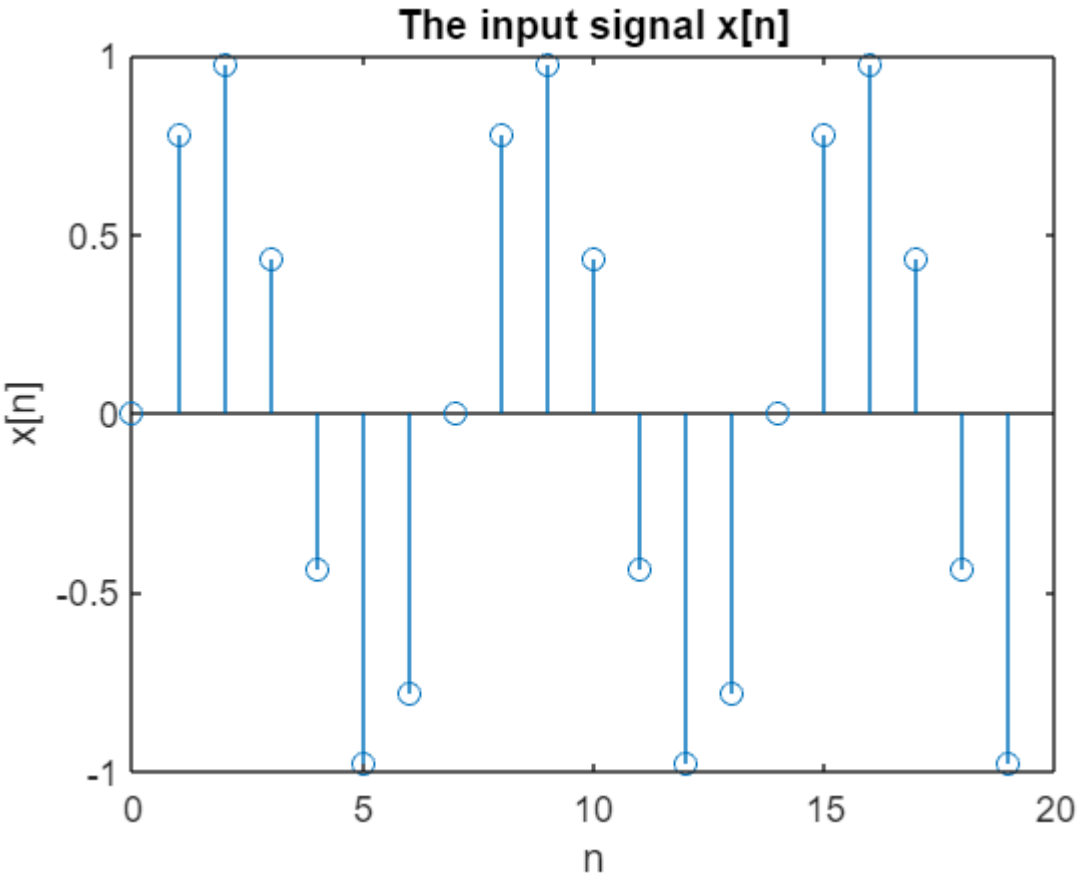
Appendix

Part a)

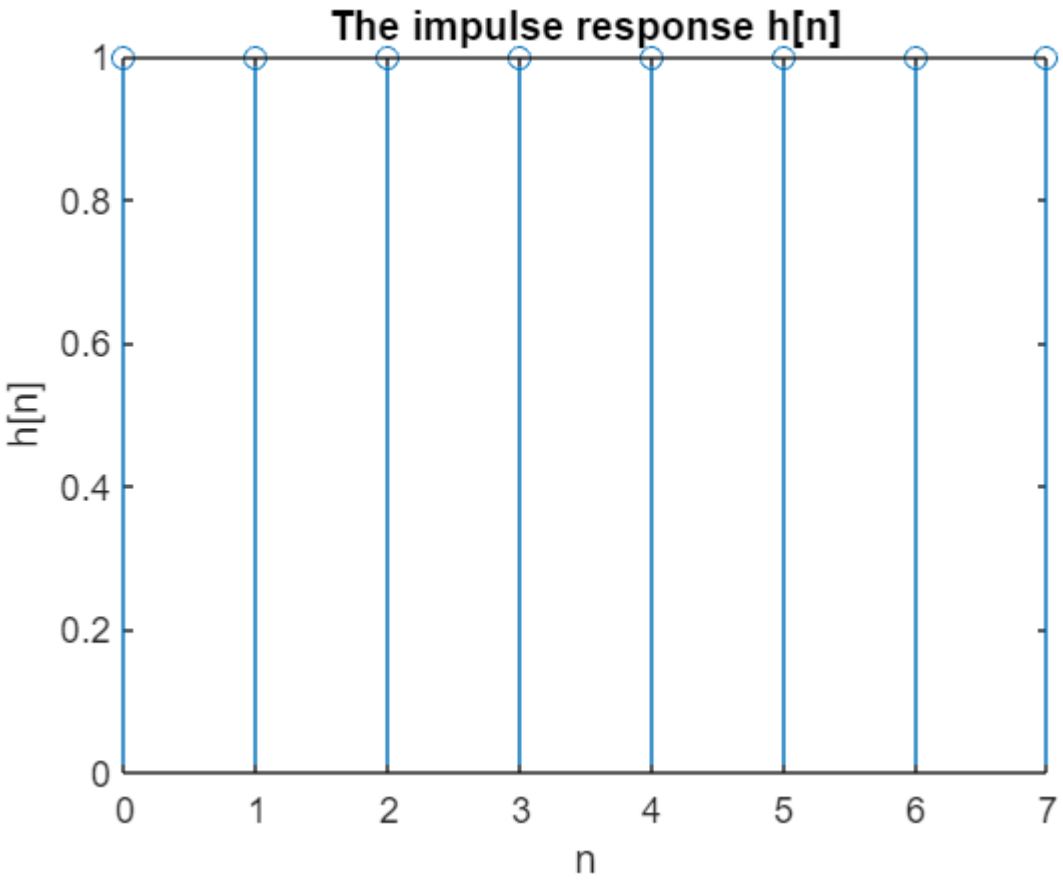
Step 1: Generate the input signal x[n]

```
N = 20;
n = 0:1:N-1;
x = sin(2*pi*n/7);
figure;
stem(n,x);
xlabel('n');
ylabel('x[n]');
title('The input signal x[n]');
```



Step 2: Generate and plot the impulse response h[n]

```
L = N-12;
h = ones(1,L);
figure;
stem(0:L-1,h);
xlabel('n');
ylabel('h[n]');
title('The impulse response h[n]');
```



Step 3: Time-reversed impulse response h[-n]

```
h_reversed = flip(h);
```

Step 4: Zero-padding

```
x_padded = [zeros(1,L-1) x  zeros(1,L-1)];
```

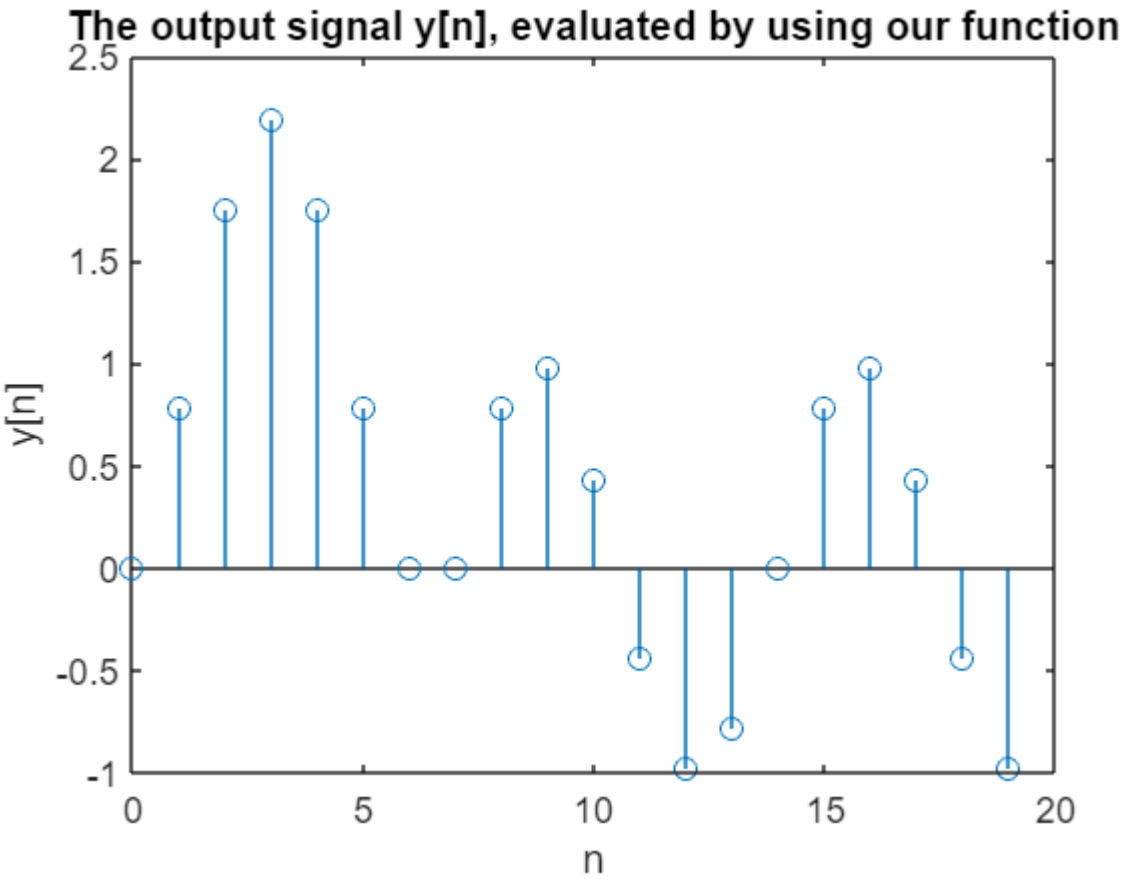
Step 5: Evaluate the convolution sum

```
y = zeros(1,N+L-1);
for i=1:N+L-1
    y(i) = x_padded(i:i+L-1)*h_reversed';
end
```

Step 6: Plot the output signal y[n]

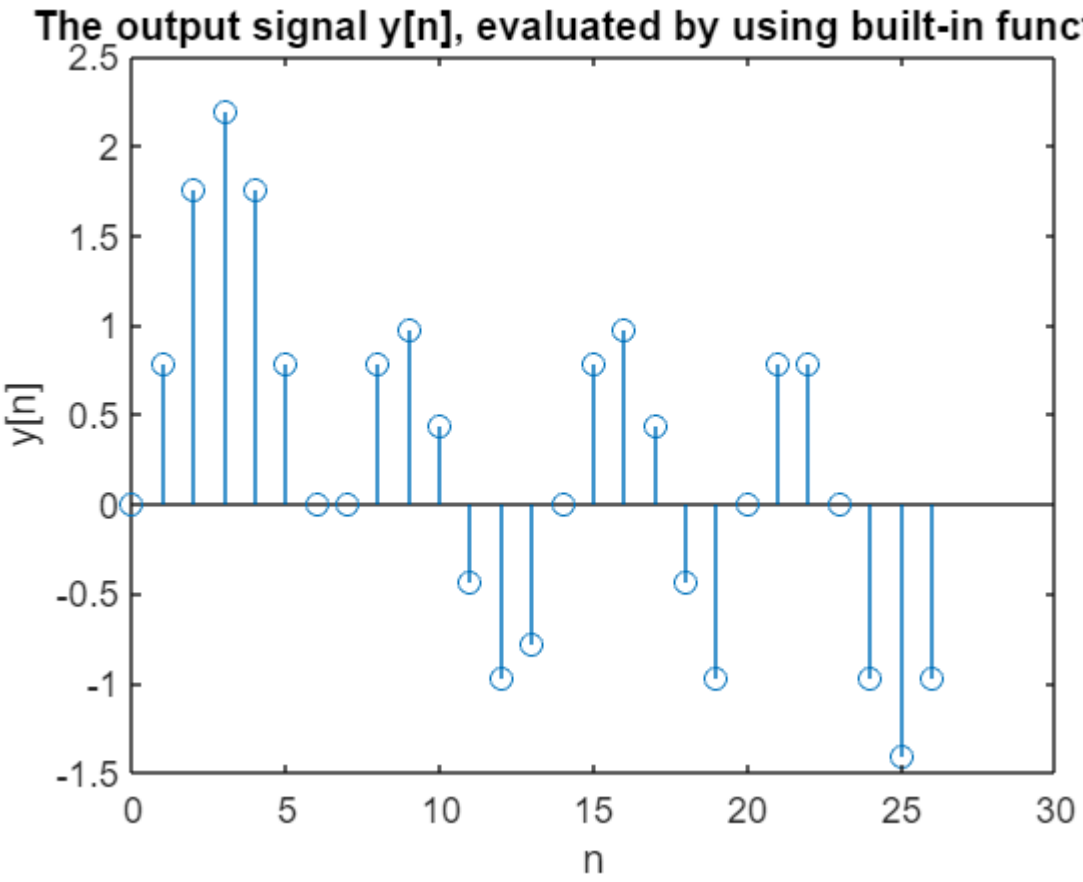
```
y = y(1:N);
figure;
stem(n,y);
xlabel('n');
ylabel('y[n]');
```

```
title('The output signal y[n], evaluated by using our function');
```



Step 7: MATLAB built-in convolution function

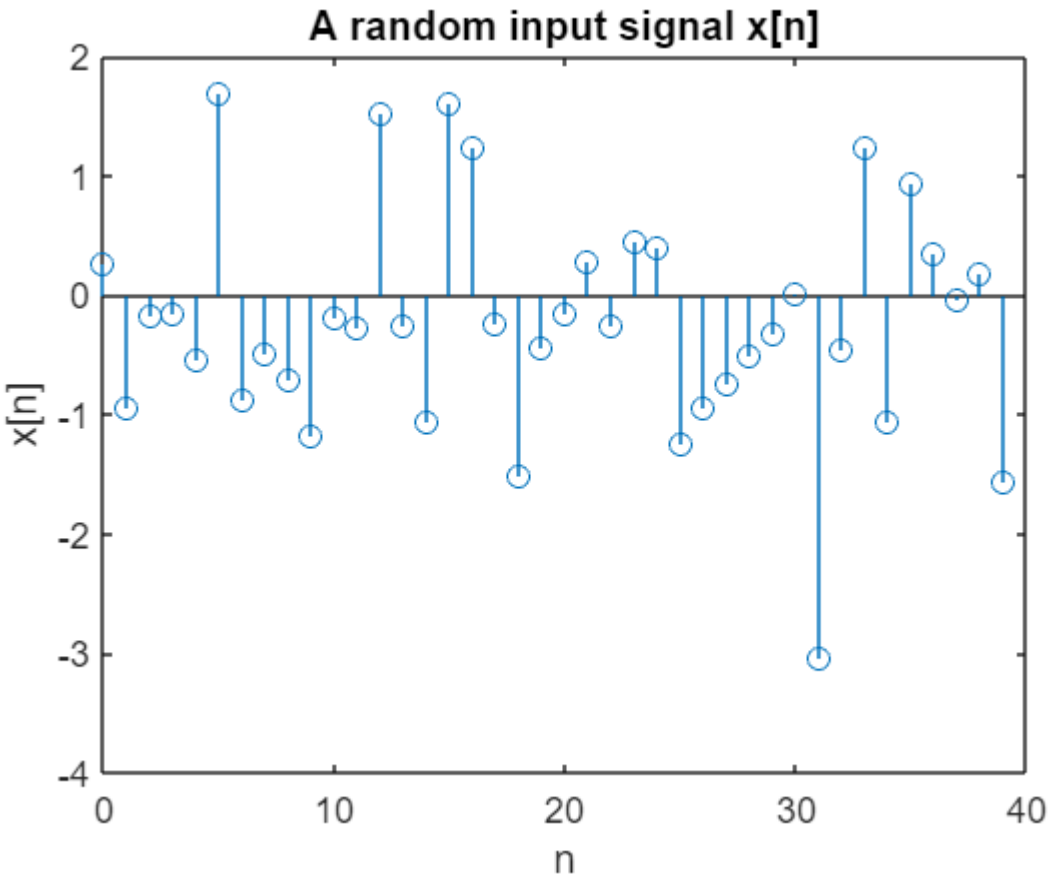
```
y = conv(x,h);
figure;
stem(0:N+L-2,y);
xlabel('n');
ylabel('y[n]');
ylabel('y[n]');
title('The output signal y[n], evaluated by using built-in function');
```



Part b)

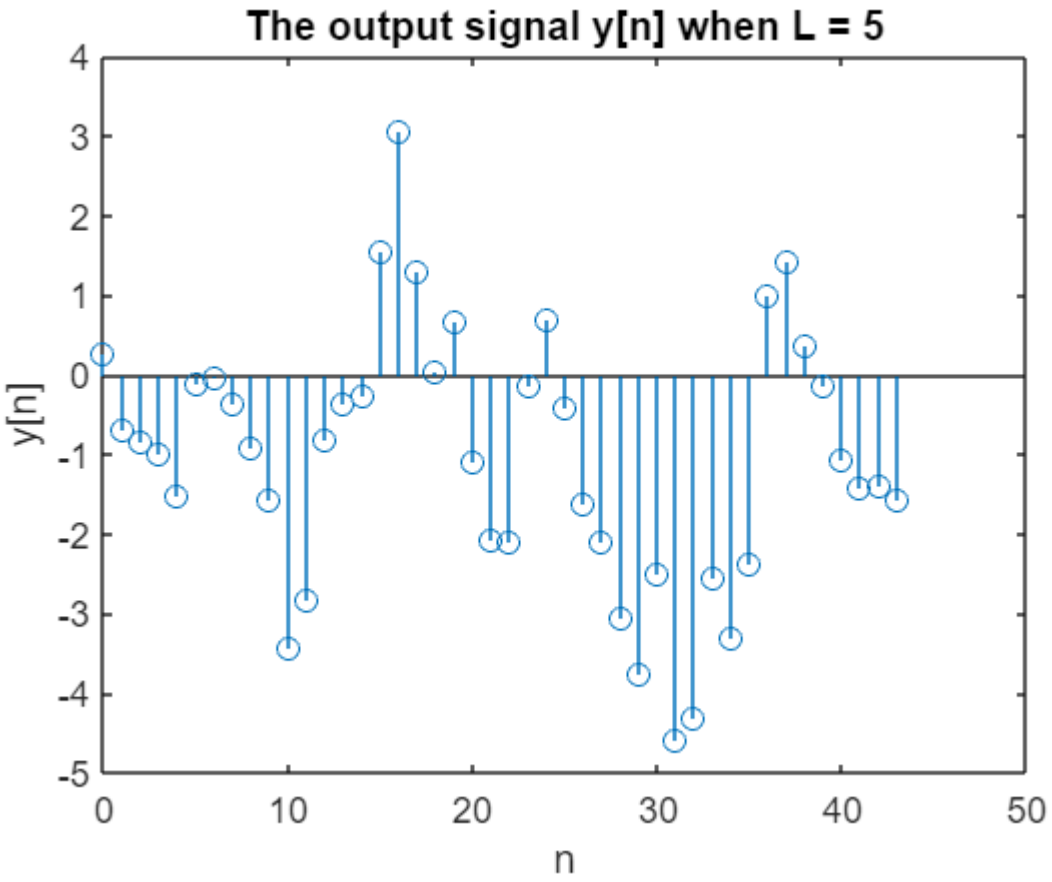
Step 1: Generate random input signal x[n]

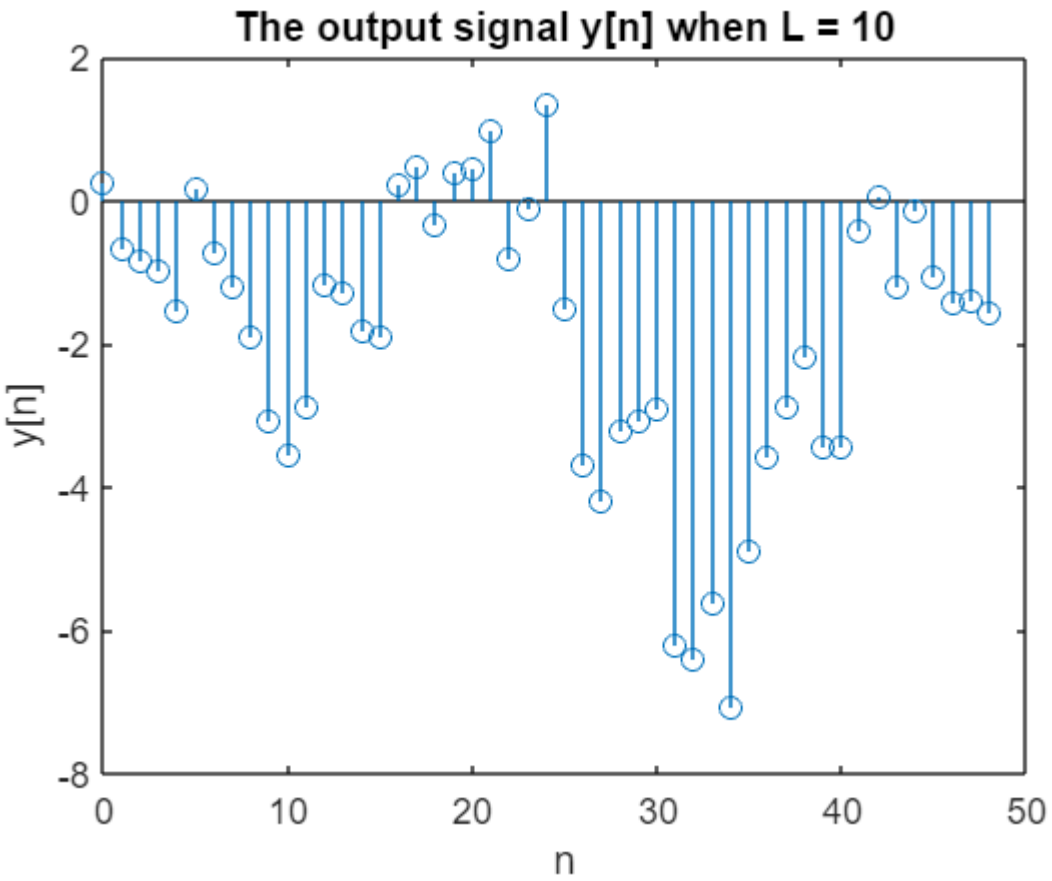
```
N = 40;
n = 0:1:N-1;
x = randn(1,N);
figure;
stem(n,x);
title('A random input signal x[n]');
xlabel('n');
ylabel('x[n]');
```

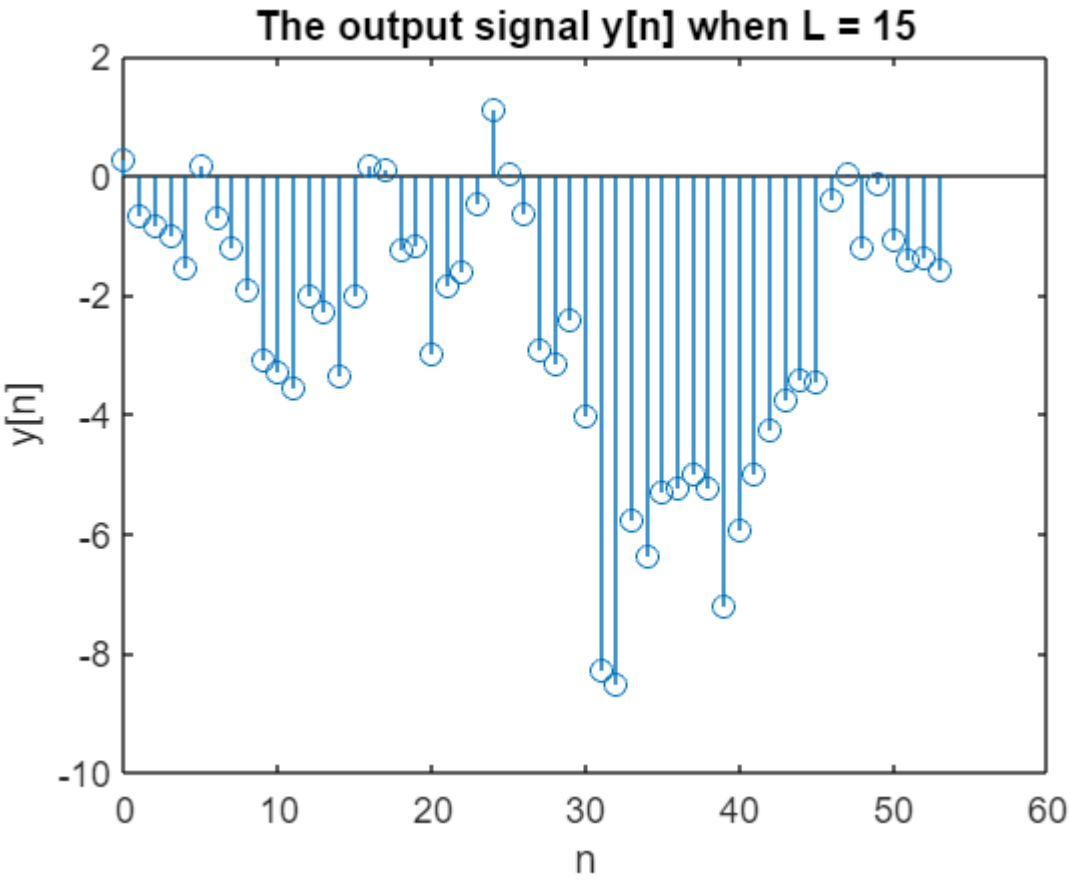


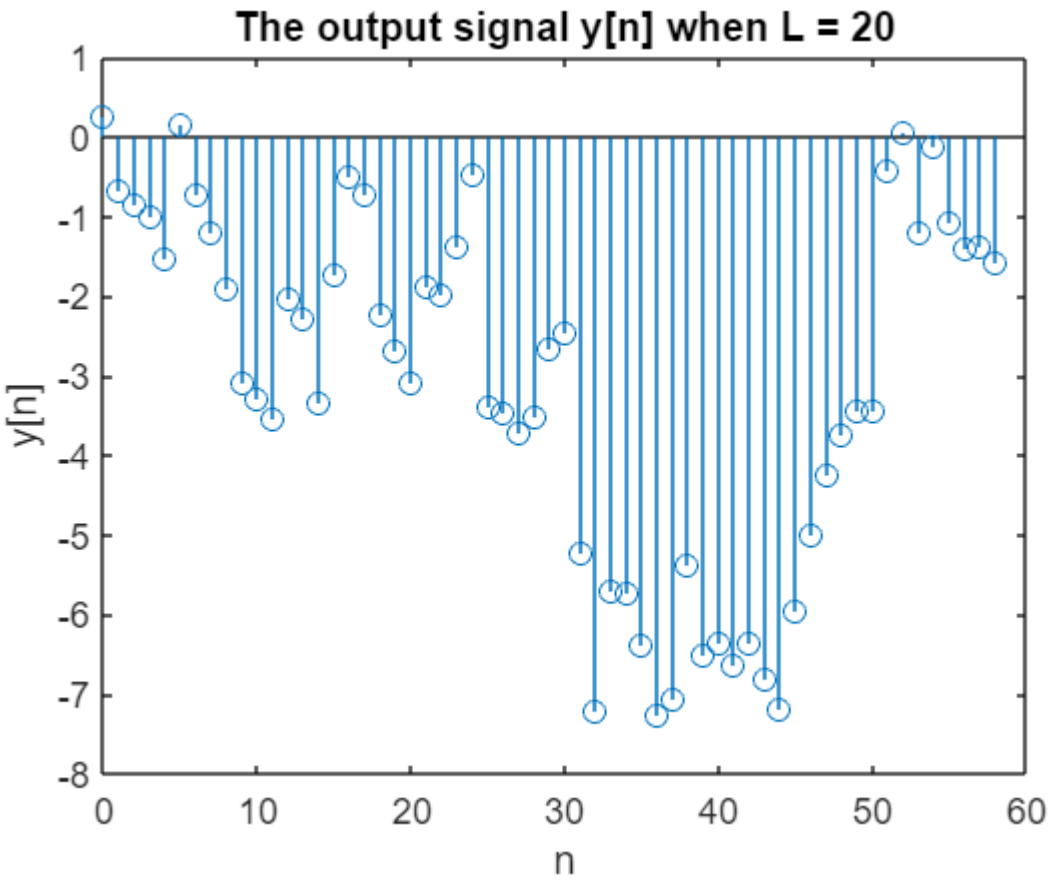
Step 2: Plot the output signal y[n] for different values of L

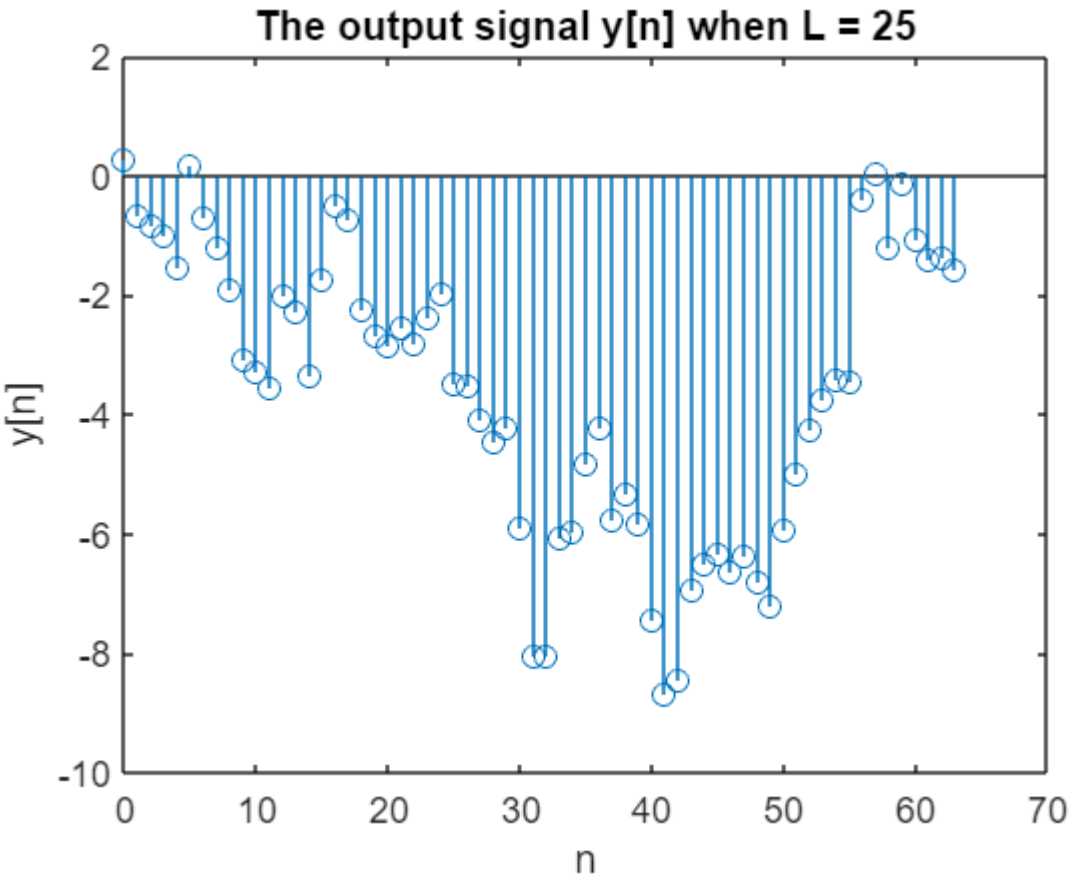
```
for l=5:5:30
    L = l;
    h = ones(1,L);
    y = conv(x,h);
    figure;
    stem(0:N+L-2,y);
    title(['The output signal y[n] when L = ',num2str(L)]);
    xlabel('n');
    ylabel('y[n]');
end
```

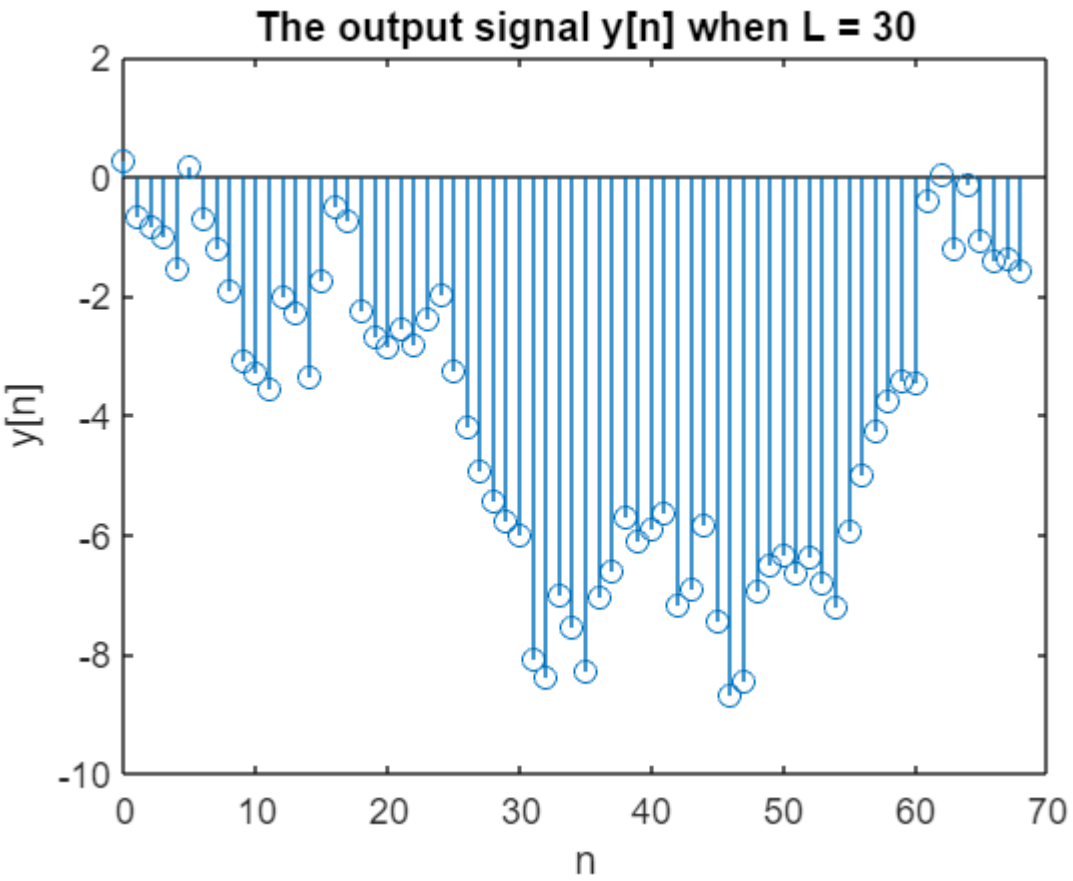

The output signal y[n] when L = 5
y[n]
n
4
3
2
1
0
-1
-2
-3
-4
-5
0
10
20
30
40
50


The output signal y[n] when L = 10
y[n]
n
2
0
-2
-4
-6
-8
0
10
20
30
40
50


The output signal y[n] when L = 15
y[n]
n
2
0
-2
-4
-6
-8
-10
0
10
20
30
40
50
60


The output signal y[n] when L = 20
y[n]
n
1
0
-1
-2
-3
-4
-5
-6
-7
-8
0
10
20
30
40
50
60


The output signal y[n] when L = 25
y[n]
n
2
0
-2
-4
-6
-8
-10
0
10
20
30
40
50
60
70


The output signal y[n] when L = 30
y[n]
n
2
0
-2
-4
-6
-8
-10
0
10
20
30
40
50
60
70