Experiment No.: 04

Experiment Name: Generation of Unit Sample Sequence

Description of the Problem:

The objective of this experiment is to generate and plot a **Unit Sample Sequence** (also called **discrete-time impulse signal**) using MATLAB.
This is a fundamental signal in **Digital Signal Processing (DSP)** because it can be used to test the response of discrete-time systems.

Basic Theory:
The **Unit Sample Sequence** is defined mathematically as:

$$\delta[n] = \begin{cases} 1, & n = 0 \\ 0, & n \neq 0 \end{cases}$$

It is represented in MATLAB by defining an array of zeros for all indices except `n = 0`, which is set to 1.

Code Explanation:

1. `n = -10:10;` → defines the discrete time indices from -10 to 10.
2. `u = [zeros(1 , 10) 1 zeros(1,10)];` → creates the impulse signal (1 at n = 0, 0 elsewhere).
3. `stem(n,u);` → plots the discrete-time signal.
4. `axis()` and `grid on` → adjust display and readability.

Source Code Sample:

```
clc;
close all;
clear all;

n = -10 : 10;
u = [zeros(1 , 10) 1 zeros(1,10)];
stem(n , u);
axis([-12 12 -1 2]);
grid on;
xlabel('Time Index');
ylabel('Amplitude');
title('Unit Sample Sequence');
```

Sample Input:

No manual input is required — all values are predefined in the code (`n` and `u`).
MATLAB automatically generates the sequence when you **Run** the script.

Sample Output:

- A discrete stem plot appears.
- Only **n = 0** has amplitude **1**, all other values are **0**.
- Confirms successful generation of the **Unit Sample Sequence**.

Screenshot:

Figure 4.1: MATLAB Output Showing the Unit Sample Sequence