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Subject :- Signal & System

Submitted to :- Engr. Aamir Usman

Semester :- 6th

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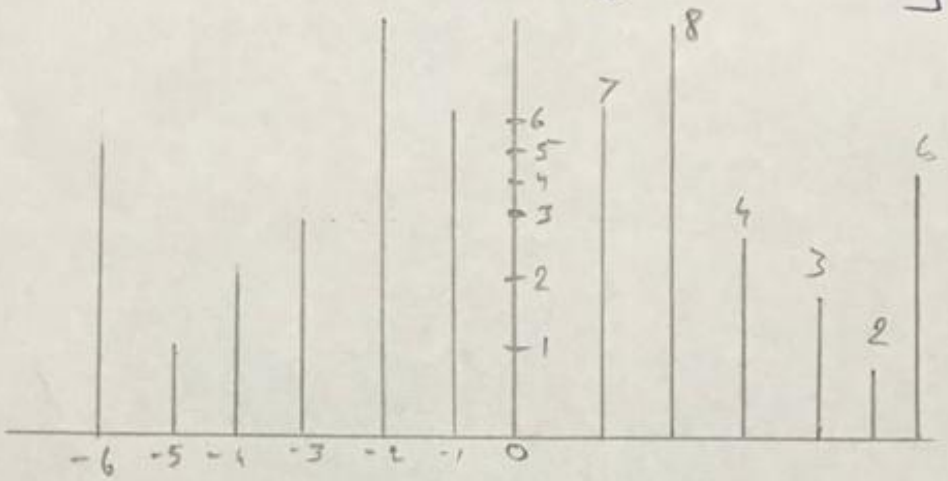
Q = 1

(a) $C_K + N_0 = C_K$

(b) $C_K = C_{N_0-K} = C_K$

$$x[n] = [7, 8, 4, 3, 2.6]$$



$$\therefore C_K = \frac{1}{N_0} \sum_{n=0}^{N_0-1} x[n] e^{-j\left(\frac{2\pi}{N_0}\right) Kn}$$

$$\therefore e^{j\theta} = \cos\theta + j\sin\theta$$

$$\text{so } e^{-j\left(\frac{2\pi}{4}\right)} = \cos(\pi/2) - j\sin(\pi/2)$$

$$\text{or } e^{-j(\pi/2)} = \cos/\pi/2 = j \sin\pi/2$$

$$\boxed{-j}$$

$$C_K = \frac{1}{6} \sum_{n=0}^{6-1} x_n (-j)^{kn}$$

$$C_K = \frac{1}{6} \sum_{n=0}^{5} x(n) (-j)^{K(n)}$$

$$K = 0, \quad C_0 = \frac{1}{6} \sum_{n=0}^{5} x(n)\{1\}$$

$$C_0 = \frac{1}{6} \{x(1) + x(8) + x(4) + x(3) + x(2) + x\{6\}.$$

$$C_0 = \frac{1}{6} [7 + 8 + 4 + 3 + 2 + 6] = \frac{31}{6}$$

$$\Rightarrow 5.16$$

$$\Rightarrow \boxed{C_0 = 5.16} \text{ DC component.}$$

Now at $K = 1$

$$C_1 = \frac{1}{6} \sum_{n=0}^{5} x(n) (-j)^n$$

$$C_1 = \frac{1}{4} [(-j)^0 x(7) + (-j)^2 x(8) + -j^2 x(4) + (-j)^3 x(3) + (-j)^4 x(2) + -j^5 x(6)]$$

$$\Rightarrow C_1 = \frac{1}{6} [-j - 7 + 93j]$$

$$C_1 = \frac{-1}{7} + \frac{j}{23}$$

Also solve for C_2 & C_3 we find coffiecnt of time-period range.

$$C_2 = \frac{-1}{4} \mp \frac{j}{23}$$

1st Properity

$$C_k + N_0 = C_k$$

$$C_1 + 4 = C_1$$

2nd Properity

$$C - K = C_{N_0} - K = C_k^2$$

$$\Rightarrow (4-1) = C_1^*$$

$$C_3 = C_1^*$$

$$\frac{-1}{7} - \frac{1}{23} j = \frac{-1}{7} + \frac{1}{23} + j$$

Q = 2

Sol:

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

$$x[n] = [1, 4, 1, 5, 0]$$

k = 0 to 4

$$= x(0) = [n-1] + n(1) = [n-4] +$$

$$x[2] = [n-1] + x[3] = [n-5] +$$

$$x[4] = [n-0]$$

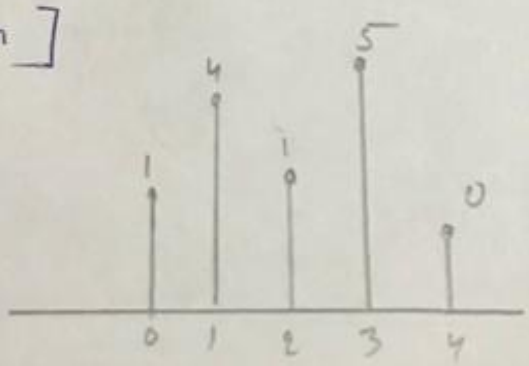
$$\delta n = 1\delta(n) + 4\delta[n-1] + 1\delta[n-2] +$$

$$5\delta(n-3) + 0\delta(n-4]$$

Magnitude =

$$[\overset{0}{1}, \overset{1}{4}, \overset{2}{1}, \overset{3}{5}, \overset{4}{0}]$$

Location = $\delta[n]$



Q = 3

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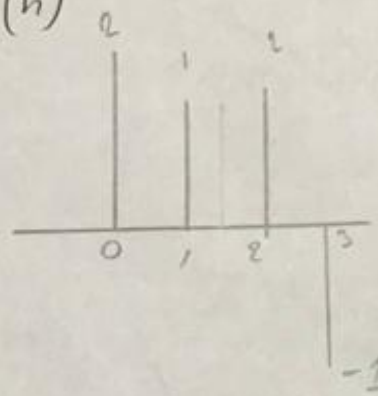
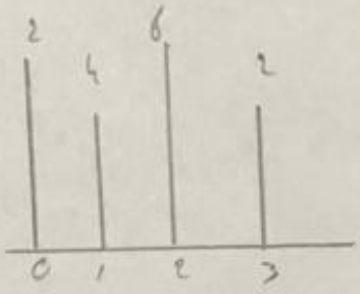
Sol: $H(n) = \{2, 1, 2, -1\}$

$x(n) = \{2, 4, 6, 2\}$

$H(n)$



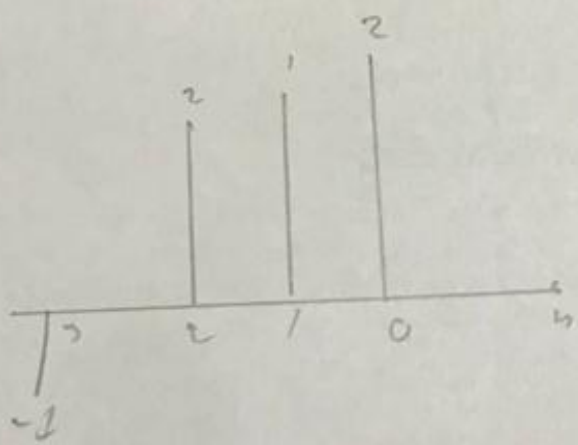
$x(n)$



Length of o/p = 2 4+4-1 = 7

Folding Impulse response

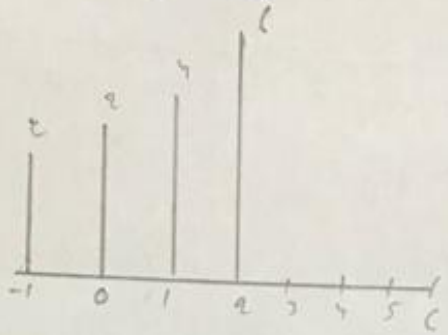
$h(-k)$



P - T. O

Now for Product sequence

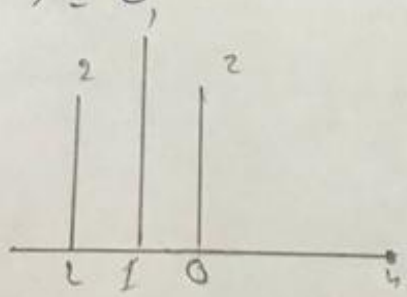
$x(n)\ h[-k]$



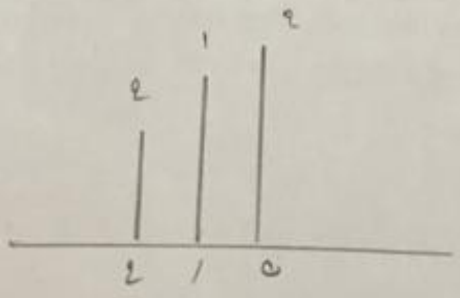
Sum: $y(1) = 4+2+6-2 = \boxed{10}$

Shifting

$n-1=0,$



$x(n)\ h(1-k)$



$y(1) = 2+1+2 = \boxed{5}$

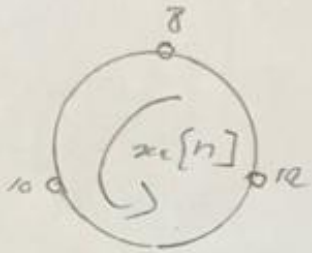
Q=5

Sol:

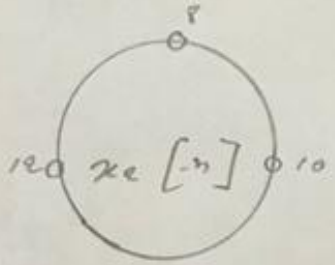
$x_1[n] = \{2, 4, 6\}$

$x_2[n] = \{8, 10, 12\}$

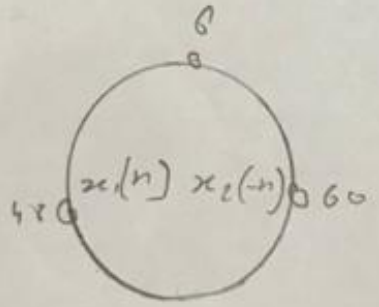
Making cycle



(1) Folding :- In this method we make clockwise image of the one sequence.



(2) Multiplication :-



$x_1[n] * x_2[-n]$

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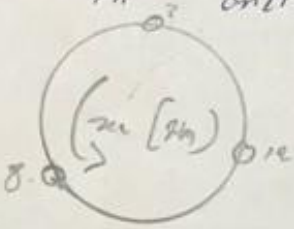
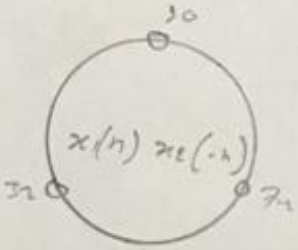
Q] Sum $y = 124$

Now we shift Two folded sequences in anti-clockwise.

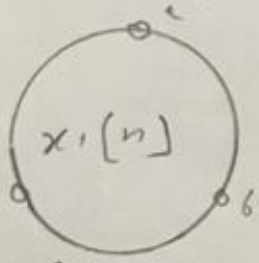


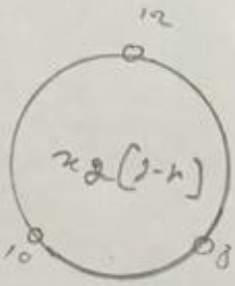
Multiplication :-



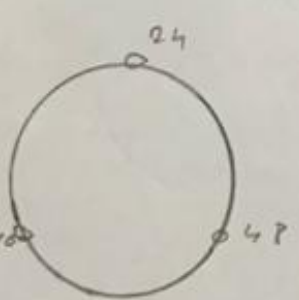
Sum = $y(1) = 124$

second shift





Multiplication :-



sum = $y[2] = 112$

So $y[n] = [124, 124, 112]$.