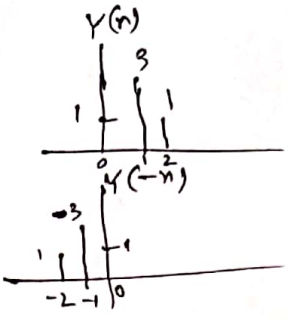
Correlation

- Cross Correlation
- Auto Correlation
- Circular Correlation

Cross correlation:

$x(n) = \{1, 1, 2, 2\}$, $y(n) = \{1, 3, 1\}$



First step: $y(-n) = \{1, 3, 1\}$

x(n) ↓ \ y(-n) →	1	3	1
1	1	3	1
1	1	3	1
2	2	6	2
2	2	6	2

$\{1, 4, 6, 9, 8, 2\}$

Highest : +3
Lowest : -2

$\therefore r_{xy} = \{1, 4, 6, 9, 8, 2\}$ Ans

Auto correlation:

$x(n) = \{1, 2, 3, 4\}$ $\therefore x(-n) = \{4, 3, 2, 1\}$

x(n) ↓ \ x(-n) →	4	3	2	1
1	4	3	2	1
2	8	6	4	2
3	12	9	6	3
4	16	12	8	4

$\{4, 11, 20, 30, 20, 11, 4\}$

Highest : +3
Lowest : -3

$\therefore r_{xx} = \{4, 11, 20, 30, 20, 11, 4\}$ Ans

Circular Correlation:

$x(n) = \{1, 1, 2, 1\}$, $y(n) = \{2, 3, 1, 1\}$

$$\overline{r_{xy}} = \begin{bmatrix} 2 & 3 & 1 & 1 \\ 1 & 2 & 3 & 1 \\ 1 & 1 & 2 & 3 \\ 3 & 1 & 1 & 2 \end{bmatrix} \begin{bmatrix} 1 \\ 1 \\ 2 \\ 1 \end{bmatrix} = \begin{bmatrix} 8 \\ 10 \\ 9 \\ 8 \end{bmatrix}$$

$y(n)$ $x(n)$

$\overline{r_{xy}} = \{8, 10, 9, 8\}$