# LAKSHMI NARAIN COLLEGE OF TECHNOLOGY & SCIENCE

**Simulation Lab**
**[EC-406]**
**Laboratory Manual**

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**Submitted By:** **Submitted To:**

**Enrollment No:**

Department of Electronics and Communication Engineering

# Department of Electronics & Communication Engineering

## ***VISION OF THE DEPARTMENT***

To be world-wide recognized for adopting and keeping innovation and entrepreneurship mindset as abreast of learning to produce professionals as valuable, ethical and moral resource for industry and society.

## ***MISSION OF THE DEPARTMENT***

- To establish an ecosystem where students could grow with innovative practices followed in communication engineering.
- Adopt the global approaches to transform the young aspirant into engineering professional catering the society with ethical and patriotic zeal.
- Facilitate and felicitate the learners to have close interactions with the industry experts and researchers for keeping them updated of the current and future needs of the society.
- To develop the mindset of learners for being innovative and entrepreneurial in becoming successful professional.

## PROGRAM SPECIFIC OUTCOME (PSO)

**PSO1:** To analyze, design and develop solutions of real time problems and industry needs.

**PSO2:** Ability of effectively communicating with the professionals and preparation of reports, documents and presentation while working in teams.

**PSO3:** Knowledge and understanding of latest developments in the field of VLSI, Embedded system, Networking, Matlab and other major tools necessary for keeping pace with the industry.

**PSO4:** Ability of solving complex engineering problems with ethical and law full approach to prevent the society and environment from adverse impacts.

## PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

**PEO1:** The graduate will have the knowledge and skills of analog and digital communication in providing necessary solutions to the real world problems.

**PEO2:** The graduate will be able to design, develop, analyze and implement the modern tools and systems involving principles of electronics and telecommunication engineering.

**PEO3:** The graduate will be following the ethical practices of the core industry and supporting software industry in providing most acceptable solution to the society.

**PEO4:** The graduate will have the innovative mindset of learning and implementing the latest technological advancements and research outcomes in the electronic hardware and software to keep pace with the rapid developments in socio economic world.

## General Lab Policies

- All labs must be attended and completed. In the event that you cannot attend a lab, prior approval must be obtained. In such case, it is required that you make up the lab at another time.

- Satisfactory completion of all the labs is required for passing the course. If you are unable to complete the lab in the assigned lab time, it is expected that you would complete the lab on your own.

- At the beginning of a lab session, the instructor will collect report for the previous week's lab. Any late lab report will have its grade reduced. If, for any valid reason, you are not able to meet the deadline, let the instructor know well in advance of start of the lab.

- You are responsible for keeping track of your e-mail. In case of difficulty with any specific lab or any other problem concerning the lab, please come and talk to the lab instructor or use e-mail.

**Student Name** **Instructor Name**

**Signature** ___________________ **Signature** ___________________

# EC-406 SIMULATION LAB INDEX

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# Practical-1

## Aim: Introduction to Scilab.

Software required: Scilab version 6.0.2

Theory:

Scilab is an open-source, cross-platform numerical computation package and high level, numerically oriented programming language. It can be used for signal processing, statistical analysis, image enhancement, fluid dynamic simulations, numerical optimisation and modelling and many more.

| | |
|---|---|
| **Developer(s)** | ESI Group |
| **Stable release** | 6.1.0 / 25 February 2020; 6 months ago[1] |
| **Repository** | git.scilab.org/scilab |
| **Written in** | Scilab, C, C++, Java, Fortran |
| **Operating system** | BSDs (e.g., FreeBSD), Linux, macOS, Windows |
| **Available in** | English, German, Spanish, French, Italian, Japanese, Portuguese (Brazil), Russian, Ukrainian, Chinese, Czech, Polish |
| **Type** | Technical computing |
| **License** | GPLv2, previously CeCILL |
| **Website** | www.scilab.org |

Scilab was created in 1990 by researchers from INRIA and ENPC. It was initially named Ψlab. Scilab Enterprises was created in June 2010. It develops and markets a comprehensive set of services for

Scilab users. It also develops and maintains Scilab software. In early 2017, Scilab Enterprises was acquired by virtual prototyping pioneer, ESI group.

Scilab provides an interpreted programming environment with matrices as the main data type. This allows users to rapidly construct models for a range of mathematical problems. Scilab is available free of cost under an open source license.

Scilab syntax is largely based on MATLAB language. The simplest way to execute Scilab code is to type it in at the prompt, —>, in the graphical command window. In this way, Scilab can be used as an interactive mathematical shell.

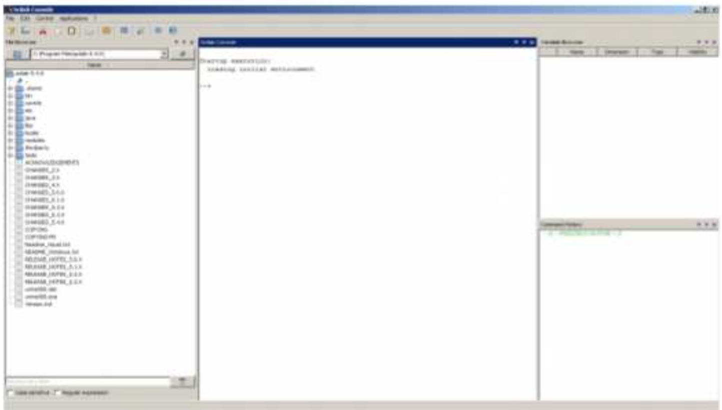

The useful workspace in Scilab consists of several windows:

- Console for making calculations
- Editor for writing programs
- Graphics windows for displaying graphics

- Embedded help

Scilab environment by default consists of following docked windows- console, files and variables browsers, command history.

**The menu bar:**



*Applications*

- The command history allows you to find all the commands from previous sessions to the current sessions.
- The variable browser allows you to find all the variables previously used during the current session.

*Edit*

- Clicking on Clear Console clears the entire content of the console but the command history is still available and calculations done during the session are still in memory.

*Control*

- Type pause in program or click on Control>Interrupt in the menu bar if the program is already running. In all cases, the prompt, —>, will turn into –1–>, then into –2–>, if the operation is repeated.

- To return to the time prior to the program interruption, type resume in the console or click on Control>Resume.
- To quit without any possibility of return, type abort in the console or click on Control>Abort.

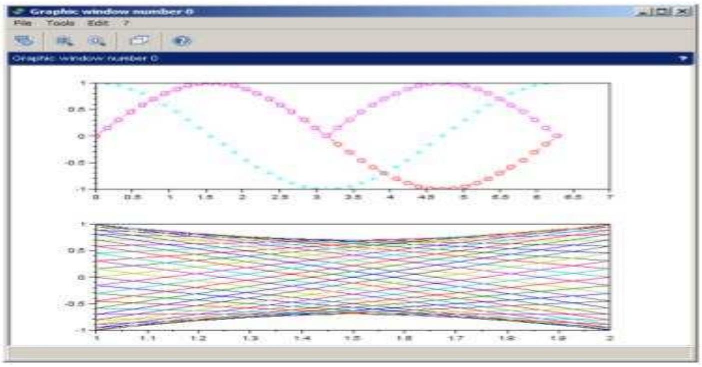
The graphics windows:

A graphics window opens automatically when any graph is plotted.

It is possible to plot curves, surfaces, sequence of points.

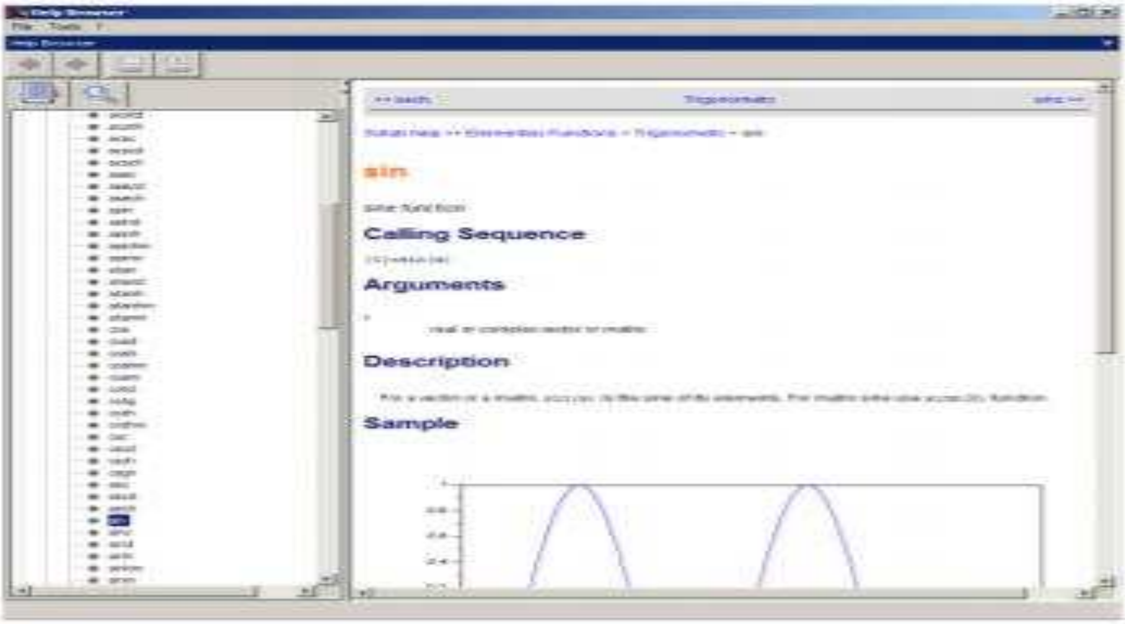
To obtain an example of plot, type in the console:

—>plot




To access online help, click on ?>Scilab Helpin the menu bar or type in the console:

—>help




To get help with any function, type help in the console followed by the appropriate function. For example:

—>help sin

displays sine function.

# PRACTICAL-2

## Aim: Write a program to perform various vector operations.

Software required: Scilab version 6.0.2

Define two vectors A and B where

A= [15819]

B= [19851] and perform calculations.

```
Startup execution:
  loading initial environment

--> A=[1 5 8 19]
 A  =

   1.   5.   8.   19.


--> B=[19 8 5 1]
 B  =

   19.   8.   5.   1.


--> A'
 ans  =

   1.
   5.
   8.
   19.


--> B'
 ans  =

   19.
   8.
   5.
   1.
```

```
--> A'*B
 ans  =

   19.    8.     5.    1.
   95.    40.    25.   5.
   152.   64.    40.   8.
   361.   152.   95.   19.


--> B'*A
 ans  =

   19.   95.   152.   361.
   8.    40.   64.    152.
   5.    25.   40.    95.
   1.    5.    8.     19.


--> A'*B-B'*A
 ans  =

   0.    -87.   -147.  -360.
   87.    0.    -39.   -147.
   147.   39.    0.    -87.
   360.   147.   87.    0.


--> A*A'+B*B'
 ans  =

   902.
```

## PRACTICAL -3

**Aim: Define vector A and B and perform given calculations**.

Software required: Scilab version 6.0.2

Define vectors A and B where

A= [1 0 1 0]

B= [2 3 4 5] and perform following calculations:

a) A+B
b) A-B
c) A'*B
d) A*B'
e) B'*A
f) B*A'
g) (A')^2*B^2
h) A^2*(B')^2
i) (B')^2*A^2
j) B^2*(A')^2

Also find out the length of A,B and sum of A and B

```
--> length(A)
 ans  =

   4.


--> length (B)
 ans  =

   4.


--> sum(A)+ sum(B)
 ans  =

   16.


--> sum(A+B)
 ans  =

   16.
```

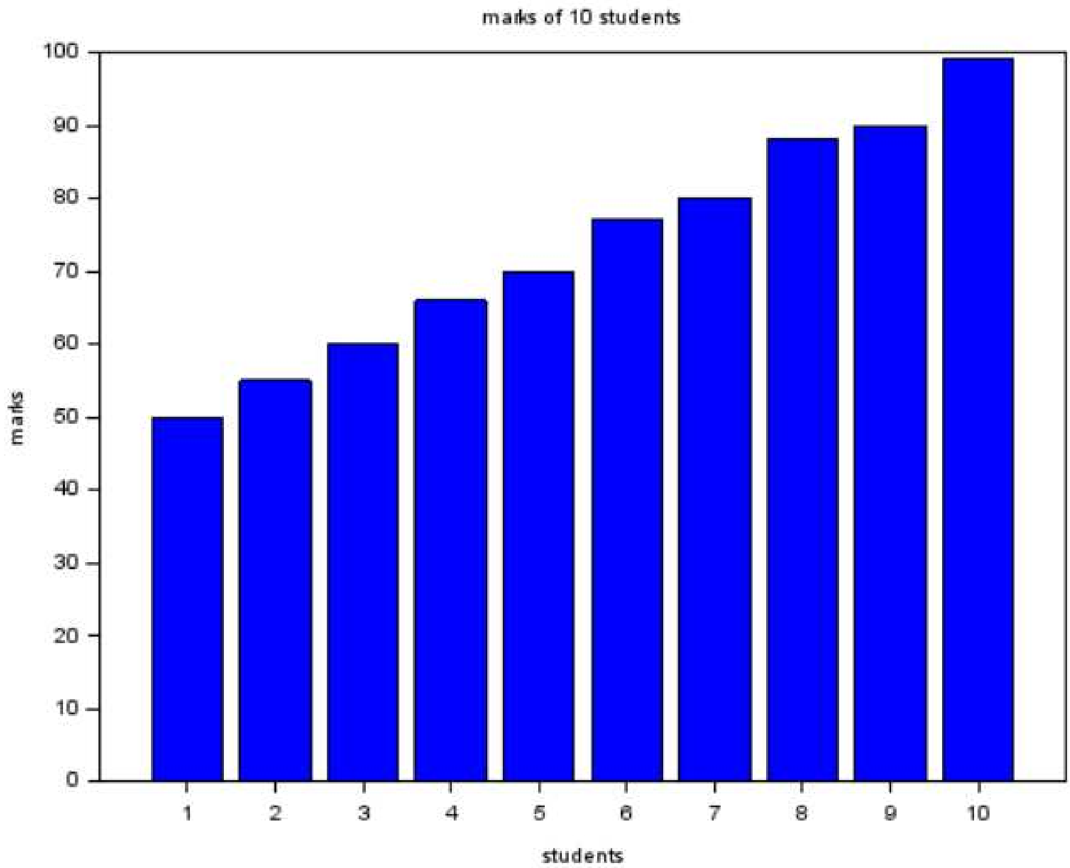
# PRACTICAL-4

**Aim: Write a scilab code to show the marks of ten students in bar graph**.

Software required: Scilab version 6.0.2

```
--> x= [1:10]
 x  =

   1.   2.   3.   4.   5.   6.   7.   8.   9.   10.


--> x= [1:10];

--> y= [50, 55, 60, 66, 70, 77, 80, 88, 90, 99];

--> xlabel('students');

--> ylabel('marks');

--> title('marks of 10 students');

--> bar(x,y);
```

The graph for the above code is plotted on the graphic window as shown below:




Result: Hence study of bar plot successfully performed.

# PRACTICAL-5

## Aim: Perform basic mathematical operations on Scilab.

Software required: Scilab version 6.0.2

```
--> 2+3
 ans  =

   5.


--> 8-9
 ans  =

  -1.


--> (2+3)^5
 ans  =

   3125.


--> %pi
 %pi  =

   3.1415927


--> %e
 %e  =

   2.7182818


--> factorial(4)
 ans  =

   24.


--> factor(26)
 ans  =

   2.   13.


--> X= [30,45,60]
 X  =

   30.   45.   60.
```

```
--> lcm(X)
 ans  =

   180.


--> gcd(X)
 ans  =

   15.
--> Y= [2,3,4,4,5,6,7,4,8,15,22,1,0,5]
 Y  =

   2.   3.   4.   4.   5.   6.   7.   4.   8.   15.   22.   1.   0.   5.


--> mean(Y)
 ans  =

   6.1428571
--> median(Y)
 ans  =

   4.5


--> C= complex(2,4)
 C  =

   2. + 4.i


--> complex([3 6 2], 7)
 ans  =

   3. + 7.i   6. + 7.i   2. + 7.i
```

```
--> x= 15.56
 x  =

   15.56


--> floor(x)
 ans  =

   15.


--> ceil(x)
 ans  =

   16.


--> floor(9.99)
 ans  =

   9.


--> ceil(58.01)
 ans  =

   59.


--> abs(58+45*%i)
 ans  =

   73.409809
```

# PRACTICAL-6

**Aim: Write programs to verify various matrix operations.**

Software used: Scilab version 6.0.2

Perform following operations:

a) Excess the element of a row and column for a given matrix E=[5, 19, 15; 8, 22, 36]
b) Generate identity matrix of order 3*3
c) Determine determinant, inverse and eigen value for given matrix A= [1, 4, 0;2, 3, 1;4, 1, 5]
d) Extract second and third rows of the matrix X= [1, 2, 3; 4, 5, 6; 7, 8, 9]
e) Extract second column of matrix Y= [10, 11, 12; 13, 14, 15; 16, 17, 18]
f) Generate a zero matrix of order 3*3
g) Generate a matrix of order 3*3 whose all elements are one.

a) Excess the element of a row and column for a given matrix E= [5, 19, 15; 8, 22, 36]

```
--> E= [5 19 15; 8 22 36]
 E  =

   5.   19.   15.
   8.   22.   36.


--> E(1,2)
 ans  =

   19.


--> E(1,1)
 ans  =

   5.


--> E(2,1)
 ans  =

   8.


--> E(2,3)
 ans  =

   36.
```

b) Generate identity matrix of order 3*3

```
--> eye(3,3)
 ans  =

   1.   0.   0.
   0.   1.   0.
   0.   0.   1.
```

c) Determine determinant, inverse and eigen value for given matrix A= [1, 4, 0;2, 3, 1;4, 1, 5]

```
--> A= [1 4 0;2 3 1;4 1 5]
 A  =

   1.   4.   0.
   2.   3.   1.
   4.   1.   5.


--> det(A)
 ans  =

  -10.


--> inv(A)
 ans  =

  -1.4    2.    -0.4
   0.6   -0.5    0.1
   1.    -1.5    0.5


--> spec(A)
 ans  =

   6.6801436
  -0.5260158
   2.8458722
```

d) Extract second and third rows of the matrix X= [1, 2, 3; 4, 5, 6; 7, 8, 9]

```
--> X= [1 2 3; 4 5 6; 7 8 9]
 X  =

   1.   2.   3.
   4.   5.   6.
   7.   8.   9.


--> X(2:3,:)
 ans  =

   4.   5.   6.
   7.   8.   9.
```

e) Extract second column of matrix Y= [10, 11, 12; 13, 14, 15; 16, 17, 18]

```
--> Y= [10 11 12; 13 14 15; 16 17 18]
 Y  =

   10.   11.   12.
   13.   14.   15.
   16.   17.   18.


--> Y(:,2,:)
 ans  =

   11.
   14.
   17.
```

f) Generate a zero matrix of order 3*3

```
--> zeros(3,3)
 ans  =

   0.   0.   0.
   0.   0.   0.
   0.   0.   0.
```

g) Generate a matrix of order 3*3 whose all elements are one

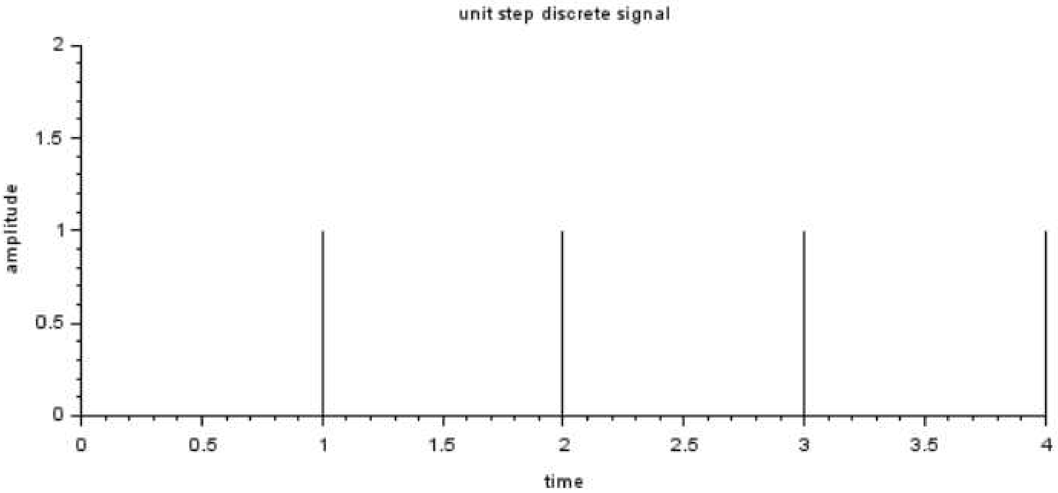
```
--> ones(3,3)
 ans  =

   1.   1.   1.
   1.   1.   1.
   1.   1.   1.
```

# PRACTICAL-7

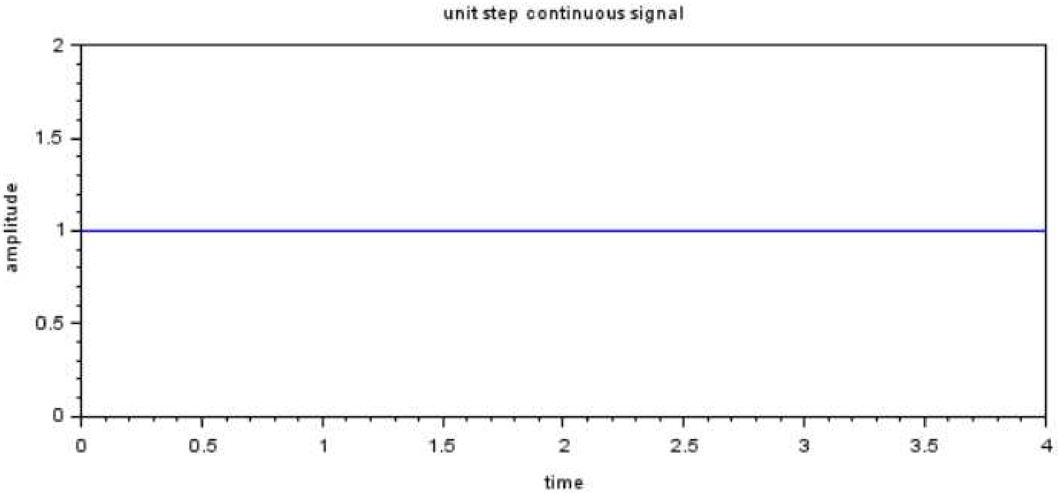
**Aim: Write a Scilab code to plot unit step discrete and unit step continuous signal.**

Software required: Scilab version 6.0.2

```
--> t=(0:4);

--> y= ones(1,5);

--> subplot(2,1,1);

--> plot2d3(t,y);

--> xlabel('time');

--> ylabel('amplitude');

--> title('unit step discrete signal');

--> subplot(2,1,2);

--> plot(t,y);
--> xlabel('time');

--> ylabel('amplitude');

--> title('unit step continuous signal');
```



unit step discrete signal
amplitude
time
0
0.5
1
1.5
2
2.5
3
3.5
4

unit step continuous signal
amplitude
time
0
0.5
1
1.5
2
2.5
3
3.5
4

# PRACTICAL-8

**Aim: Perform radix conversion on Scilab.**

Software required: Scilab version 6.0.2

Convert from:

a) Decimal to binary

```
--> dec2bin(27)
 ans  =

 11011
```

b) Decimal to octal

```
--> dec2oct(27)
 ans  =

 33
```

c) Decimal to hexadecimal

```
--> dec2hex(27)
 ans  =

 1B
```

d) Binary to decimal

```
--> bin2dec('11011')
 ans  =

   27.
```

e) Octal to decimal

```
--> oct2dec('33')
 ans  =

   27.
```

e) Hexadecimal to decimal

```
--> hex2dec('1B')
 ans  =

   27.
```

# PRACTICAL-9

**Aim: Study on matrix relational operations, logical operations and bitwise operations.**

Software required: Scilab version 6.0.2

A= [5 5 5; 5 5 5; 5 5 5]

B= [1 2 3; 4 5 6; 7 8 9]

```
--> A= [5 5 5; 5 5 5; 5 5 5]
 A  =

   5.   5.   5.
   5.   5.   5.
   5.   5.   5.


--> B= [1 2 3; 4 5 6; 7 8 9]
 B  =

   1.   2.   3.
   4.   5.   6.
   7.   8.   9.
```

a) Relation operations

```
--> A>B
 ans  =

  T T T
  T F F
  F F F


--> A<B
 ans  =

  F F F
  F F T
  T T T
```

```
--> A>=B
 ans  =

  T T T
  T T F
  F F F


--> A<=B
 ans  =

  F F F
  F T T
  T T T
--> A==B
 ans  =

  F F F
  F T F
  F F F


--> A~=B
 ans  =

  T T T
  T F T
  T T T
```

b) Logical operations

```
--> A&B
 ans  =

  T T T
  T T T
  T T T
```

```
--> A|B
 ans  =

  T T T
  T T T
  T T T


--> ~A
 ans  =

  F F F
  F F F
  F F F
--> ~B
 ans  =

  F F F
  F F F
  F F F
```

c) Bitwise operations

```
--> bitand(A,B)
 ans  =

   1.   0.   1.
   4.   5.   4.
   5.   0.   1.


--> bitor(A,B)
 ans  =

   5.   7.    7.
   5.   5.    7.
   7.   13.   13.
```

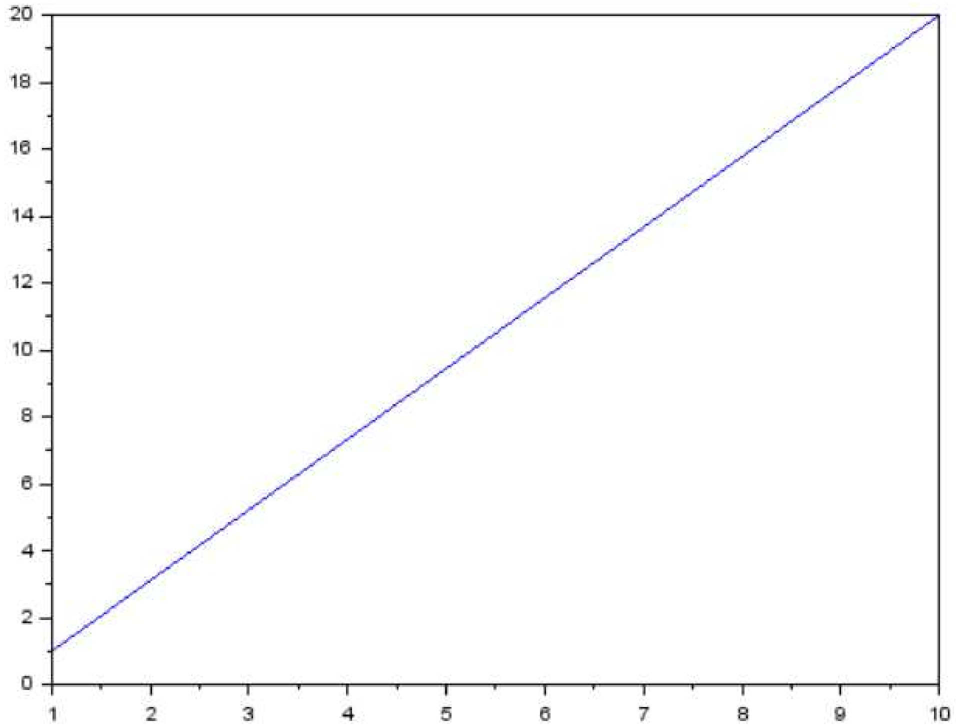
```
--> bitxor(A,B)
 ans  =

   4.   7.    6.
   1.   0.    3.
   2.   13.   12.
```

# PRACTICAL-10

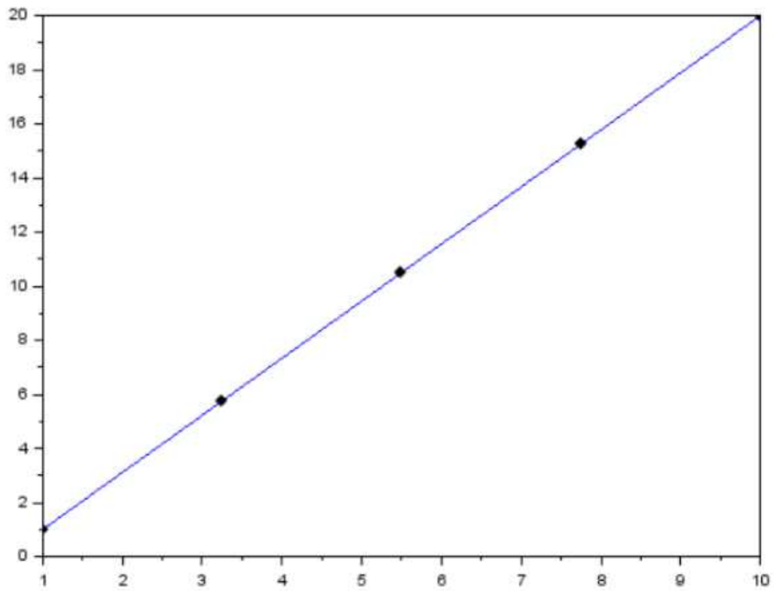
## Aim: Write a Scilab code to show 2D plot.

Software required: Scilab version 6.0.2

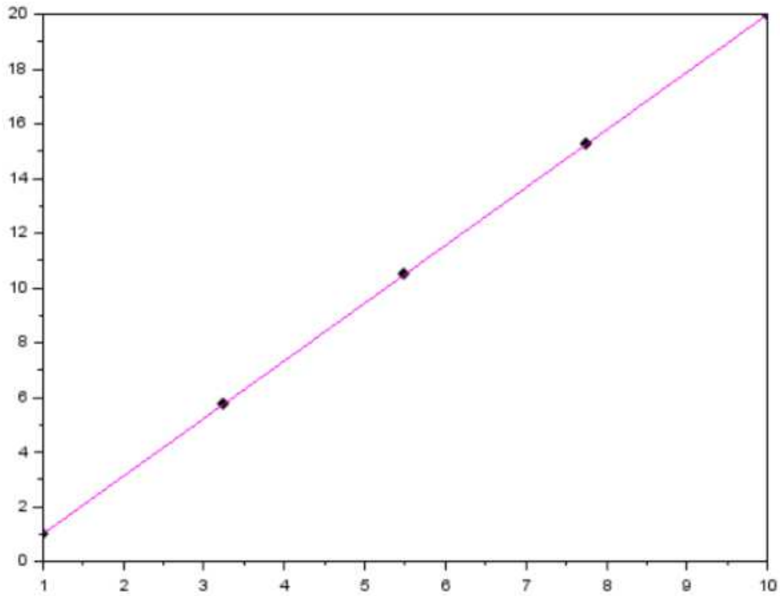
```
--> x= linspace(1,10,5)
 x  =

   1.   3.25   5.5   7.75   10.


--> y= linspace(1,20,5)
 y  =

   1.   5.75   10.5   15.25   20.


--> plot(x,y);
```



```
--> plot2d(x,y,-4);
```




```
--> plot2d(x,y,6);
```



# PRACTICAL-11

**Aim: Write for and while loop codes to perform given functions using Scilab edit window.**

Software used: scilab version 6.0.2

a) Compute sum of numbers from 1 to 10 using for loop and display the result

```
//finding the sum of integers from 1 to 10 using for loop
s=0;
for i=1:10;
    s=s+i
end
disp(s,'s=');
```

Result:

```
--> exec('E:\Scilab Practicals\Edit window\Sum from 1 to 10.sce', -1)

 s=

   55.
```

b) Compute sum of numbers from 1 to 10 using while loop and display the result

```
//sum of numbers from 1 to 10 using while loop
d=0;
j=1;
while j<=10
    d=d+j;
    j=j+1;
end
disp(d,'d=');
```

Result:

```
--> exec('E:\Scilab Practicals\Edit window\While loop.sci', -1)

 d=

   55.
```

c) Display following series on the console

1, 2, 3, 5, 8, 13, 21, 34, 55, 89

```
//1 2 3 5 8 13 21 34 55
s=zeros(1,10)
s(1)=1
s(2)=2
for i=3:10
    s(i)=s(i-2)+s(i-1)

end
    disp(s,'s=')
```

Result:

```
--> exec('E:\Scilab Practicals\Edit window\print series.sci', -1)

 s=

   1.   2.   3.   5.   8.   13.   21.   34.   55.   89.
```

# PRACTICAL-12

**Aim: Study the function command of Scilab.**

Software required: Scilab version 6.0.2

a) Form a function to add two numbers

```
--> function y = add(a,b)
  > y = a+b
  > endfunction

--> add(24,67)
 ans  =

   91.
```

b) Form a function to calculate square and cube of a number

```
--> function [a,b] = sqrcb(x)
  > a = x^2
  > b = x^3
  > endfunction

--> [s,q] = sqrcb(9)
 q  =

   729.

 s  =

   81.
```

# PRACTICAL-13

**Aim: Write a code on edit window to check the sign of a number using if else condition.**

Software required: Scilab version 6.0.2

```
//if else statement
//check the sign of the number
a=input("Enter the number: ")
if a<0 then
    disp("The number is negative")
elseif a==0 then
    disp("The number is zero")
else
    disp("The number is positive")
end
```

Result:

```
--> exec('E:\Scilab Practicals\Edit window\check sign of number.sce', -1)
Enter the number: 5


 The number is positive

--> exec('E:\Scilab Practicals\Edit window\check sign of number.sce', -1)
Enter the number: -4


 The number is negative

--> exec('E:\Scilab Practicals\Edit window\check sign of number.sce', -1)
Enter the number: 0


 The number is zero
```

# PRACTICAL-14

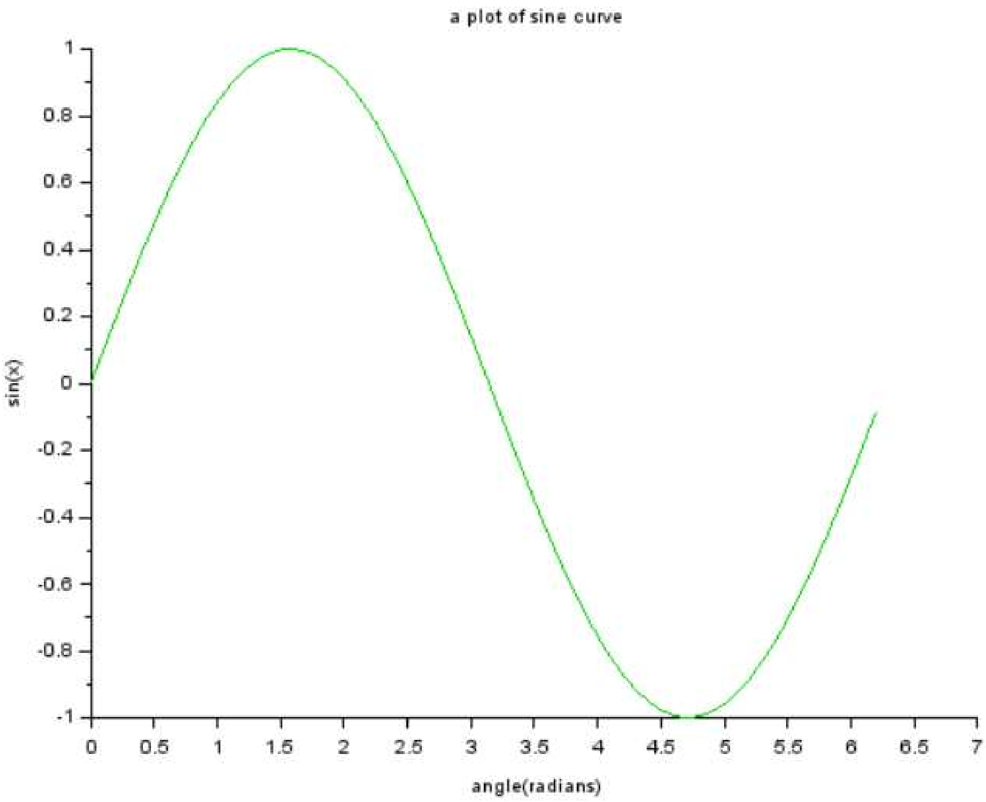
**Aim: To plot sine and cosine graphs using Scilab edit window**

Software required: Scilab version 6.0.2

a) Sine graph

```
//plot sine curve
x=[0:0.1:2*%pi];
plot2d(x,sin(x),style=15)
xtitle("a plot of sine curve")
xlabel("angle(radians)")
ylabel("sin(x)")
```

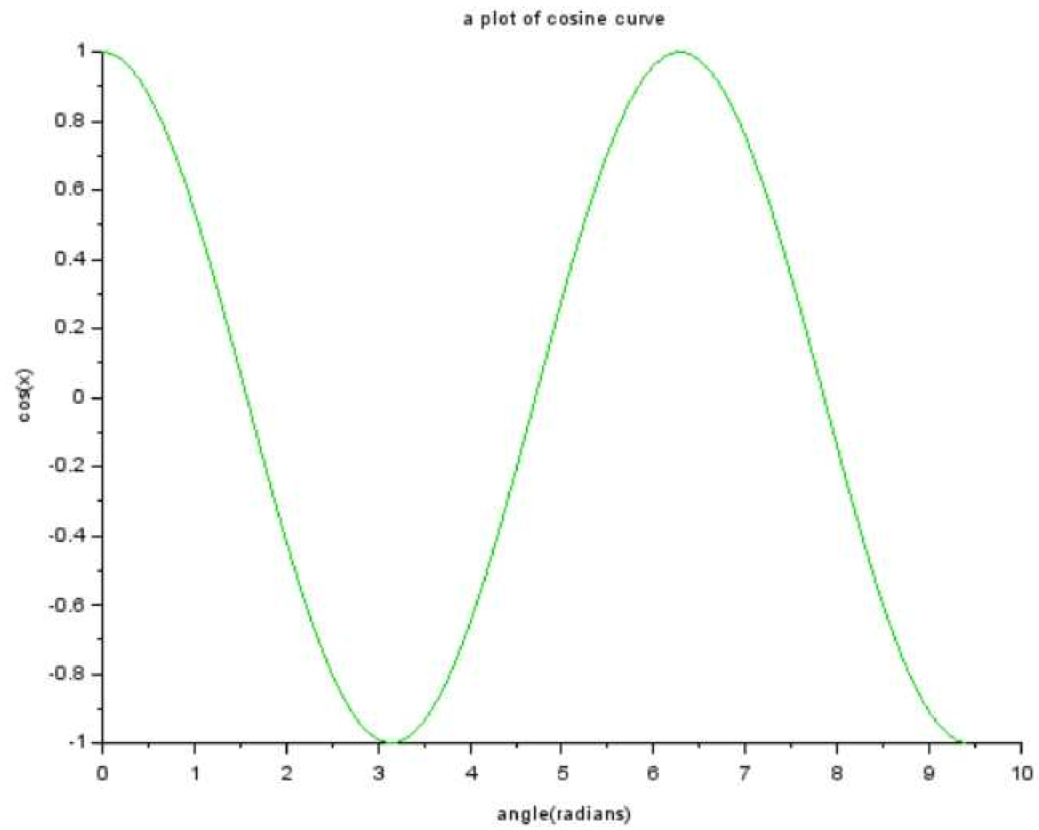
Result:



Cosine graph

```
//plot cosine curve
x=[0:0.1:3*%pi];
plot2d(x,cos(x),style=15)
xtitle("a plot of cosine curve")
xlabel("angle(radians)")
ylabel("cos(x)")
```

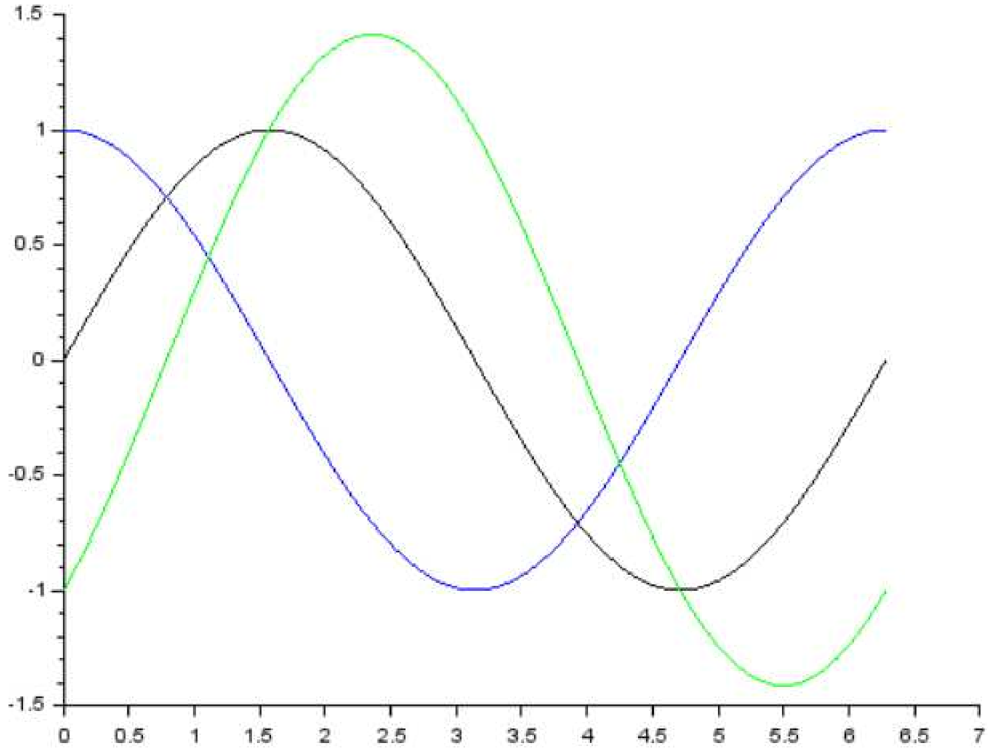
Result:



Sine and cosine graph with their difference

```
//sine and cosine graph
x=linspace(0,2*%pi,100);
x=x';
y=sin(x);
z=cos(x);
plot2d(x,[y,z]);
plot2d(x,[y,z,y-z]);
```

Result:



# PRACTICAL-15

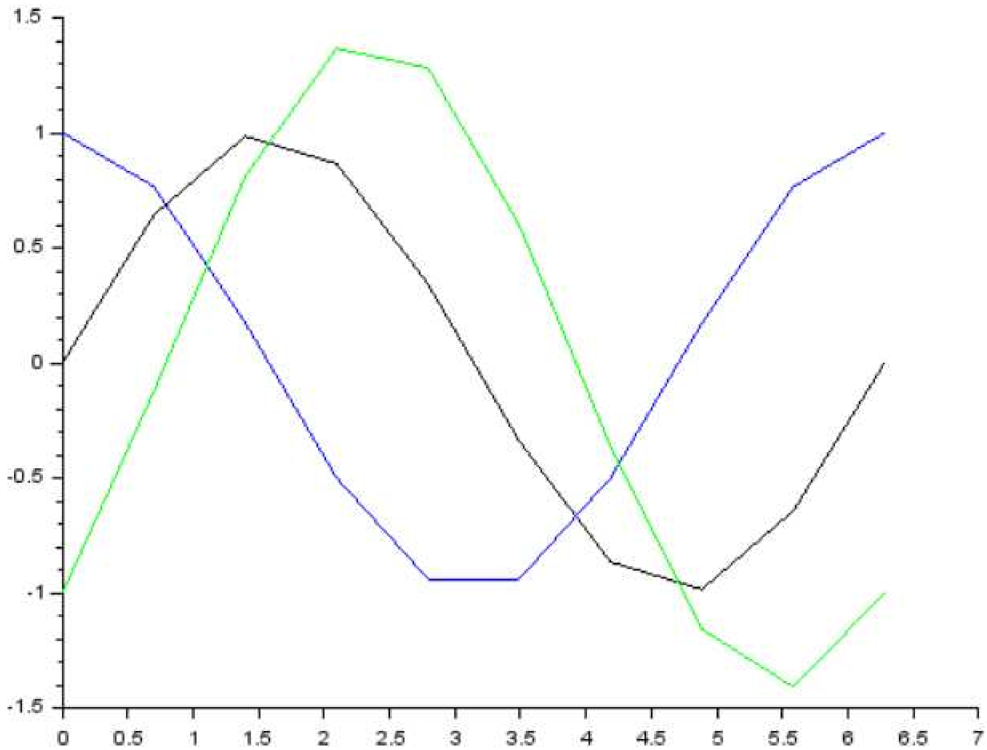
**Aim: To study the application of 'linspace' command.**

Software required: Scilab version 6.0.2

As we change the arguments of linspace, we observe following changes:

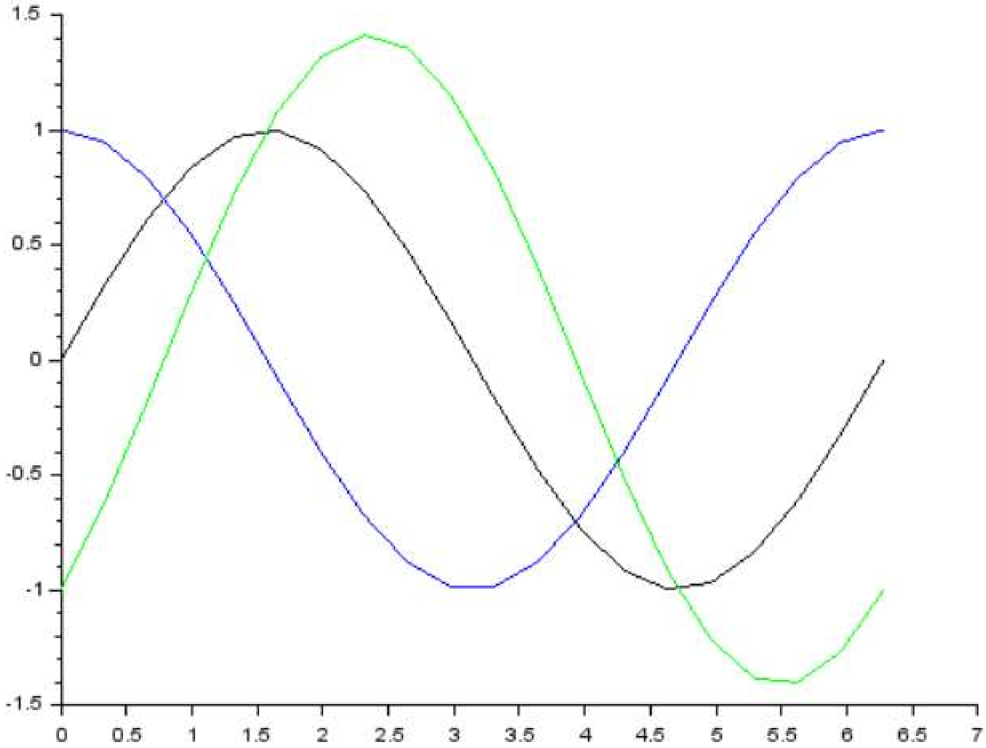
```
x=linspace(0,2*%pi,10);
x=x';
y=sin(x);
z=cos(x);
plot2d(x,[y,z,y-z]);
```

Result:



```
x=linspace(0,2*%pi,20);
x=x';
y=sin(x);
z=cos(x);
plot2d(x,[y,z,y-z]);
```

Result:



# PRACTICAL-16

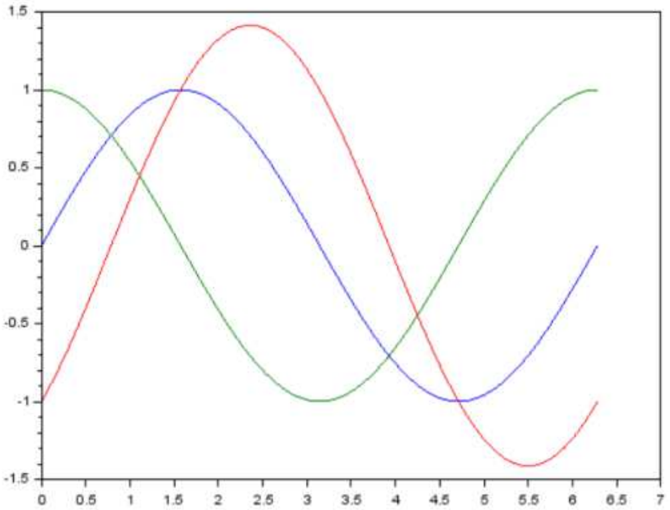
**Aim: Study different types of graphs.**

Software required: Scilab version 6.0.2

a) plot()

```
x=linspace(0,2*%pi,100);
x=x';
y=sin(x);
z=cos(x);
plot(x,[y,z,y-z]);
```

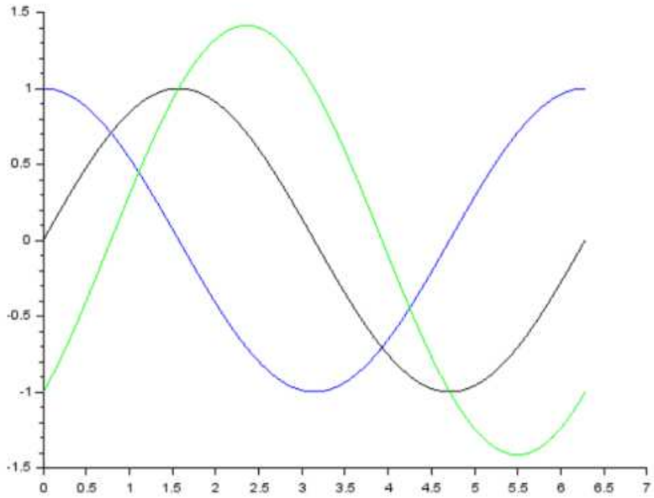
Result:




b) plo2d()

```
x=linspace(0,2*%pi,100);
x=x';
y=sin(x);
z=cos(x);
plot2d(x,[y,z,y-z]);
```

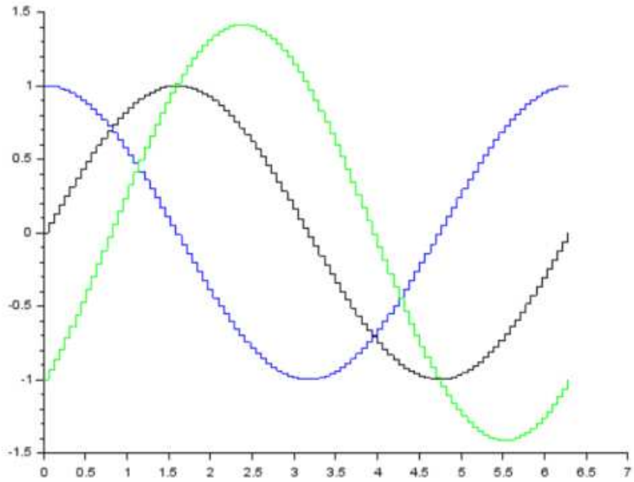
Result:




c) plot2d2()

```
x=linspace(0,2*%pi,100);
x=x';
y=sin(x);
z=cos(x);
plot2d2(x,[y,z,y-z]);
```

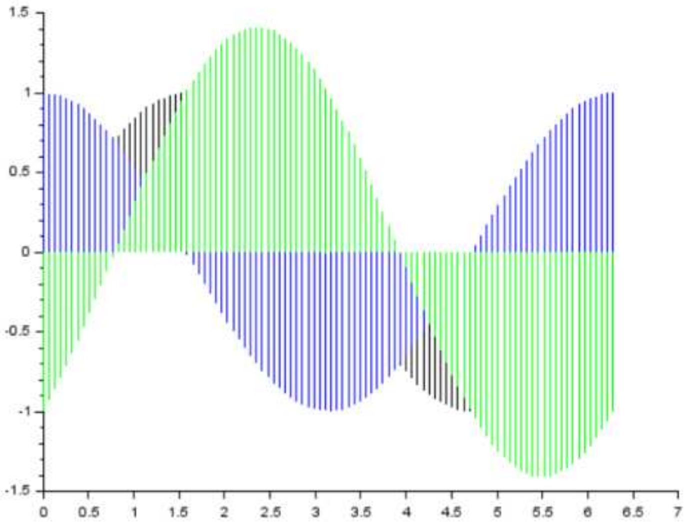
Result:



d) plot2d3()

```
x=linspace(0,2*%pi,100);
x=x';
y=sin(x);
z=cos(x);
plot2d3(x,[y,z,y-z]);
```

Result:



# PRACTICAL-17

**Aim: Solve linear equations using matrix on Scilab.**

Software used: Scilab version 6.0.2

Solve given set of linear equations using matrix on Scilab:

```
//x1+2x2+4x3=15
//2x1+x2+3x3=10
//x1+x2+x3=5
//solving linear equation using scilab code
B=[15;10;5]
A=[1 2 4; 2 1 3; 1 1 1]
X=inv(A)*B
disp(X)
```

Result:

```
--> exec('E:\Scilab Practicals\Edit window\solving linear equations.sce', -1)

  0.
  2.5
  2.5
```

# PRACTICAL-18

**Aim: To plot graph of two functions.**

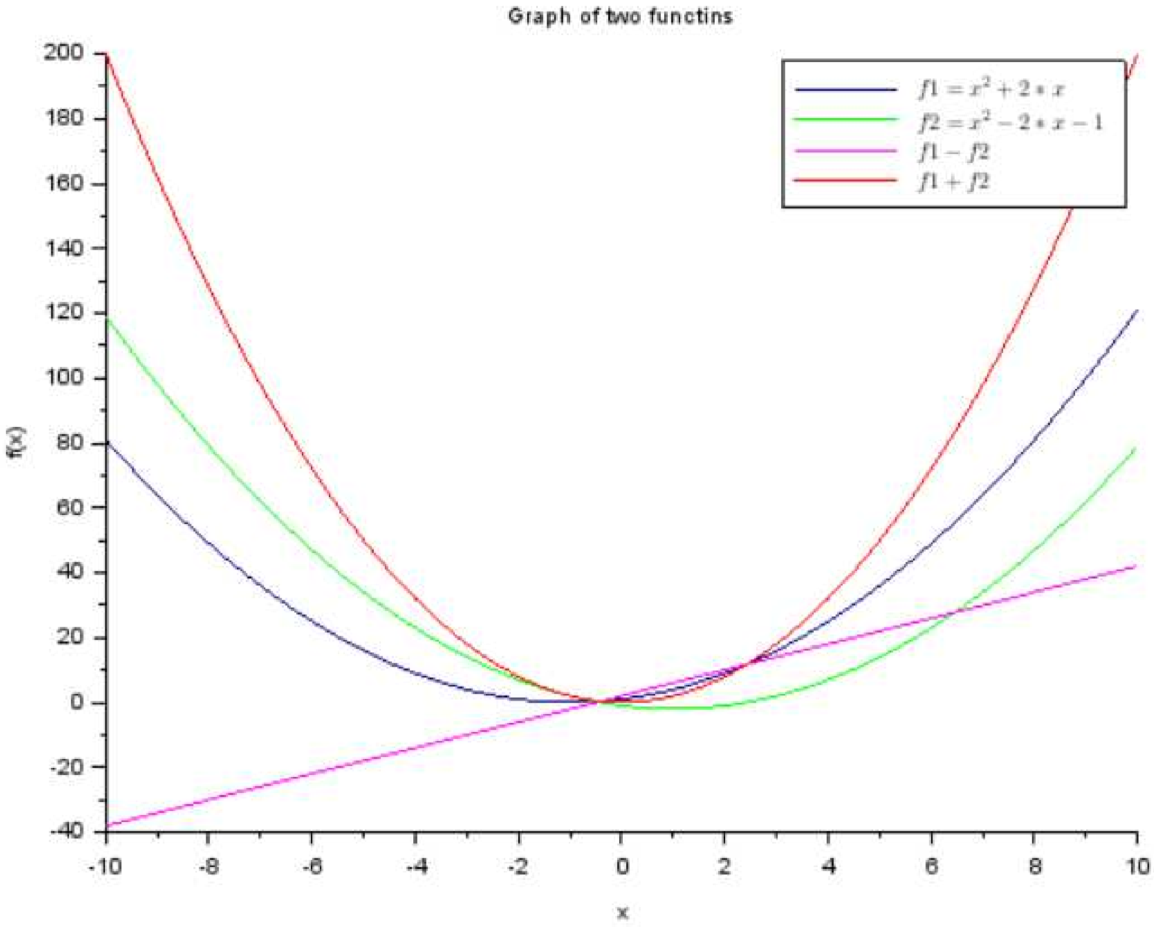
Software required: Scilab version 6.0.2

f1=x^2+2*x+1

f2=x^2-2*x-1

```
//using scilab code plot graph of two functions
//f1=x^2+2x+1
//f2=x^2-2x-1
x=[-10:0.1:10];
f1=x^2+2*x+1;
f2=x^2-2*x-1;
plot2d(x,f1,9);
plot2d(x,f2,3);
plot2d(x,f1-f2,6);
plot2d(x,f1+f2,5);
xlabel("x");
ylabel("f(x)");
title("Graph of two functins");
hl=legend(['$f1=x^2+2*x$','$f2=x^2-2*x-1$','$f1-f2$','$f1+f2$']);
```

Result:


Graph of two functins
f1 = x^2 + 2 * x
f2 = x^2 - 2 * x - 1
f1 - f2
f1 + f2
200
180
160
140
120
100
80
60
40
20
0
-20
-40
f(x)
-10
-8
-6
-4
-2
0
2
4
6
8
10
x

# PRACTICAL-19

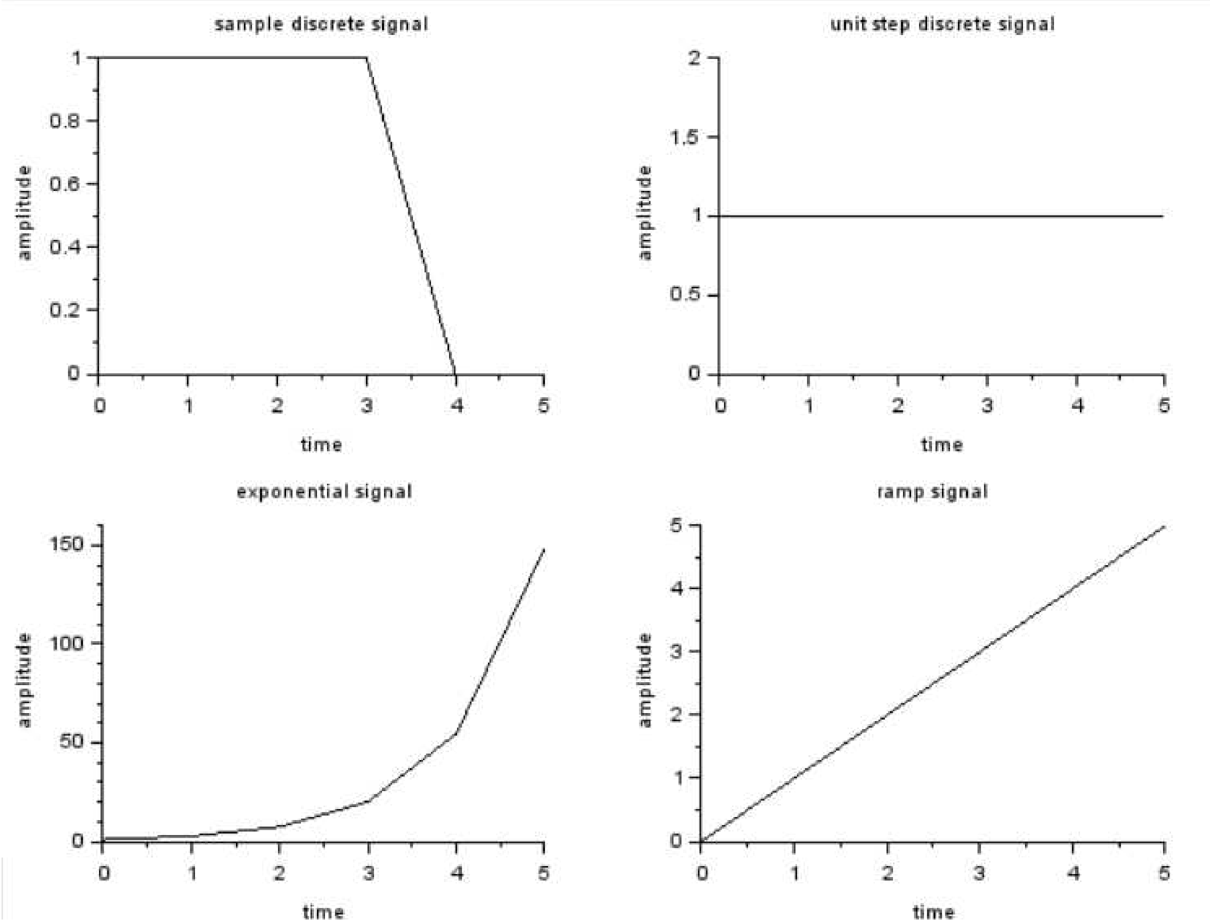
**Aim: To generate continuous unit step signal, unit step discrete signal, exponential signal, ramp signal.**

Software required: Scilab version 6.0.2

a) plot2d

```
n1=(0:5);
y1=[ones(1,4),zeros(1,2)];
y2=[ones(1,6)];
y3=exp(n1);
y4=(n1);
subplot(2,2,1);
plot2d(n1,y1);
xlabel("time");
ylabel("amplitude");
title("sample discrete signal");
subplot(2,2,2);
plot2d(n1,y2);
xlabel("time");
ylabel("amplitude");
title("unit step discrete signal");
subplot(2,2,3);
plot2d(n1,y3);
xlabel("time");
ylabel("amplitude");
title("exponential signal");
subplot(2,2,4);
plot2d(n1,y4);
xlabel("time");
ylabel("amplitude");
title("ramp signal");
```

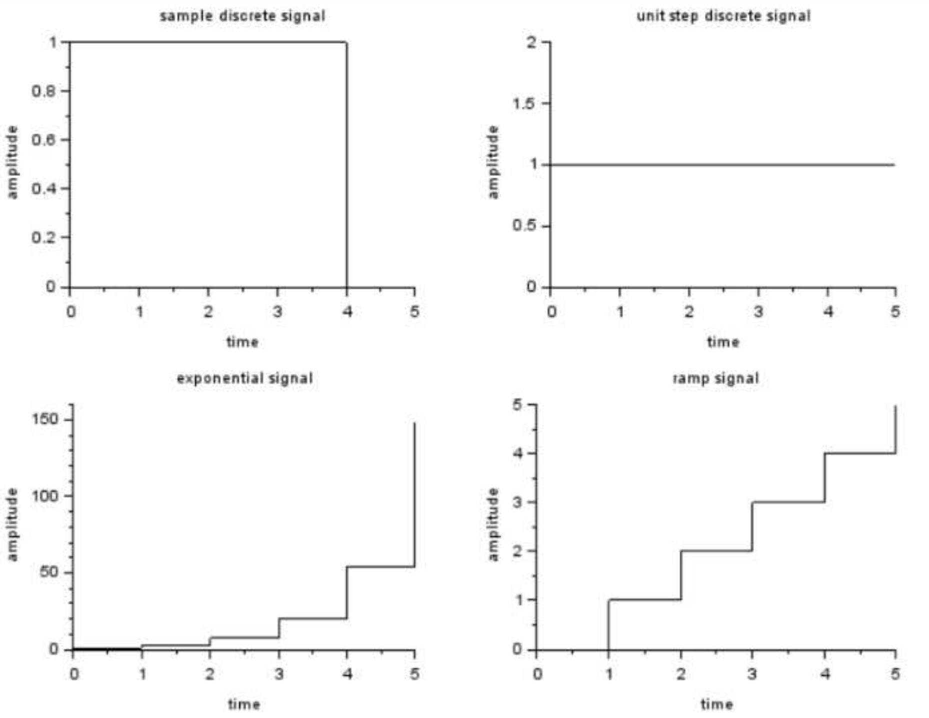
Result:


sample discrete signal
amplitude
time
unit step discrete signal
amplitude
time
exponential signal
amplitude
time
ramp signal
amplitude
time

b) plot2d2

```
n1=(0:5);
y1=[ones(1,4),zeros(1,2)];
y2=[ones(1,6)];
y3=exp(n1);
y4=(n1);
subplot(2,2,1);
plot2d2(n1,y1);
xlabel("time");
ylabel("amplitude");
title("sample discrete signal");
subplot(2,2,2);
plot2d2(n1,y2);
xlabel("time");
ylabel("amplitude");
title("unit step discrete signal");
subplot(2,2,3);
plot2d2(n1,y3);
xlabel("time");
ylabel("amplitude");
title("exponential signal");
subplot(2,2,4);
plot2d2(n1,y4);
xlabel("time");
ylabel("amplitude");
title("ramp signal");
```

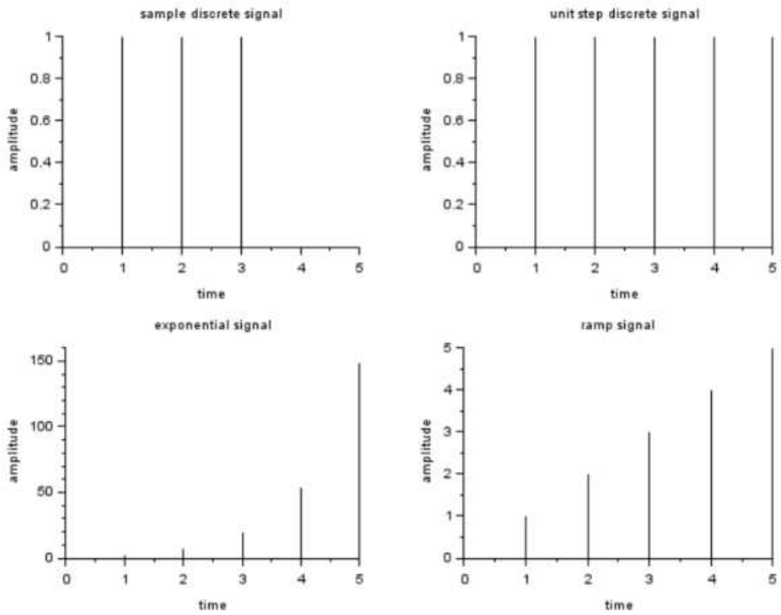
Result:



c) plot2d3

```
n1=(0:5);
y1=[ones(1,4),zeros(1,2)];
y2=[ones(1,6)];
y3=exp(n1);
y4=(n1);
subplot(2,2,2);
plot2d3(n1,y1);
subplot(2,2,1);
plot2d3(n1,y1);
xlabel("time");
ylabel("amplitude");
title("sample discrete signal");
subplot(2,2,2);
plot2d3(n1,y2);
xlabel("time");
ylabel("amplitude");
title("unit step discrete signal");
subplot(2,2,3);
plot2d3(n1,y3);
xlabel("time");
ylabel("amplitude");
title("exponential signal");
subplot(2,2,4);
plot2d3(n1,y4);
xlabel("time");
ylabel("amplitude");
title("ramp signal");
```

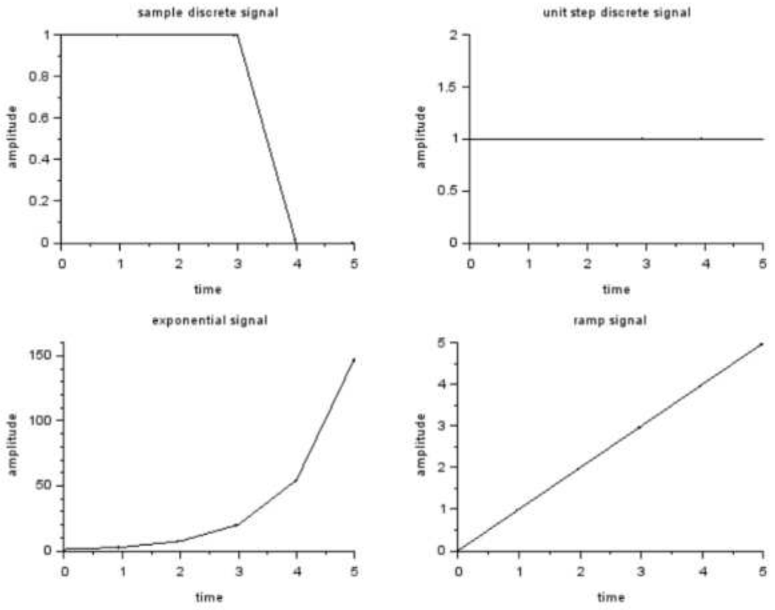
Result:



d) plot2d4

```
n1=(0:5);
y1=[ones(1,4),zeros(1,2)];
y2=[ones(1,6)];
y3=exp(n1);
y4=(n1);
subplot(2,2,1);
plot2d4(n1,y1);
xlabel("time");
ylabel("amplitude");
title("sample discrete signal");
subplot(2,2,2);
plot2d4(n1,y2);
xlabel("time");
ylabel("amplitude");
title("unit step discrete signal");
subplot(2,2,3);
plot2d4(n1,y3);
xlabel("time");
ylabel("amplitude");
title("exponential signal");
subplot(2,2,4);
plot2d4(n1,y4);
xlabel("time");
ylabel("amplitude");
title("ramp signal");
```

Result:



# PRACTICAL-20

**Aim: To solve ordinary differential equations using Scilab.**

**Software require: Scilab version 6.0.2**

a) Example 1 – $\frac{dy}{dx} = -2x - y$

```
//ordinary differential equation
//dy/dx=-2x-y
//initial condition y(0)=-1, y(0.4)=?
//answer=0.81096
function dx=f(x,y);
    dx=-2*x-y;
endfunction
y0=-1;
x0=0;
t=0.4;
sol=ode(y0,x0,t,f);
disp(sol,"answer");
```

Output:

```
--> exec('E:\Scilab Practicals\Edit window\differential equation.sce', -1)

 answer

  -0.8109602
```

b) Example 2 - $\frac{dy}{dx} = x + y$

```
//differencial equation
//dy/dx=x+y
//y(1)=2
//find y(1.2)
//answer=-0.4026
function dx=f(x,y);
    dx=x+y;
endfunction
y1=2;
x1=1;
t=1.2;
sol=ode(x1,y1,t,f);
disp(sol,"answer");
```

Output:

```
--> exec('E:\Scilab Practicals\Edit window\differential equation2.sce', -1)

 answer

  -0.4026841
```

c) Example 3 - $x \times y$

```
//differencial equation
//dy/dx=x*y
//y(1)=2
//find y(1.2)
//answer=0.278
function dx=f(x,y);
    dx=x*y;
endfunction
y1=2;
x1=1;
t=1.2;
sol=ode(x1,y1,t,f);
disp(sol,"answer");
```

Output:

```
--> exec('E:\Scilab Practicals\Edit window\differential equation2.sce', -1)

 answer

   0.2780373
```