AMERICAN INTERNATIONAL UNIVERSITY BANGLADESH
Faculty of Engineering

Laboratory Report Cover Sheet
Students must complete all details except the faculty use part.

Please submit all reports to your subject supervisor or the office of the concerned faculty.

Lab Title: **Introduction to MATLAB**

Experiment Number: **01** Due Date: **12 /2/2024** Semester: **Spring 2023-2024**

Subject Code: **COE3103** Subject Name: **DATA COMMUNICATION** Section: **E**

Course Instructor: **NOWSHIN ALAM** Degree Program: **B.Sc. CSE**

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Group Number (if applicable): 8 Individual Submission ☐ Group Submission ☐

No.	Student Name	Student Number	Student Signature	Date
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For faculty use only:

Total Marks: _____ Marks Obtained: _____

Faculty comments_____

Introduction:

A high-performance language for technical computing is called MATLAB. It combines programming, calculation, and visualization in an approachable setting where issues and their fixes are presented in simple mathematical language. An array is the fundamental data element in MATLAB, an interactive system that does not require dimensioning. This makes it possible to solve a lot of technical computing issues faster than writing a program in scalar, non interactive language like C or Fortan, specially when those problems involve matrix and vector operation. Toolboxes are a series of application-specific solutions available in MATLAB. The majority of users find it crucial that toolboxes make it study and use specific technology. These toolboxes are extensive sets of MATLAB functions. also referred as M files, that enhance the environment to address certain issue classes. MATLAB is a programming tool that uses matrices. The user must be always on the lookout for matrics dimension, even though they are not frequently not required to dimensioned explicitly. In the absence of any other definition, the conventional matrix displays two dimensions, represented as $n \times m$. $N \times 1$ and $1 \times n$ matrices respectively represent column and row vectors.

Theory :

Matlab operation can be classified into the following types of operation : arithmatic and logical expression, mathematical function, graphical functions, input/output operation. MATLAB provides mathematical expressions. The building blocks of expressions are variable, numbers, operators, functions. Matlab does not require any type declarations. When a new variable is created it automatically creates the variable and allocates the appropiate amount of memory. If a variable declared already exists it changes its contents. Conventional decimal notation is used by MATLAB. Scientific notation uses the ~~power of~~ letter e to specify power of ten scale factor. Imaginary number use either i or j as a suffix. MATLAB also provides operators such as addition, substraction, multiplication, division, complex conjugate transpose etc. It also provides a large number of standard and elementary mathematical functions including sin, sqrt, exp and abs.

Simulated Results:

ID = AB-CDEFG-H

ID = 22-46026-1

$x1(t) = K1*\cos(2\pi(E+F+5)t + J1)$,

$x2(t) = K2*\cos(2\pi(C+D+5)t + J2)$

The values of the amplitudes are as follows: let K1 = A+B and K2 = G+H+2. For the phases, using J1 = D+G+20 (in degrees), and take J2 = 30º.

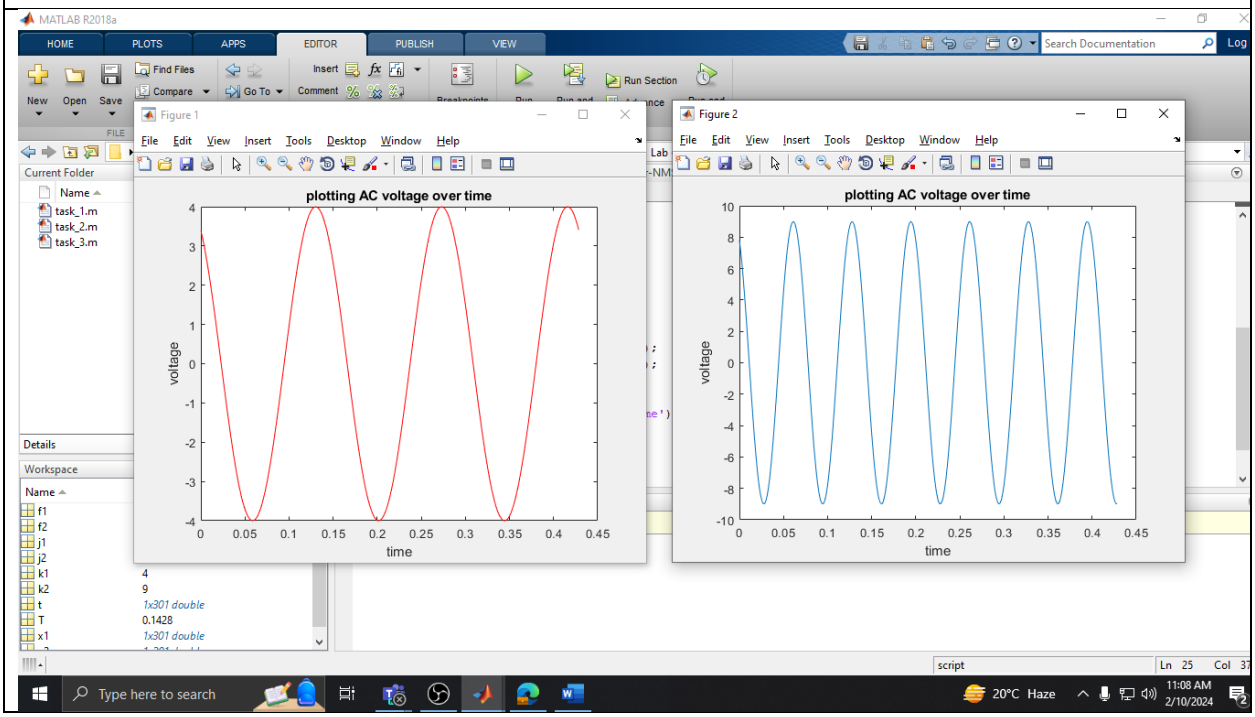
(a)

Making a plot of both signals on two separate figure windows, over a range of 't' that will exhibit approximately 3 cycles.

Code & Simulation:

```
clc
close all

%22-46026-1
%AB-CDEFG-H

%K1 = A + B
k1 = 4;
%K2 = G+H+2
k2 = 9;
% J1 = D+G+20
j1 = deg2rad(32);
% j2 = 30 degrees
j2 = deg2rad(30);

%f1 = E+F+5
f1 = 7;
% f2 = C+D+5
f2 = 15;

T = 0.1428;
t = 0: (T/100) : 3*T;

x1 = k1 * cos(2 * pi * f1 * t + j1);
x2 = k2 * cos(2 * pi * f2 * t + j2);

plot(t, x1, 'r-')
title('plotting AC voltage over time')
xlabel('time')
ylabel('voltage')
figure()
plot(t, x2)
title('plotting AC voltage over time')
```

```
xlabel('time')
ylabel('voltage')
```



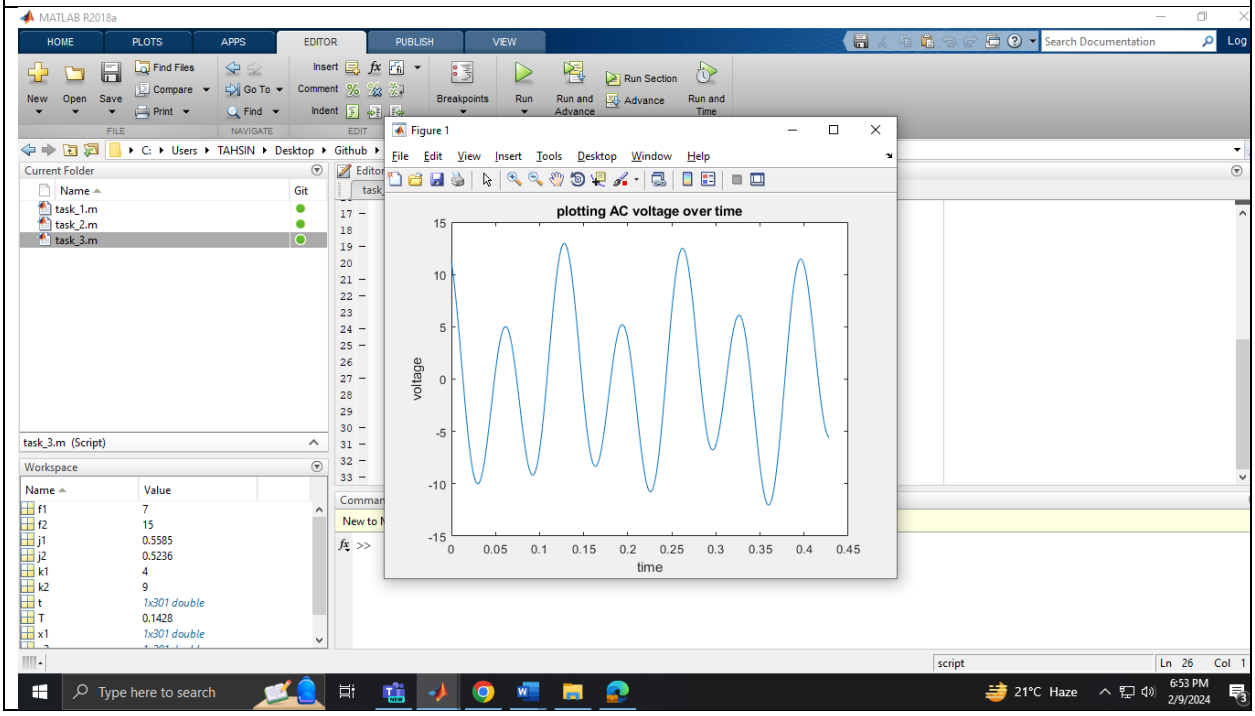
(b)

Creating a third sinusoid as the sum: x3(t) = x1(t) + x2(t) and making a plot of x3(t) over the same range of time as used in the previous two plots.

Code & Simulation

```
clc
close all

%22-46026-1
%AB-CDEFG-H

%K1 = A + B
k1 = 4;
%K2 = G+H+2
k2 = 9;
% J1 = D+G+20
j1 = deg2rad(32);
% j2 = 30 degrees
j2 = deg2rad(30);

%f1 = E+F+5
f1 = 7;
% f2 = C+D+5
f2 = 15;
```

```
T = 0.1428;
t = 0: (T/100) : 3*T;

x1 = k1 * cos(2 * pi * f1 * t + j1);
x2 = k2 * cos(2 * pi * f2 * t + j2);

x3 = x1 + x2;


plot(t, x3)
title('plotting AC voltage over time')
xlabel('time')
ylabel('voltage')
```



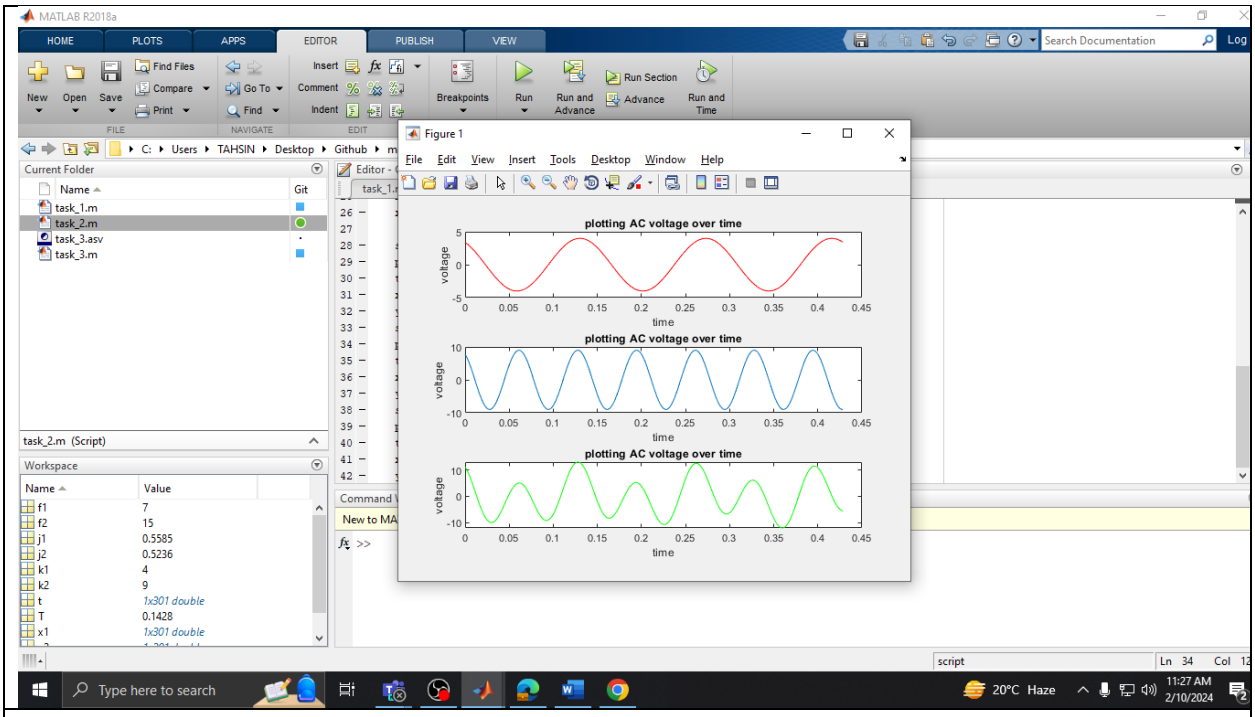
(c)

Using subplot (3,1,1), subplot (3,1,2), and subplot (3,1,3) to make a three-panel subplot that puts all of three signals (x1(t), x2(t), and x3(t)) on the same window.

Code & Simulation

```
clc
close all

%22-46026-1
%AB-CDEFG-H
```

```
%K1 = A + B
k1 = 4;
%K2 = G+H+2
k2 = 9;
% J1 = D+G+20
j1 = deg2rad(32);
% j2 = 30 degrees
j2 = deg2rad(30);

%f1 = E+F+5
f1 = 7;
% f2 = C+D+5
f2 = 15;

T = 0.1428;
t = 0: (T/100) : 3*T;

x1 = k1 * cos(2 * pi * f1 * t + j1);
x2 = k2 * cos(2 * pi * f2 * t + j2);
x3 = x1 + x2;

subplot(311);
plot(t, x1, 'r-')
title('plotting AC voltage over time')
xlabel('time')
ylabel('voltage')
subplot(312);
plot(t, x2)
title('plotting AC voltage over time')
xlabel('time')
ylabel('voltage')
subplot(313)
plot(t, x3, 'g-')
title('plotting AC voltage over time')
xlabel('time')
ylabel('voltage')
```



Conclusion :

The experiment was done perfectly and were no errors. Valuable insights into the application of MATLAB in solving communication engineering problems were gained through this experiment.