

Experiment No.: 05

Experiment Name: Signal Reversal and Even Component Extraction using MATLAB

Description of the Problem:

The objective of this experiment is to:

1. Reverse a discrete-time signal $x[n]$ to obtain $x[-n]$.
2. Extract the **even component** of the signal $x_e[n]$.

In **Digital Signal Processing (DSP)**, any discrete-time signal $x[n]$ can be decomposed into **even** and **odd** components:

$$x[n] = x_e[n] + x_o[n]$$

Where:

$$x_e[n] = \frac{x[n] + x[-n]}{2} \text{ (Even component)}$$
$$x_o[n] = \frac{x[n] - x[-n]}{2} \text{ (Odd component)}$$

This experiment helps students understand signal symmetry, reversal, and decomposition — fundamental concepts for system analysis and Fourier transforms.

Source Code Sample:

```
clc;
clear all;
close all;

% Input from user
n = input('Enter the range of n ');      % Time indices
x = input('Enter the signal values ');    % Signal values

% Compute reversed signal
x_rev = fliplr(x);

% Compute even component
x_even = (x + x_rev) / 2;
```

```

% Plot original signal
subplot(3,1,1);
stem(n, x, 'filled');
axis([-6 6 -3 3]);
title('Original Signal x[n]');
xlabel('n');
ylabel('Amplitude');
grid on;

% Plot reversed signal
subplot(3,1,2);
stem(n, x_rev, 'filled');
axis([-6 6 -3 3]);
title('Reversed Signal x[-n]');
xlabel('n');
ylabel('Amplitude');
grid on;

% Plot even component
subplot(3,1,3);
stem(n, x_even, 'filled');
axis([-6 6 -3 3]);
title('Even Signal x_e[n]');
xlabel('n');
ylabel('Amplitude');
grid on;

```

Sample Input:

Since this code uses `input()`, you need to provide:

Example:

```

Enter the range of n: [-2 -1 0 1 2]
Enter the signal values: [1 2 3 4 5]

```

- $n \rightarrow$ Time indices
 - $x \rightarrow$ Original signal values
-

Sample Output:

After entering the input values:

1. **Original Signal** $x[n]$: Plotted in first subplot.
2. **Reversed Signal** $x[-n]$: Plotted in second subplot.
3. **Even Component** $x_e[n] = (x[n] + x[-n])/2$: Plotted in third subplot.

Each subplot shows amplitude vs time index clearly with grid and labels.

Screenshot:

Figure 5.1: Original, Reversed, and Even Signal Components in MATLAB

