|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| n | -3 | -2 | -1 | **0** | 1 | 2 | 3 |  |  |  |  |
|  |  |  |  | **4** | 1 | 2 | 5 |  |  |  | Y[n] |
| 1 | **-1** | **2** | **1** |  |  |  |  |  |  |  | 0 |
| 2 |  | -1 | 2 | 1 |  |  |  |  |  |  | 4 |
| 3 |  |  | -1 | 2 | 1 |  |  |  |  |  | 9 |
| 4 |  |  |  | -1 | 2 | 1 |  |  |  |  | 0 |
| 5 |  |  |  |  | -1 | 2 | 1 |  |  |  | 8 |
| 6 |  |  |  |  |  | -1 | 2 | 1 |  |  | 8 |
| 7 |  |  |  |  |  |  | -1 | 2 | 1 |  | -5 |
| 8 |  |  |  |  |  |  |  | -1 | 2 | 1 | 0 |
|  |  |  |  |  |  |  |  |  |  |  |  |

**Discrete Time Convolution**

X[n]=[4 1 2 5], h[n]=[1 2 -1] m=4, n=3

Y[n]={ 0 4 9 0 8 8 -5 0}

**Function**

First: to make the lengths equal by zero padding (if elseif)

Second: We’ll break this shifting process in LHS and RHS and perform shifting and multiplication in a loop one loop for RHS and other for LHS shift

1. Loop: runs for length of h or n we have made all equal

H=[0 h]

X=[x 0]

First start **multiplication** then append 0 at the start of h and end of X.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | **4** | 1 | 2 | 5 | 0 | 0 |  |  |
| 1 | **-1** | **2** | **1** | 0 | 0 | 0 | 0 |  |  |  |  |
| 2 |  | -1 | 2 | 1 | 0 | 0 | 0 |  |  |  |  |
| 3 |  |  | -1 | 2 | 1 | 0 | 0 |  |  |  |  |
| 4 |  |  |  | -1 | 2 | 1 | 0 |  |  |  | 1st x, b/c exactly overlapped |
| 5 |  |  |  | 0 | -1 | 2 | 1 | 0 |  |  |  |
| 6 |  |  |  | 0 | 0 | -1 | 2 | 1 | 0 |  |  |
| 7 |  |  |  | 0 | 0 | 0 | -1 | 2 | 1 | 0 |  |
| 8 | No need |  |  | 0 | 0 | 0 | 0 | -1 | 2 | 1 | 0 |
|  |  |  |  |  |  |  |  |  |  |  |  |

1. Loop: runs for length of h or n we have made all equal

First append 0 at the start of X and end of h then start multiplication

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | 0 | 0 | 0 | **4** | 1 | 2 | 5 |  |  |  |  |
| 0 | **-1** | **2** | **1** | 0 |  |  |  |  |  |  |  | 4th |
| 1 |  | **-1** | **2** | **1** | 0 | 0 |  |  |  |  |  | 3rd |
| 2 |  |  | -1 | 2 | 1 | 0 | 0 | 0 |  |  |  | 2nd |
| 3 |  |  |  | -1 | 2 | 1 | 0 | 0 |  |  |  | 1st |
| 4 |  |  |  |  | -1 | 2 | 1 | 0 | 0 |  |  |  |
| 5 |  |  |  |  | 0 | -1 | 2 | 1 | 0 |  |  |  |
| 6 |  |  |  |  | 0 | 0 | -1 | 2 | 1 | 0 |  |  |
| 7 |  |  |  |  | 0 | 0 | 0 | -1 | 2 | 1 | 0 |  |
| 8 |  | No need |  |  | 0 | 0 | 0 | 0 | -1 | 2 | 1 | 0 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |