College of Engineering and Physics

Electrical Engineering Department

EE562 - Digital Signal Processing I

Second Semester (212)

Computer Assignment 1

Solved By: Mahmoud Yassin

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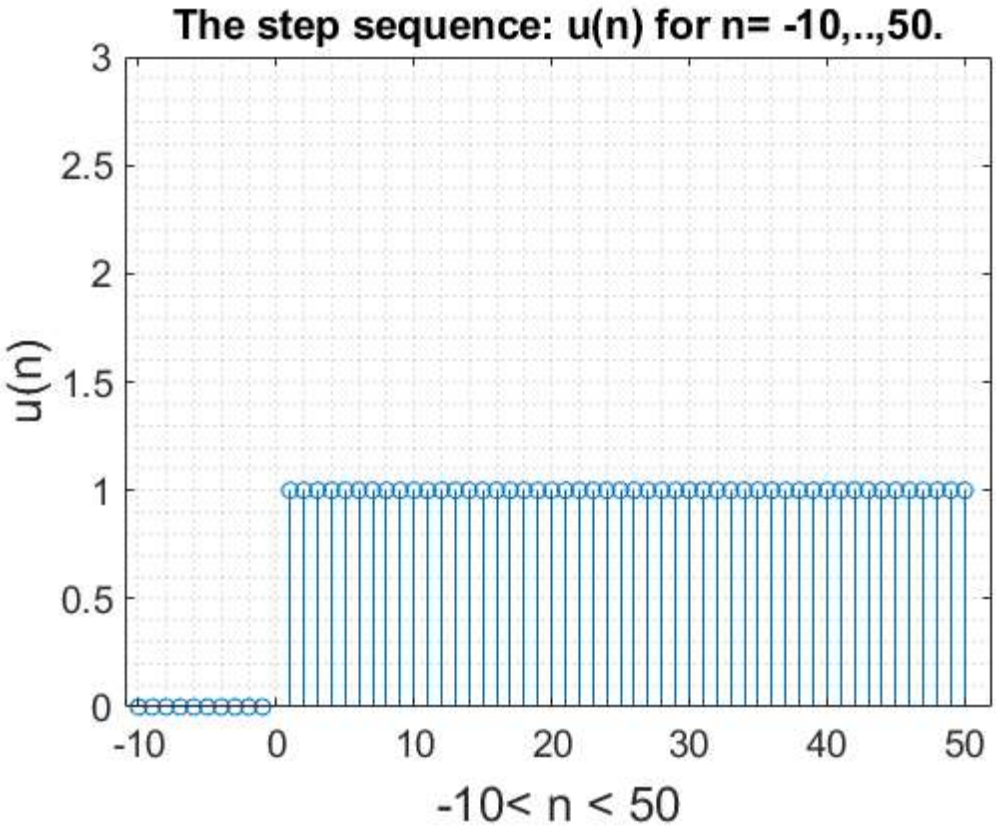
Supervised by: Dr. Wail A. Mousa

```matlab
%Assignment 1
% Done by Mahmoud Yassin Mahmoud
% ID: 202113650
% Submitted To Dr. Wail A. Mousa
% Bism Allah and I will begin with
%(Q1)The step sequence: u(n) for n= -10,..,50.
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
clc;
clear;
%..................................................
%calculation of discrete time

  n1 = -10:-1;
  n2 = 1:50;
  n = [n1 n2];
%..................................................
%calculation of step sequence

u1 = zeros(size(n1));
u2 = ones(size(n2));
u = [u1 u2];
%..................................................
%calculation of length

  the_length_u = length(u);
  the_length_n = length(n);
fprintf('The length of u(n) is : %d\n',the_length_u);
fprintf('The length of n is : %d\n',the_length_n);
%....................................................
%ploting

stem(n,u);
grid minor
xlim([-11 52])
ylim([0 3])
set(gca,'fontsize',14)
title('The step sequence: u(n) for n= -10,..,50.')
xlabel('-10< n < 50','fontsize',18)
ylabel('u(n)','fontsize',18)
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

```
The length of u(n) is : 60
The length of n is : 60
```



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```
%Assignment 1
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% ID: 202113650
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% Bism Allah and I will continue with
%(Q2)The exponential sequences:
% 1- h1(n) = 0.9^n
% 2- h2(n) = 2^n
% 3- h3(n) = (-0.5)^n
% 4- h4(n) = (-3)^n
% for n = 0,..,50.
% Obtain the maximum value of each sequence and its index value.
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
clc;
clear;
%....................  ............................
%defining time and base for exponential
 n= 0:50;
 a1 = 0.9;
 a2 = 2;
 a3 = -0.5;
 a4 = -3;
%.......................................
% exponential calculations and maximum value with its index

h1 = a1.^n;
 [max_val_1,index_max_1] = max(h1);
 fprintf('The maximum value of h1(n) is : %d and its index is %d\n',max_val_1,index_max_1);

h2 = a2.^n;
[max_val_2,index_max_2] = max(h2);
fprintf('The maximum value of h2(n) is : %d and its index is %d\n',max_val_2,index_max_2);

h3 = a3.^n;
[max_val_3,index_max_3] = max(h3);
 fprintf('The maximum value of h3(n) is : %d and its index is %d\n',max_val_3,index_max_3);

h4 = a4.^n;
[max_val_4,index_max_4] = max(h4);
 fprintf('The maximum value of h4(n) is : %d and its index is %d\n',max_val_4,index_max_4);
%.........................................................................................
%ploting

subplot(221)
   stem(n,h1)
   grid minor
   title('h1(n) = 0.9^n')
   xlabel('0< n < 50')
   ylabel('h1(n)')

subplot(222)
   stem(n,h2)
   title('h2(n) = 2^n ');
   grid minor
   xlabel('0< n < 50')
   ylabel('h2(n)')

subplot(223)
   stem(n,h3)
```
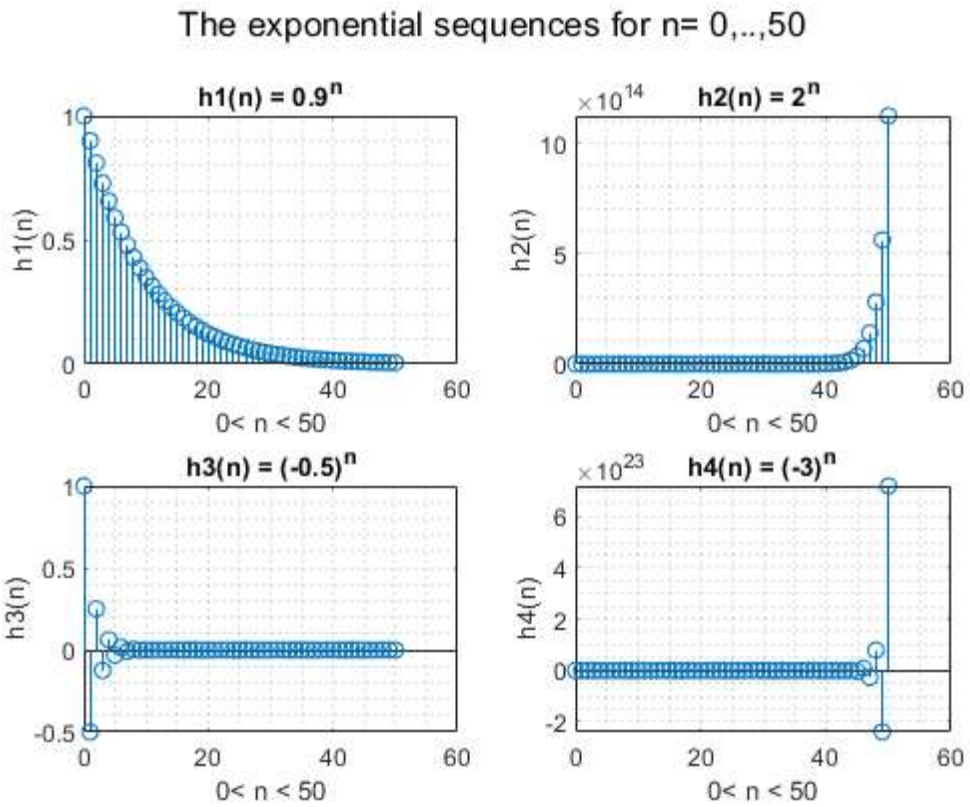

```
    grid minor
    title('h3(n) = (-0.5)^n');
    xlabel('0< n < 50')
    ylabel('h3(n)')

subplot(224)
  stem(n,h4)
  grid minor
  title('h4(n) = (-3)^n');
  xlabel('0< n < 50')
  ylabel('h4(n)')

sgtitle('The exponential sequences for n= 0,..,50 ') % title for the hole figure
```

```
The maximum value of h1(n) is : 1 and its index is 1
The maximum value of h2(n) is : 1125899906842624 and its index is 51
The maximum value of h3(n) is : 1 and its index is 1
The maximum value of h4(n) is : 7.178980e+23 and its index is 51
```



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```
%Assignment 1
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%(Q3)The sinusoidal sequence:
% h5(n) = sin(2*pi*n/20) for n = -40:...:40
% Is it a periodic signal? If yes, then what is its period?
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
clc;
clear;
%.....................................
% difine n
 n= -40:40;
 %.........................................
%calculate sinusoidal
 h5 = sin(2*pi*n/20);
 %.........................................
 %ploting
 stem(n,h5)
   grid minor
   title('h5(n) = sin(2*pi*n/20) for n = -40:...:40')
   xlabel('-40 < n < 40')
   ylabel('h5(n)')
 % Periodicity
 fprintf('Signal is periodoc with fundamental period equals to 20\n');
```
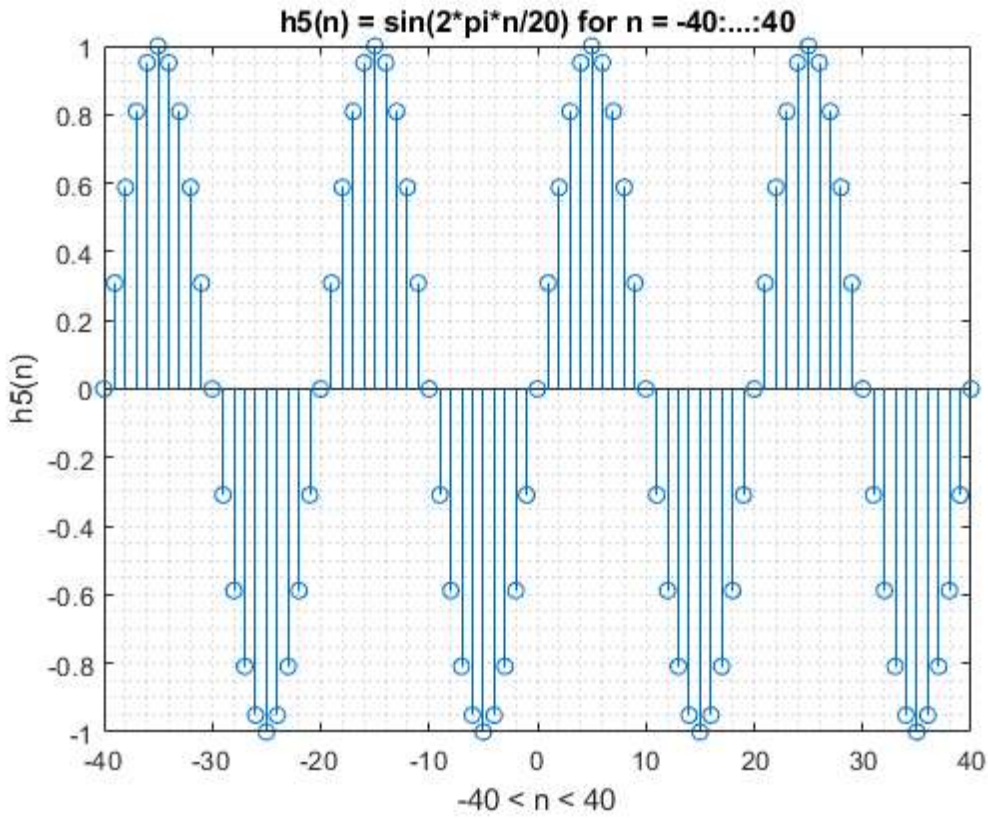

```
Signal is periodoc with fundamental period equals to 20
```



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periodicity check for $h_s(n)$

$$\omega = \frac{2\pi}{20} = \frac{2\pi m}{N}$$

integer ← 1

$$\therefore \frac{1}{20} = \frac{m}{N}$$

20 → integer

$\therefore h_s(n)$ is periodic with fundamental period $= 20$