Name	**Hatim Sawai**
UID no.	**2021300108**

Experiment 2	
AIM:	The aim of this experiment is to study mathematical operation Correlation and measure degree of similarity between two signals.
OBJECTIVE:	• Write a function to find Correlation Operation • Calculate correlation of a DT signals and verify the results using mathematical formula
PROBLEM DEFINITION:	1. Find auto correlation of input signal and find the significance of value of output signal at n=0. Let y[n] = x[n] O x[n] Classify the resultant signal Even / Odd). Calculate the energy of the signal . Q. What is the significance of value of y[0]. 2. Find auto correlation of delayed input signal. Let p[n]= x[n-1] O x[n-1]. Compare the resultant signal p[n] with y[n]. Give your conclusion. 3. Find cross correlation of input signal and delayed input signal q[n] = x[n] 0 x[n-1]. Compare the resultant signal q[n] with p[n] and y[n]

	Give your conclusion. 4. Find cross correlation of input signal and scaled input signal. Let s[n] = x[n] O a x[n-2] where "a" is any constant. Compare the resultant signals. Give your conclusion.

RESULT:	**1. To find y[n] = x[n] o x[n]**
	`PS C:\Users\shabb\OneDrive\Desktop\Hatim\FOSIP-Practicals> python correlation.py"`
	`Enter the input sequence x(n): 5 6 7 8`
	`Auto-correlation of y[n]: [ 40. 83. 128. 174. 128. 83. 40.]`
	`Significance of y[0]: Even`
	`Energy of the signal: 80022.0`
	
	Let y[n] = {40, 83, 128, 174, 128, 83, 40}
	By comparing y[n] with y[-n] we get,
	Now y[n] = y[-n]
	
	2. To find p[n] = x[n-1] o x[n-1]
	`Auto-correlation of p[n]: [ 0. 40. 83. 128. 174. 128. 83. 40. 0.]`
	`Conclusion: p[n] is not equal to y[n]`
	
	Let p[n] = {0, 40, 83, 128, 174, 128, 83, 40, 0}
	
	By comparing y[n] with p[n] we get,
	
	Here, p[n] = y[n]
	
	Signals with some delay also have the same correlation

3. To find q[n] = x[n] o x[n-1]

```
Cross-correlation of q[n]: [ 40.  83. 128. 174. 128.  83.  40.   0.   0.]
Conclusion: q[n] is not equal to p[n] or y[n]
```

Let p[n] = {40, 83, 128, 174, 128, 83, 40, 0, 0]

By comparing y[n] with p[n] we get,

p[n] = y[n+1]

4. To find s[n] = x[n] o (a * x[n-2])

```
Cross-correlation of s[n]: [ 40.  83. 128. 174. 128.  83.  40.   0.   0.   0.   0.]
Conclusion: s[n] is not equal to y[n]
PS C:\Users\shabb\OneDrive\Desktop\Hatim\FOSIP-Practicals>
```

Let p[n] = {40, 83, 128, 174, 128, 83, 40, 0, 0, 0, 0}

Here, p[n] = 2*y[n + 2]

CONCLUSION:

1. Autocorrelation signal is an even function, meaning it is symmetric around the vertical axis (y[n] = y[-n]).

2. When input signals are delayed, the autocorrelation of the delayed input signal remains the same as the autocorrelation of the original signal.

3. The cross-correlation of an input signal with a delayed version of itself is equivalent to the advanced autocorrelation of the input signal.