

Digital Signal Processing
Experiment 03

Linear Convolution:

```
% Define two signals
x = [1, 2, 3, 4];
h = [2, 1, 1];

% linear convolution of x and h
y = conv(x, h);

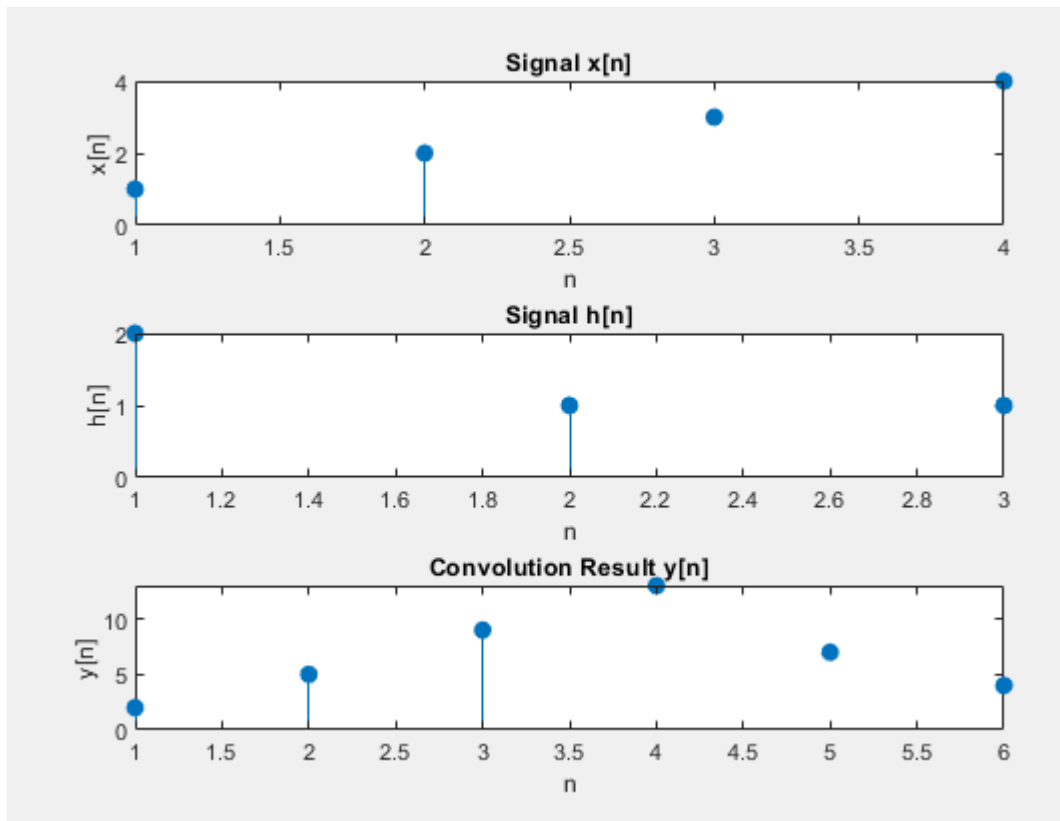
% Display the result
disp('The result of the convolution is:');
disp(y);

% Optionally, plot the signals and their convolution
figure;
subplot(3, 1, 1);
stem(x, 'filled');
title('Signal x[n]');
xlabel('n');
ylabel('x[n]');

subplot(3, 1, 2);
stem(h, 'filled');
title('Signal h[n]');
xlabel('n');
ylabel('h[n]');

subplot(3, 1, 3);
stem(y, 'filled');
title('Convolution Result y[n]');
xlabel('n');
ylabel('y[n]');

The result of the convolution is:
    2     5     9    13     7     4
```



Linear Convolution without using in-built conv() function

```
% Define two signals
x = [1, 2, 3, 4];
h = [2, 1, 1];

% Lengths of the input signals
N = length(x);
M = length(h);

% Length of the output signal
L = N + M - 1;

% Initialize the output signal
y = zeros(1, L);

% linear convolution manually
for i = 1:N
    for j = 1:M
        y(i + j - 1) = y(i + j - 1) + x(i) * h(j);
    end
end

% result
disp('The result of the convolution is:');
disp(y);

% plot signals and their convolution
figure;
subplot(3, 1, 1);
stem(x, 'filled');
```

```

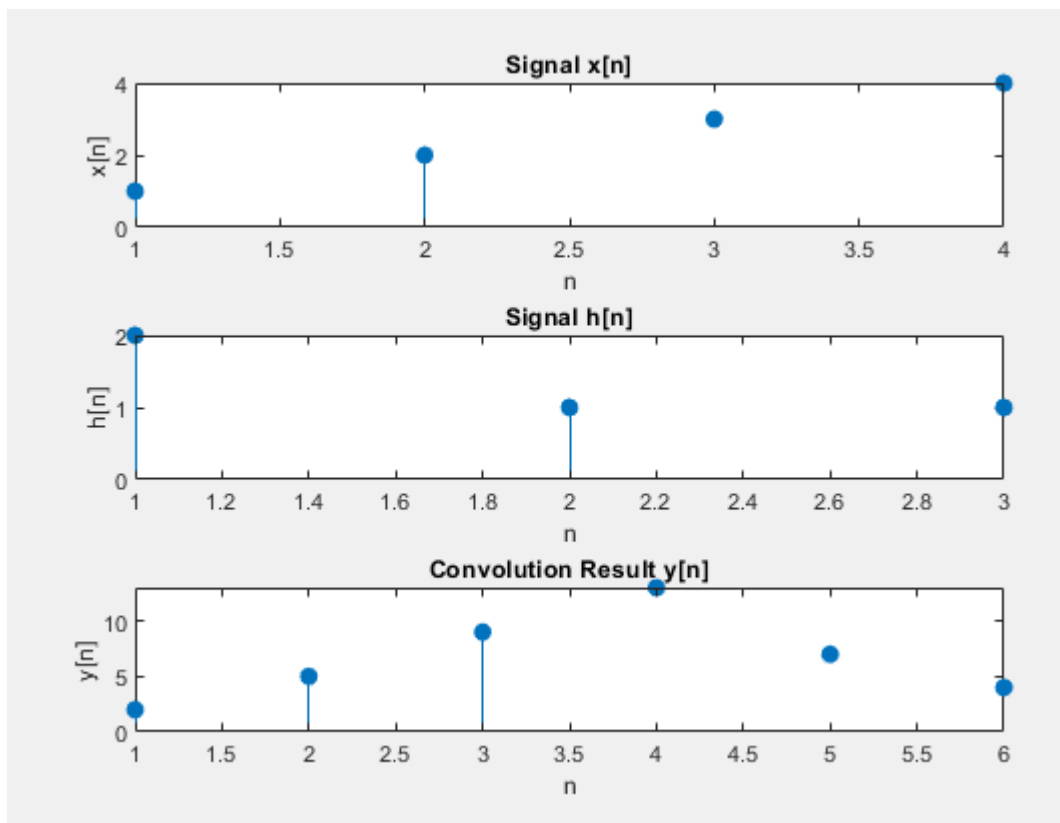
title('Signal x[n]');
xlabel('n');
ylabel('x[n]');

subplot(3, 1, 2);
stem(h, 'filled');
title('Signal h[n]');
xlabel('n');
ylabel('h[n]');

subplot(3, 1, 3);
stem(y, 'filled');
title('Convolution Result y[n]');
xlabel('n');
ylabel('y[n]');

The result of the convolution is:
    2     5     9    13     7     4

```



Circular Convolution

```

% Define two signals
x = [1, 2, 3, 1];
h = [1, 1, 1, 0];

% Compute the circular convolution using cconv
y = cconv(x, h, length(x));

% Display the result

```

```
disp('The result of the circular convolution is:');
disp(y);
```

```
% plot signals and their circular convolution
```

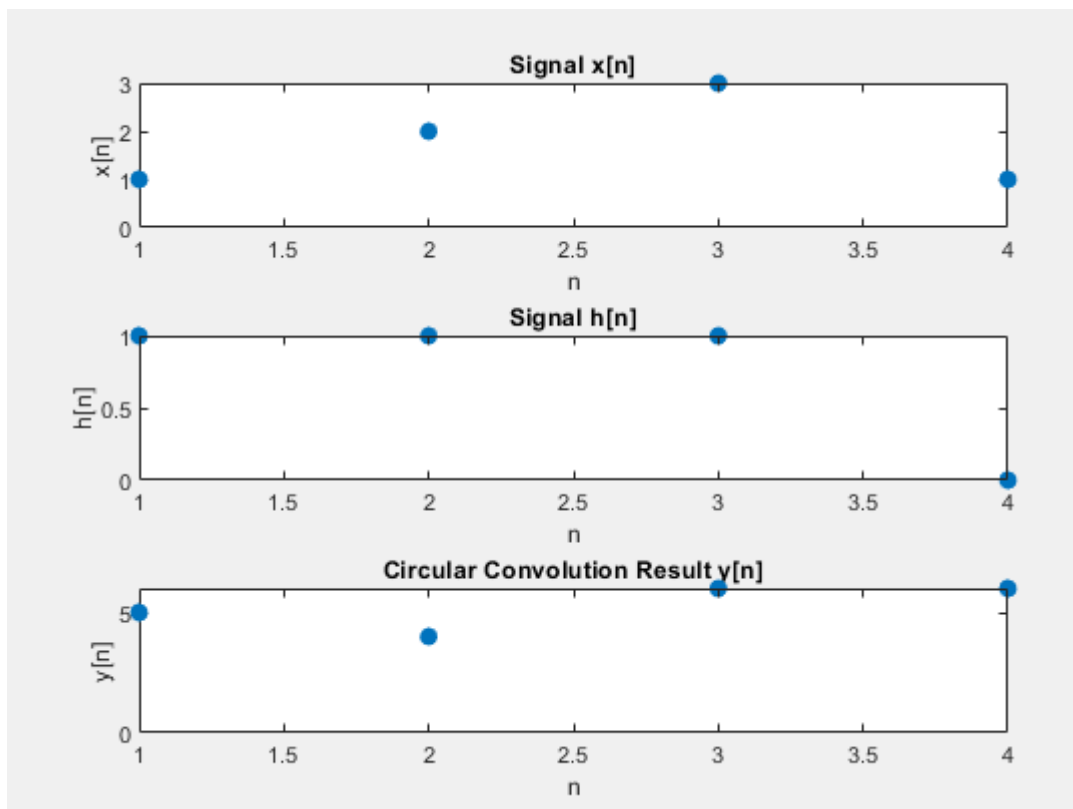
```
figure;
subplot(3, 1, 1);
stem(x, 'filled');
title('Signal x[n]');
xlabel('n');
ylabel('x[n]');
```

```
subplot(3, 1, 2);
stem(h, 'filled');
title('Signal h[n]');
xlabel('n');
ylabel('h[n]');
```

```
subplot(3, 1, 3);
stem(y, 'filled');
title('Circular Convolution Result y[n]');
xlabel('n');
ylabel('y[n]');
```

```
The result of the circular convolution is:
```

```
5    4    6    6
```



```
% Define two signals
```

```
x = [1, 3, 0, 6];
h = [4, 2, 1];
```

```
% Compute the circular convolution using cconv
```

```
y = cconv(x, h, length(x));
```

```

% Display the result
disp('The result of the circular convolution is:');
disp(y);

% plot signals and their circular convolution
figure;
subplot(3, 1, 1);
stem(x, 'filled');
title('Signal x[n]');
xlabel('n');
ylabel('x[n]');

subplot(3, 1, 2);
stem(h, 'filled');
title('Signal h[n]');
xlabel('n');
ylabel('h[n]');

subplot(3, 1, 3);
stem(y, 'filled');
title('Circular Convolution Result y[n]');
xlabel('n');
ylabel('y[n]');

```

```

>> cirConv
The result of the circular convolution is:
    16    20     7    27

```

