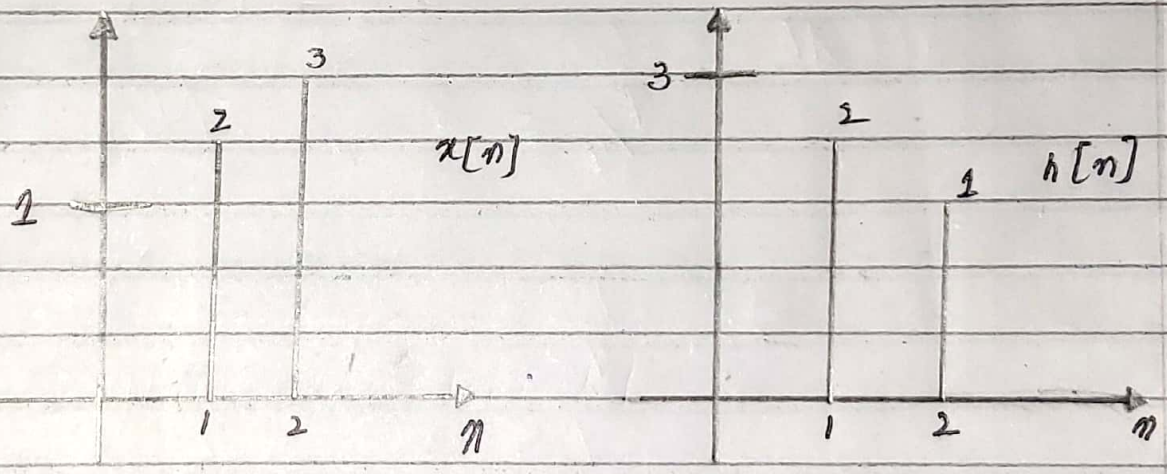
STUDENT SIGNATURE :- 

Q No. (1) Part (A):-

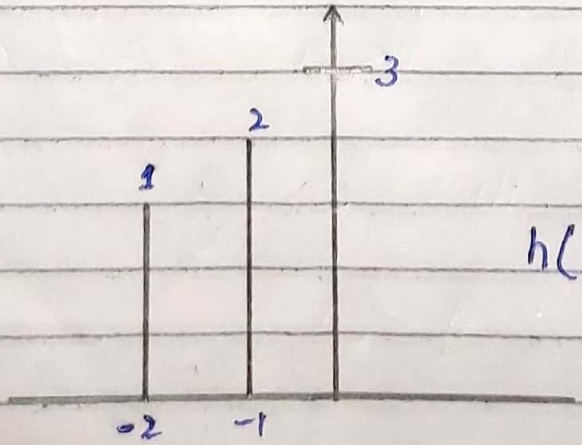
(A):- Evaluate $y[n]$ using convolution summation.



Sol:-

↳ The Reflect signal $h(x)$ to $h(-x)$

$h(-k) = h(0-k)$



$h(-n)$ or $h(-k)$.

↳ for $n=0$

$y[0] = x[k]\ h[0-k] = 1 \times 3 = 3$

↳ for $n<0$

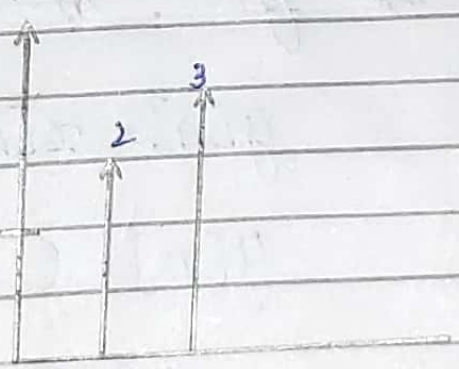
so $y[n] = 0$

↳ for $n=1$

$y(n) = x[k] \cdot h[1-k]$

$y(n) = (1\times2) + (2\times3)$

$y(n) = 8$



↳ for $n=2$

$y[n] = x[k] \cdot h[n-k]$

$y[n] = (1\times1) + (2\times2) + (3\times3)$

$y[n] = 1 + 4 + 9$

$y[n] = 14$

↳ for $n = 3$

$$y[n] = x[k] \cdot h[n-k]$$

$$y[n] = (1 \times 2) + (2 \times 3)$$

$$y[n] = 2 + 6$$

$$y[n] = 8$$

↳ for $n = 4$

$$y[n] = x[k]\, h[n-k]$$

$$y[n] = (3 \times 1) = 3$$

$$y[n] = 3$$

↳ for $n > 4$.

$y[n]$ will be zero. so

$$y[n] = 0.$$

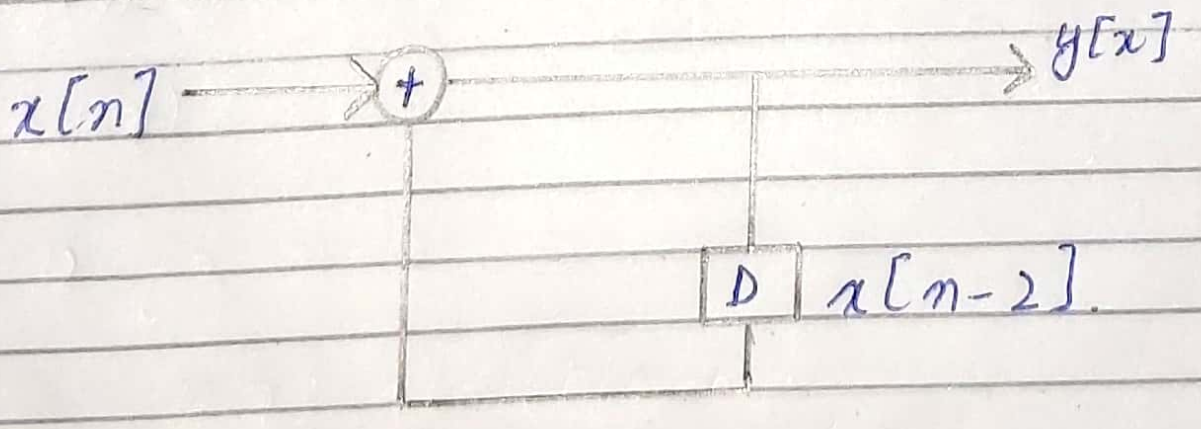
Part (B) Sketch block diagram for the given system.

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

Sol:- The sketch block diagram for the given system is:-

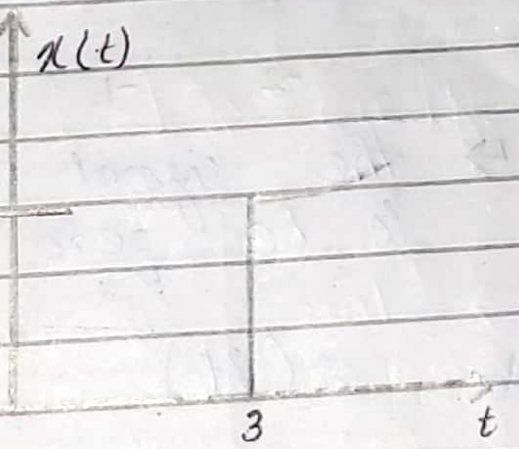
$$y[n] = x[n] + x[n-2].$$

↳ Sketch Block diagram:-



Q No. (2) :-

(A) :- Sketch the transformed versions for the signal $x(t)$ mentioned in i. and ii.



(i) $x(t+5)$ and $x(3t)$

(i) Solution :-

$x(t+5)$

At

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

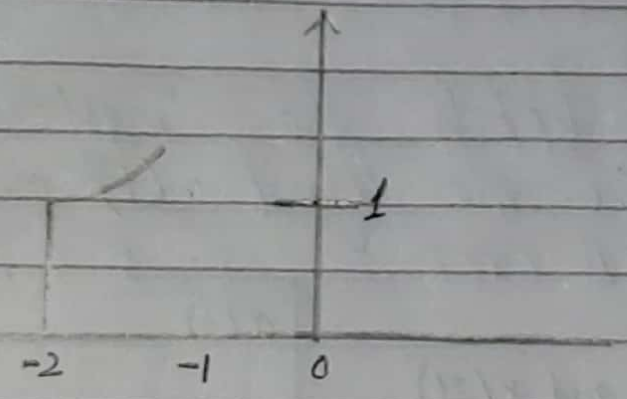
$t + 5 = 3$, $x(t+5) = 1$

→ $t + 5 = 3$

$t = 3 - 5 = -2$

→ $\boxed{t = -2}$

So



↳ The signal is generated for to be zero for $t < -2$

So $x(3t)$

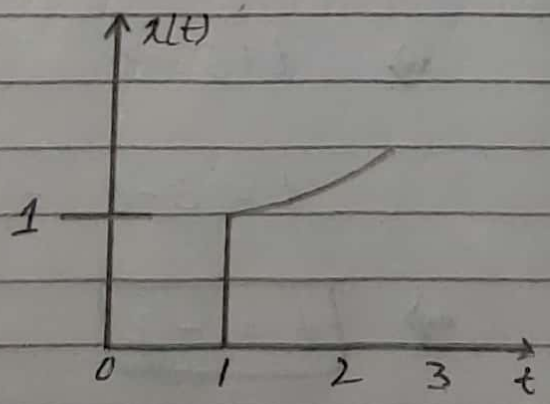
$t = 3 \quad , \quad x(t) = 1$

$3t = 3 \quad , \quad x(3t) = 1$

→ $3t = 3$

→ $t = \frac{3}{3} = 1$

→ $\boxed{t = 1}$



↳ The signal is generated from to be zero for

(ii) $x\left(\frac{t}{4}\right)$ and $x(t-2)$

At

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

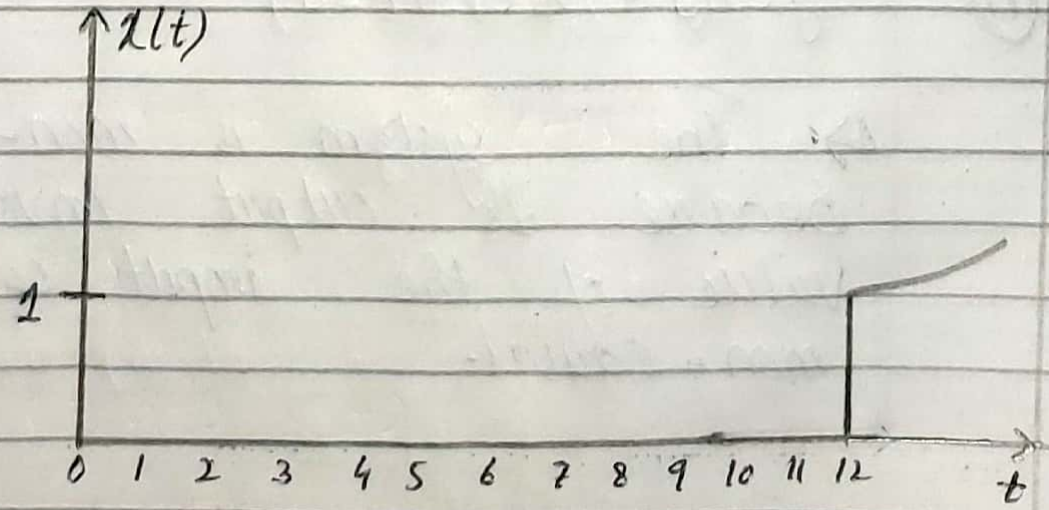
At

$\frac{t}{4} = 3$, $x\left(\frac{t}{4}\right) = 1$

→ $\frac{t}{4} = 3$

$t = 3 \times 4 = 12$

→ $\boxed{t = 12}$



Q No. (2) Part (B):-

(B) Outline the given system as invertible or non-invertibe, linear or non-linear, causal or non-causal- Given the reason for you answers too.

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

↳ This system is non-invertible, because we cannot determine the sign of the input from knowledge of output.

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

↳ The system is non-causal, because it's output involves future value of the input so it's non-causal.

Q.No. (3) Fill in the blank-

Ans:- If a time shift in the input signal results in an identical time shift in the output signal, the system is said to be Time-Invarient.