ELECENG 3TP3 – Signals and Systems

Lab 1: MATLAB Introduction and Refresher

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Table of Contents

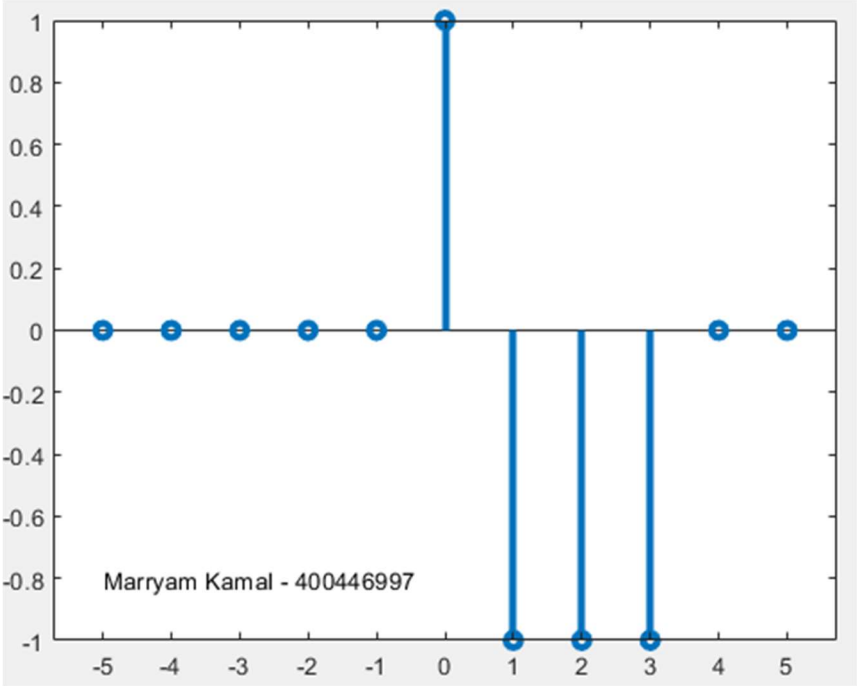
Part 1 – Plotting Discrete Time Signals

For this part, I used the provided SimpleFunctions class and called various methods into my main file, each generating the respective discrete time plot.

1) x[n] = u[n] – 2u[n – 1] + u[n – 4]

Code:

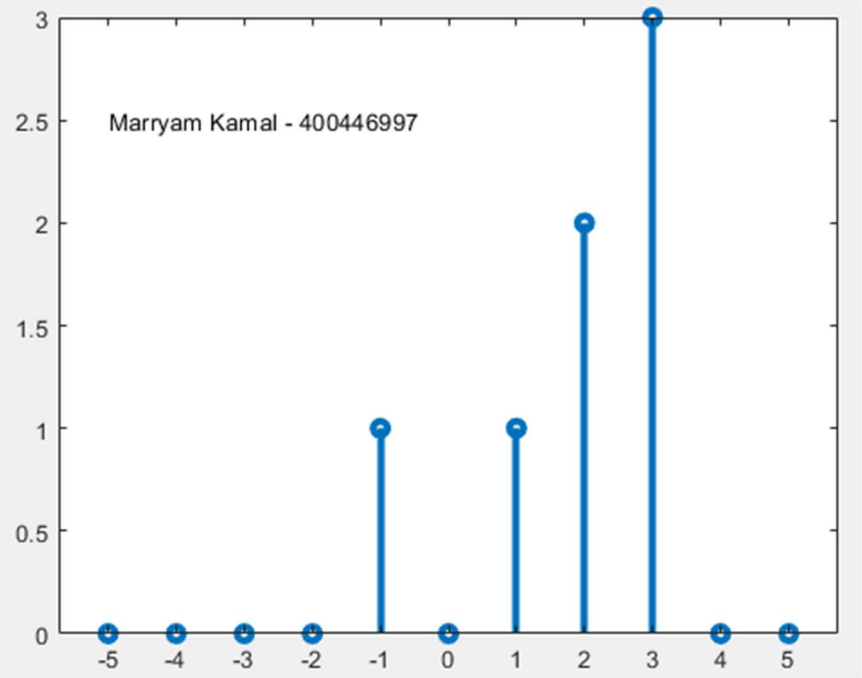
```
f = SimpleFunctions();
n = -5:5;
y = f.unitstep(n) - 2*f.unitstep(n-1) + f.unitstep(n-4);
```



2) x[n] = (n + 2)u[n + 2] – 2u[n] – nu[n – 4]

Code:

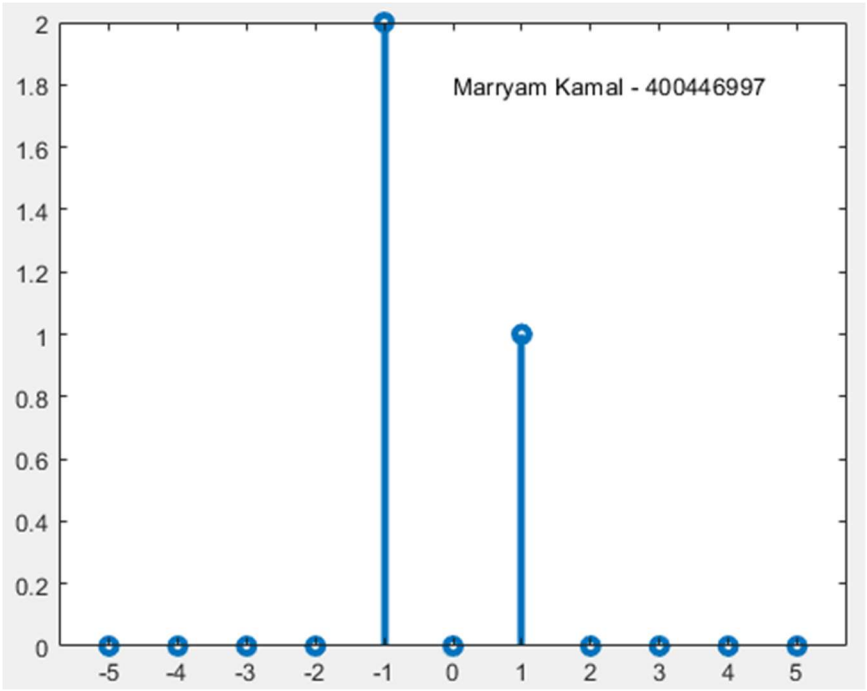
```
f = SimpleFunctions();
n = -5:5;
y = (n+2).*f.unitstep(n+2) - 2*f.unitstep(n) - n.*f.unitstep(n-4);
```



3) x[n] = δ[n + 1] − δ[n] + u[n + 1] − u[n − 2]

Code:

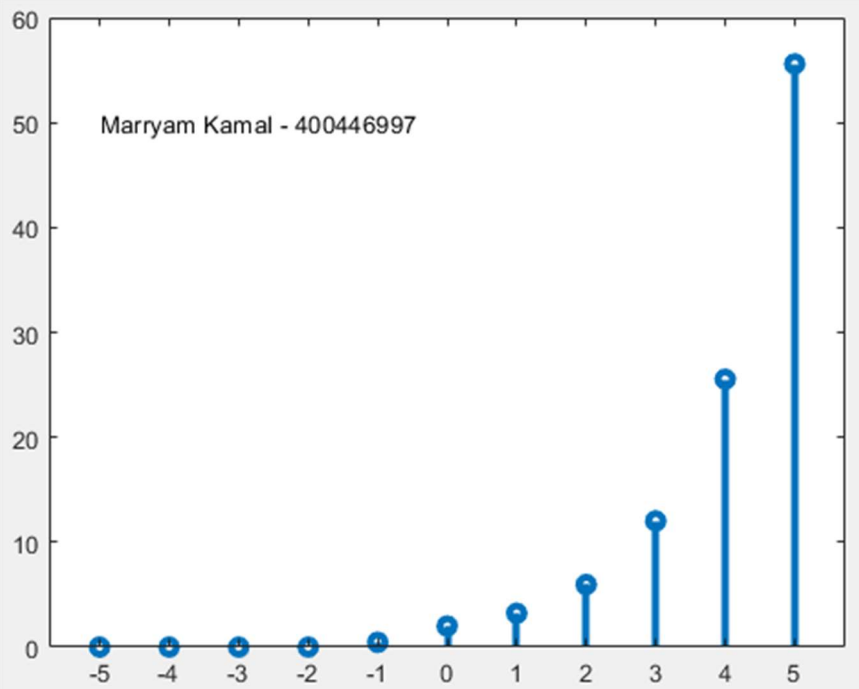
```
f = SimpleFunctions();
n = -5:5;
y = f.delta(n+1) - f.delta(n) + f.unitstep(n+1) - f.unitstep(n-2);
```



4) $x[n] = e^{0.8n}u[n + 1] + u[n]$

Code:

```
f = SimpleFunctions();
n = -5:5;
y = exp(0.8*n).*f.unitstep(n+1) + f.unitstep(n);
```



Part 2 – Functions with Table Arrays

1) Highest total lab mark

Code:

```
function maxLab(t)
    t([1],:) = [];
    total_lab_mark = sum(t{:,3:6},2);
    [val, idx] = max(total_lab_mark);
    disp(['Name: ', t.Name(idx), 'Total lab mark: ', val]);
end
maxLab(T)
```

Output:

```
>> main
    "Name: "    "Morgan Bush"    "Total lab mark: "    "32"
```

2) Highest exam mark

Code:

```
function maxExam(t)
    t([1],:) = [];
    total_exam_mark = sum(t{:,8:11},2);
    [val, idx] = max(total_exam_mark);
    disp(['Name: ', t.Name(idx), 'Total exam mark: ', val]);
end
maxExam(T)
```

Output:

```
>> main
    "Name: "    "Anthony Bernard"    "Total exam mark: "    "37"
```

3) Highest final mark

Code:

```
function maxFinal(t)
    t([1],:) = [];
    total_mark = sum(t{:,3:11},2);
    [val, idx] = max(total_mark);
    disp(['Name: ', t.Name(idx), 'Total final mark: ', val]);
end
maxFinal(T)
```

Output:

```
>> main
    "Name: "    "Anthony Bernard"    "Total final mark: "    "79"
```

4) New row entry

Code:

```
newRow = {'Marryam Kamal','400446997',0,0,0,0,0,0,0,0,0};
T = [T;newRow];
```

Output:

```
>> main
>> T

T =
```

22×11 table

Name	ID_Number	Lab_1	Lab_2	Lab_3	Lab_4	Midterm
"Maximum Mark"	"0"	10	10	10	10	20
"Kacie Stephenson"	"1803933"	7	2	9	0	9
"Yassin Jordan"	"1884159"	1	2	10	3	8
"Lowri Mathews"	"1853847"	2	0	0	2	17
"Tiya Sheridan"	"1810192"	7	1	0	6	15
:	:	:	:	:	:	:
"Jannat Cassidy"	"1863450"	1	2	4	5	10
"Imran Marquez"	"1830190"	2	9	1	6	17
"Amani Castro"	"1835544"	8	9	5	7	3
"Blanka Holt"	"1820930"	6	5	2	0	8
"Marryam Kamal"	"400446997"	0	0	0	0	0

Display all 22 rows.

Part 3 – Image Processing

Using some MATLAB functions, I separated the red, green and blue channels of the image into separate column vectors and then scaled them by a constant until the image looked correct.

Code:

```
img = imread('ee3tp3picture2024.jpg');
red = img(:,:,1);
green = img(:,:,2);
blue = img(:,:,3);
red = red*3;
green = green*3;
blue = 0.5*blue;
reconstructed_image = cat(3, red, green, blue);
imshow(reconstructed_image);
```