LAB 1: 3TP SIGNALS AND SYSTEMS

Abdurahman Butt – 400435085, Erion Keka - 400435050

SEPTEMBER 24, 2024
MCMASTER UNIVERSITY

Part 1:

A)

```matlab
%The range
n = -8:8;

Close
%creating instance of simplefuntions
sf = SimpleFunctions(n);

%discrete time signal eq part a) in matlab code
x_a = sf.unitstep(n) - 2*sf.unitstep(n-1) + sf.unitstep(n-4);

%plotting graph below
%stem range, equation and width of line (this is given in lab manual)
stem(n, x_a, 'LineWidth', 3);

%title of graph
title('x[n] = u[n] - 2u[n - 1] + u[n - 4]');

%name and student number of group members
text(2.3, 0.9, 'Abdurahman Butt - 400435085', 'FontSize', 8);
text(2.3, 0.8, 'Erion Keka - 400435050', 'FontSize', 8);

exportgraphics(gcf, 'Graph_a.jpg');
```
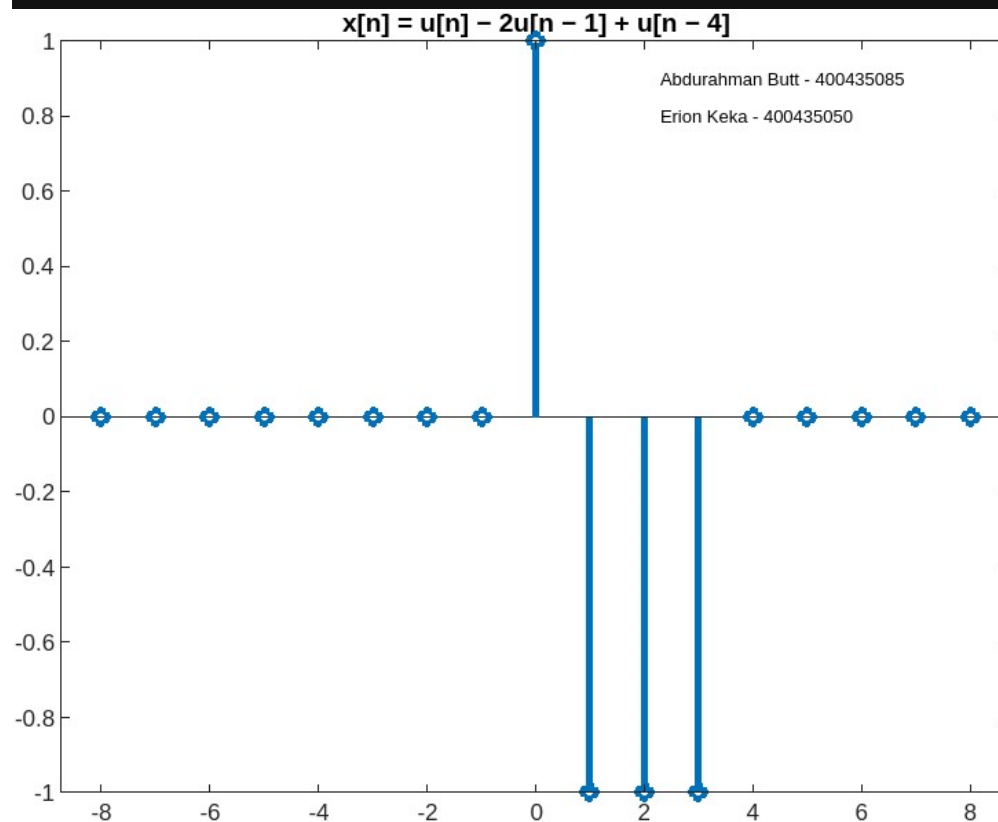
B)

```
%The range
n = -8:8;

%creating instance of simplefuntions
sf = SimpleFunctions(n);

%discrete time signal eq part a) in matlab code
x_b = (n + 2).*sf.unitstep(n+2) - 2*sf.unitstep(n) - n.*sf.unitstep(n-4);

%plotting graph below
%stem range, equation and width of line (this is given in lab manual)
stem(n, x_b, 'LineWidth', 3);

%title of graph
title('x[n] = (n + 2)u[n + 2] - -2u[n] - nu[n - 4]');

%name and student number of group members
text(-8, 1.9, 'Abdurahman Butt - 400435085', 'FontSize', 8);
text(-8, 1.8, 'Erion Keka - 400435050', 'FontSize', 8);

exportgraphics(gcf, 'Graph_b.jpg');
```
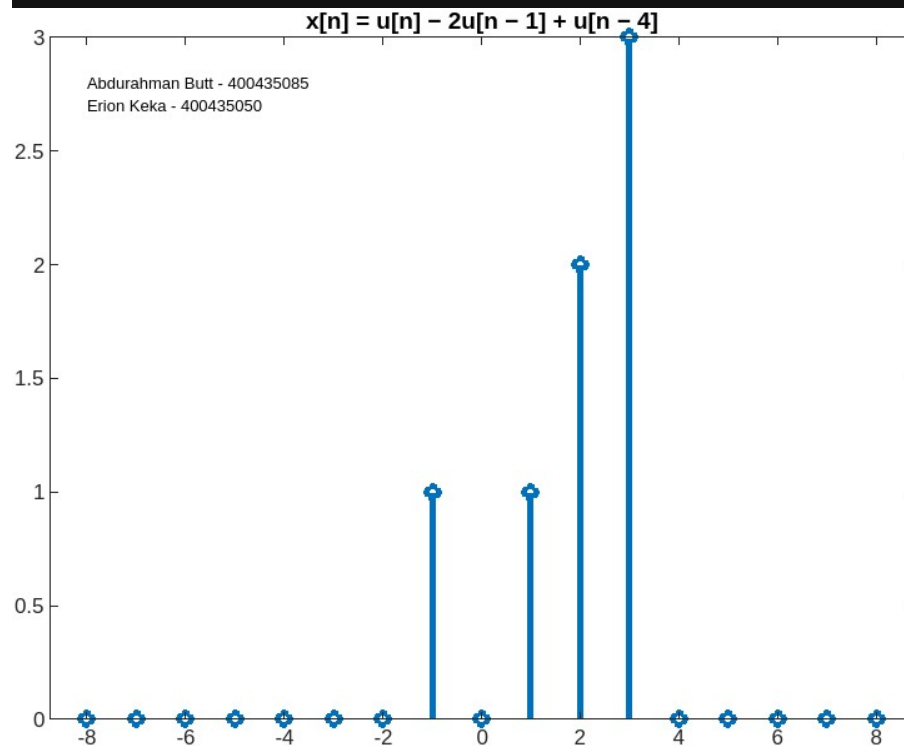

x[n] = u[n] − 2u[n − 1] + u[n − 4]

C)

```matlab
%The range
n = -8:8;

%creating instance of simplefuntions
sf = SimpleFunctions(n);

%discrete time signal eq part a) in matlab code
x_c = sf.delta(n+1) - sf.delta(n) +sf.unitstep(n+1) - sf.unitstep(n-2);

%plotting graph below
%stem range, equation and width of line (this is given in lab manual)
stem(n, x_c, 'LineWidth', 3);

%title of graph
title('x[n] = \delta[n + 1] - \delta[n] + u[n + 1] - u[n - 2]');

%name and student number of group members
text(-8, 1.9, 'Abdurahman Butt - 400435085', 'FontSize', 8);
text(-8, 1.8, 'Erion Keka - 400435050', 'FontSize', 8);

exportgraphics(gcf, 'Graph_c.jpg');
```
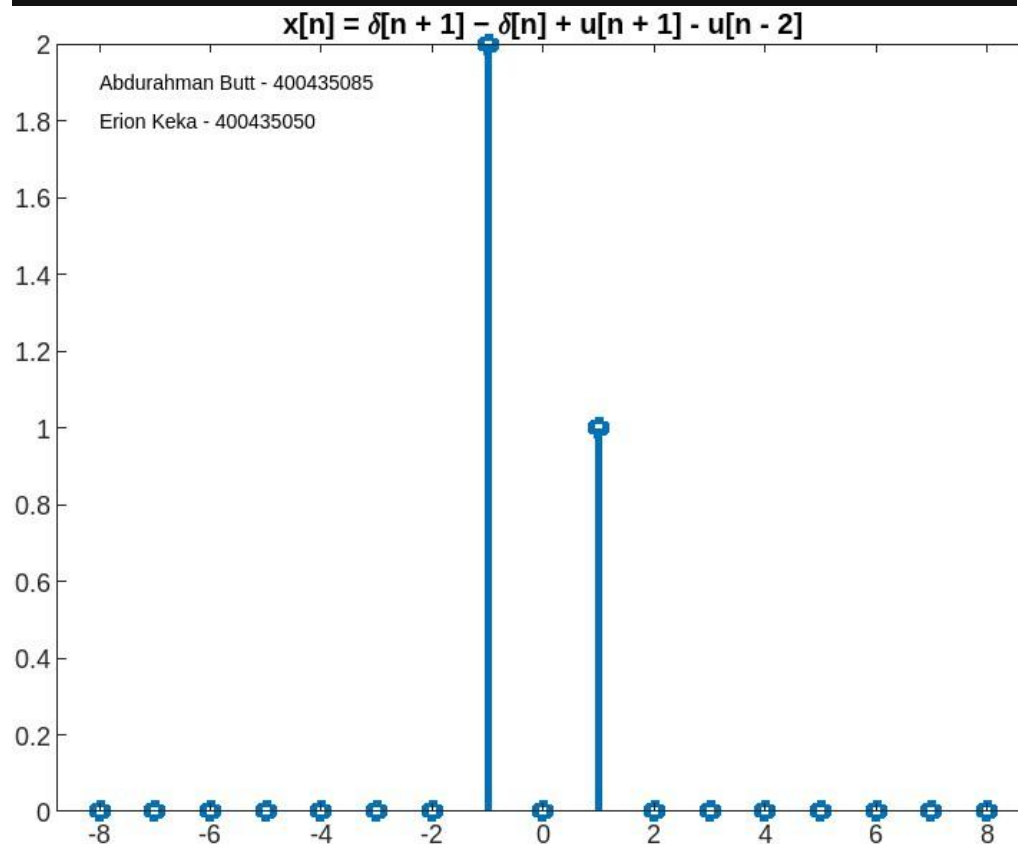

$x[n] = \delta[n + 1] - \delta[n] + u[n + 1] - u[n - 2]$

D)

```matlab
%The range
n = -10:10;

%creating instance of simplefuntions
sf = SimpleFunctions(n);

%discrete time signal eq part a) in matlab code
x_d = exp(0.8*n).*sf.unitstep(n + 1) + sf.unitstep(n);
%plotting graph below
%stem range, equation and width of line (this is given in lab manual)
stem(n, x_d, 'LineWidth', 3);

%title of graph
title('e^{0.8n}u[n + 1] + u[n]');

%name and student number of group members
text(-10, 2900, 'Abdurahman Butt - 400435085', 'FontSize', 8);
text(-10, 2800, 'Erion Keka - 400435050', 'FontSize', 8);

exportgraphics(gcf, 'Graph_d.jpg');
```


$e^{0.8n}u[n + 1] + u[n]$

Abdurahman Butt - 400435085
Erion Keka - 400435050

Part 2:

A)
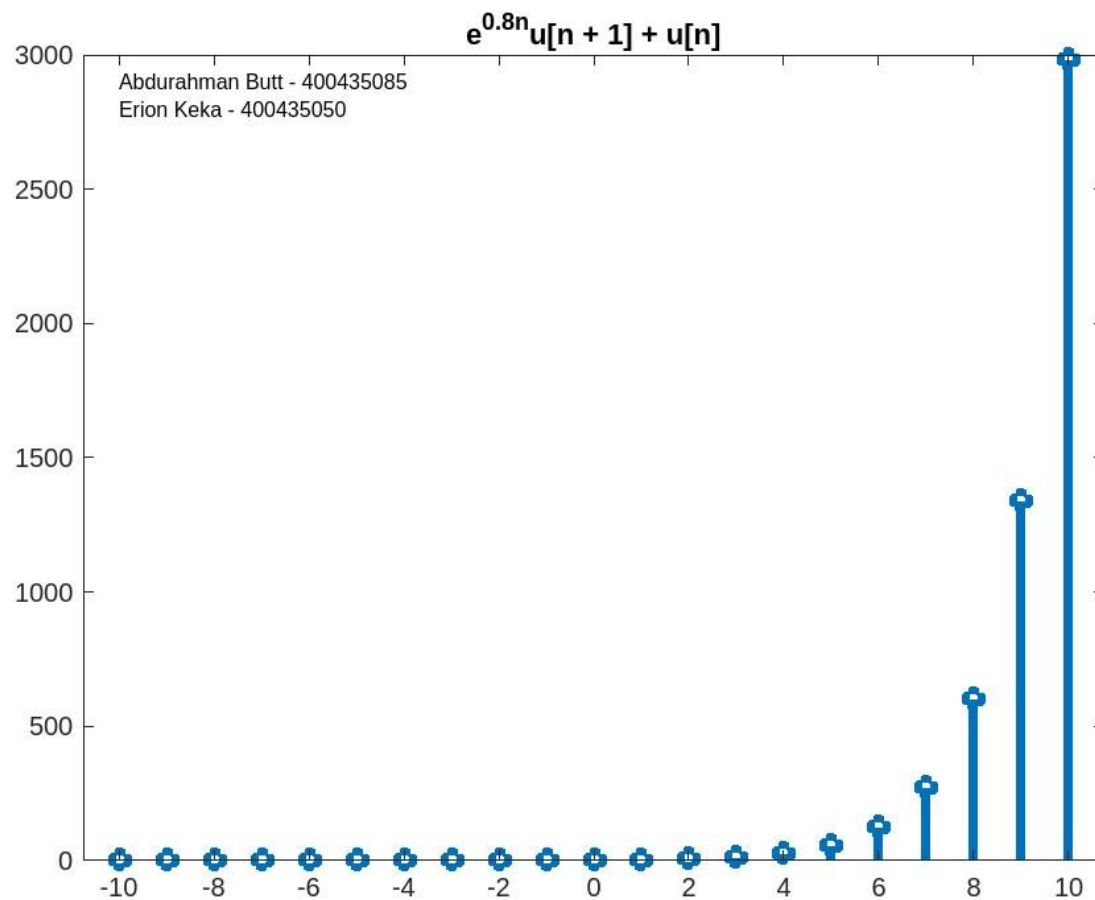
```matlab
function [Student, MaxMark] = highestLabMark(table)

    % Read the table from the Excel file
    opts = detectImportOptions('course_grades_2024.xlsx');
    opts = setvartype(opts, {'ID_Number', 'Name'}, 'string');
    table = readtable('course_grades_2024.xlsx', opts);

    % Remove the first row (Maximum Mark row)
    table(1,:) = [];

    % Calculate total lab mark for each student
    TotMark = table.Lab_1 + table.Lab_2 + table.Lab_3 + table.Lab_4;

    % Find the student with the maximum total lab mark
    [MaxMark, Pos] = max(TotMark);

    % Get the name of the student with the highest lab mark
    Student = table.Name(Pos);

    % Display the result
    fprintf('The student with the highest total lab mark is %s with a score of %d.\n', Student, MaxMark);
end

% Call the function to find the student with the highest lab mark
[Student, MaxMark] = highestLabMark(table);
```

```
 ▼ Command Window
>> untitled3
The student with the highest total lab mark is Morgan Bush with a score of 32.
>>
```

B)

```matlab
function [Student, MaxMark] = highestExamMark(table)

    % Read the table from the Excel file
    opts = detectImportOptions('course_grades_2024.xlsx');
    opts = setvartype(opts, {'ID_Number', 'Name'}, 'string');
    table = readtable('course_grades_2024.xlsx', opts);

    % Remove the first row (Maximum Mark row)
    table(1,:) = [];

    % Calculate total Exam mark for each student
    TotMark = table.Exam_1 + table.Exam_2 + table.Exam_3 + table.Exam_4;

    % Find the student with the maximum total Exam mark
    [MaxMark, Pos] = max(TotMark);

    % Get the name of the student with the highest Exam mark
    Student = table.Name(Pos);

    % Display the result
    fprintf('The student with the highest total Exam mark is %s with a score of %d.\n', Student, MaxMark);
end

% Call the function to find the student with the highest Exam mark
[Student, MaxMark] = highestExamMark(table);
```

```
The student with the highest total Exam mark is Anthony Bernard with a score of 37.
>>
```

C)

```matlab
function [Student, MaxMark] = HighestTotalMark(table)

    % Read the table from the Excel file
    opts = detectImportOptions('course_grades_2024.xlsx');
    opts = setvartype(opts, {'ID_Number', 'Name'}, 'string');
    table = readtable('course_grades_2024.xlsx', opts);

    % Remove the first row (Maximum Mark row)
    table(1,:) = [];

    % Calculate total Exam mark for each student
    TotMark = table.Lab_1 + table.Lab_2 + table.Lab_3 + table.Lab_4 + table.Midterm + table.Exam_1 + table.Exam_2 + table.Exam_3 + table.Exam_4;

    % Find the student with the maximum total total mark
    [MaxMark, Pos] = max(TotMark);

    % Get the name of the student with the highest total mark
    Student = table.Name(Pos);

    % Display the result
    fprintf('The student with the highest total mark is %s with a score of %d.\n', Student, MaxMark);
end

% Call the function to find the student with the highest total mark
[Student, MaxMark] = HighestTotalMark(table);
```

```
The student with the highest total mark is Anthony Bernard with a score of 79.
```

D)

```
%Read the  table from the Excel file
opts = detectImportOptions('course_grades_2024.xlsx');
opts = setvartype(opts, {'ID_Number', 'Name'}, 'string');
table = readtable('course_grades_2024.xlsx', opts);

%Creating variable with my partners and I name and student #
newEntries = {
    'Abdurahman Butt', '400435085', 9, 8, 10, 9, 19, 9, 8, 10, 9;
    'Erion Keka', '400435050', 8, 7, 9, 10, 18, 8, 9, 9, 10
};

%turning entries into table format
newRows = cell2table(newEntries, 'VariableNames', table.Properties.VariableNames);

%Append the new rows to the existing table
Newtable = [table; newRows];

%Display the updated table
disp(Newtable);
```

Name	ID_Number	Lab_1	Lab_2	Lab_3	Lab_4	Midterm	Exam_1	Exam_2	Exam_3	Exam_4
"Maximum Mark"	"0"	10	10	10	10	20	10	10	10	10
"Kacie Stephenson"	"1803933"	7	2	9	0	9	4	5	8	10
"Yassin Jordan"	"1884159"	1	2	10	3	8	3	9	5	7
"Lowri Mathews"	"1853847"	2	0	0	2	17	6	10	7	4
"Tiya Sheridan"	"1810192"	7	1	0	6	15	8	7	6	6
"Nikola Forrest"	"1891352"	1	7	0	6	5	0	5	5	10
"Veer Blair"	"1811313"	4	8	5	3	12	7	4	0	2
"Isabelle Mcgrath"	"1804841"	6	7	4	0	13	8	9	6	4
"Samir Greaves"	"1881925"	9	3	7	1	6	4	6	5	9
"Zander Kendall"	"1877711"	8	10	5	4	17	4	8	10	2
"Shahzaib Buckley"	"1830894"	4	5	7	9	8	5	7	0	6
"Morgan Bush"	"1855191"	9	6	7	10	1	5	7	2	8
"Amaan Robbins"	"1821012"	1	8	4	4	8	0	9	5	8
"Theodore Lawson"	"1844339"	5	7	10	7	14	9	2	2	9
"Ace Branch"	"1898468"	2	1	3	7	11	9	9	3	6
"Anthony Bernard"	"1883633"	4	1	10	8	19	10	9	9	9
"Tobey Bell"	"1808742"	0	10	8	2	10	9	0	8	6
"Jannat Cassidy"	"1863450"	1	2	4	5	10	4	5	9	3
"Imran Marquez"	"1830190"	2	9	1	6	17	10	0	7	5
"Amani Castro"	"1835544"	8	9	5	7	3	7	6	8	4
"Blanka Holt"	"1820930"	6	5	2	0	8	6	0	7	10
"Abdurahman Butt"	"400435085"	9	8	10	9	19	9	8	10	9
"Erion Keka"	"400435050"	8	7	9	10	18	8	9	9	10

Part 3:

```matlab
%open image file to read
img = imread('ee3tp3picture2024.jpg');

%iterate through each pixel of image
for i=1:854
    for j = 1:1280
        %scale factor of red and green to
        %what we found works the best
        img(i, j, 1) = img(i, j, 1)*4.5;
        img(i, j, 2) = img(i, j, 2)*4.7;
    end
end
%show image and save image
imshow(img);
imwrite(img, 'newimg.jpg');
```