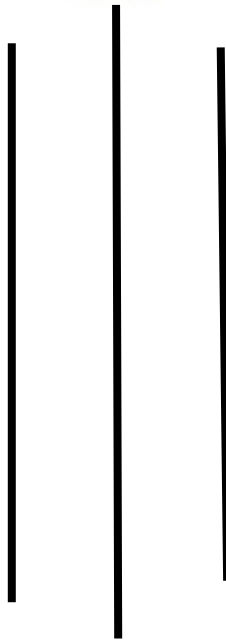


NEPAL ENGINEERING COLLEGE

(AFFILIATED TO POKHARA UNIVERSITY)

Changunarayan, Bhaktapur



REPORT ON:

Basic Gauss Elimination Method

SUBMITTED BY:

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CRN: 020-626

SUBMITTED TO:

Electrical and

Electronics

Experiment no:-6

TITLE:-

Gauss Elimination Method

OBJECTIVE:-

To find the solution of number of equation using Matlab and C-programming.

THEORY:-

Introduction:

Gauss elimination method proposes a systematic strategy for reducing the system of equations to the upper triangular form using the forward elimination approach and then for obtaining values of unknowns using the back substitution process. For general set of 3 equations:

$$a_{11}x + a_{12}y + a_{13}z = b_1$$

$$a_{21}x + a_{22}y + a_{23}z = b_2$$

$$a_{31}x + a_{32}y + a_{33}z = b_3$$

The final form of elimination process is given by:

$$a_{11} \quad a_{12} \quad a_{13} = b_1$$

$$0 \quad a_{22} \quad a_{23} = b_2$$

$$0 \quad 0 \quad a_{33} = b_3$$

Value of x , y and z can be computed as:

$$z = \frac{b_3}{a_{33}},$$

$$y = \frac{b_2 - a_{23} z}{a_{22}},$$

$$x = \frac{b_1 - a_{13} z - a_{12} y}{a_{11}},$$

Algorithm:

1. Start
2. Read Number of Unknowns: n
3. Read Augmented Matrix (A) of n by n+1 Size
4. Transform Augmented Matrix (A) to Upper Triangular Matrix by Row Operations.
5. Obtain Solution by Back Substitution.
6. Display Result.
7. Stop

Question:-

Write a MATLAB program to solve following system of linear equations using Gauss elimination method:

$$x + y + z = 6$$

$$2x - y + 3z = 4$$

$$4x + 5y - 10z = 13$$

Using C-programming

Syntax:-

```
/* Gauss Elimiantion
prepared by:-
Subash khalal
crn: 020-626 */
#include<stdio.h>
#include<conio.h>
int main()
{
    // programmer details
    printf("Gauss Elimiantion by:-\n Subash khalal\n\n");
    int i,j,k,n;
    float A[20][20],c,x[10],sum=0.0;
    // order might be 2*2, 3*3 etc;
    printf("\nEnter the order of matrix: ");
    scanf("%d",&n);
    printf("\nEnter the elements of augmented matrix row-wise:\n\n");
    for(i=1; i<=n; i++)
    {
        for(j=1; j<=(n+1); j++)
        {
            printf("A[%d][%d] : ", i,j);
            scanf("%f",&A[i][j]);
        }
    }
    /* loop for the generation of upper triangular matrix*/
    for(j=1; j<=n; j++)
    {
        for(i=1; i<=n; i++)
        {
            if(i>j)
            {
                c=A[i][j]/A[j][j];
                for(k=j+1; k<=n+1; k++)
                {
                    A[i][k]=A[i][k]-c*A[j][k];
                }
            }
        }
    }
}
```

```

        for(k=1; k<=n+1; k++)
        {
            A[i][k]=A[i][k]-c*A[j][k];
        }
    }
}
x[n]=A[n][n+1]/A[n][n];
/* this loop is for backward substitution*/
for(i=n-1; i>=1; i--)
{
    sum=0;
    for(j=i+1; j<=n; j++)
    {
        sum=sum+A[i][j]*x[j];
    }
    x[i]=(A[i][n+1]-sum)/A[i][i];
}
printf("\nThe solution is: \n");
for(i=1; i<=n; i++)
{
    //printing the value of solution
    printf("\nx%d=%f\t",i,x[i]);
}
return(0);
}

```

Output:-

The image shows a C++ IDE with two windows. The left window displays the source code for a program named 'gausselimantion.cpp'. The code includes comments about the author (Subash khalal) and the CRN (020-626). It uses `<stdio.h>` and `<conio.h>`. The `main` function prompts the user for the order of the matrix (3) and then for the elements of the augmented matrix row-wise. The right window shows the output of the program, which displays the matrix elements and the solution values $x_1=2.000000$, $x_2=3.000000$, and $x_3=1.000000$. The process exited after 72.72 seconds with a return value of 0.

```
1  /* Gauss Elimiantion
2  prepared by:-
3  Subash khalal
4  crn: 020-626 */
5  #include<stdio.h>
6  #include<conio.h>
7  int main()
8  {
9      // programmer details
10     printf("Gauss Elimiantion by:-\n Subash khalal\n\n")
11     public int __cdecl printf(const char * __restrict__ _Format, ...)
12     float A[20][20],c,x[10],sum=0.0;
13     // order might be 2*2, 3*3 etc;
14     printf("\nEnter the order of matrix: ");
15     scanf("%d",&n);
16     printf("\nEnter the elements of augmented matrix row-wise\n");
17     for(i=1; i<=n; i++)
18     {
```

Gauss Elimiantion by:-
Subash khalal

Enter the order of matrix: 3

Enter the elements of augmented matrix row-wise:

A[1][1] : 1
A[1][2] : 1
A[1][3] : 1
A[1][4] : 6
A[2][1] : 2
A[2][2] : -1
A[2][3] : 3
A[2][4] : 4
A[3][1] : 4
A[3][2] : 5
A[3][3] : -10
A[3][4] : 13

The solution is:

x1=2.000000
x2=3.000000
x3=1.000000

Process exited after 72.72 seconds with return value 0
Press any key to continue . . .

The value of x_1 x_2 x_3 are found by using C-programming i.e. 2, 3, 1 respectively which was highlighted on output screen.

Using Matlab.

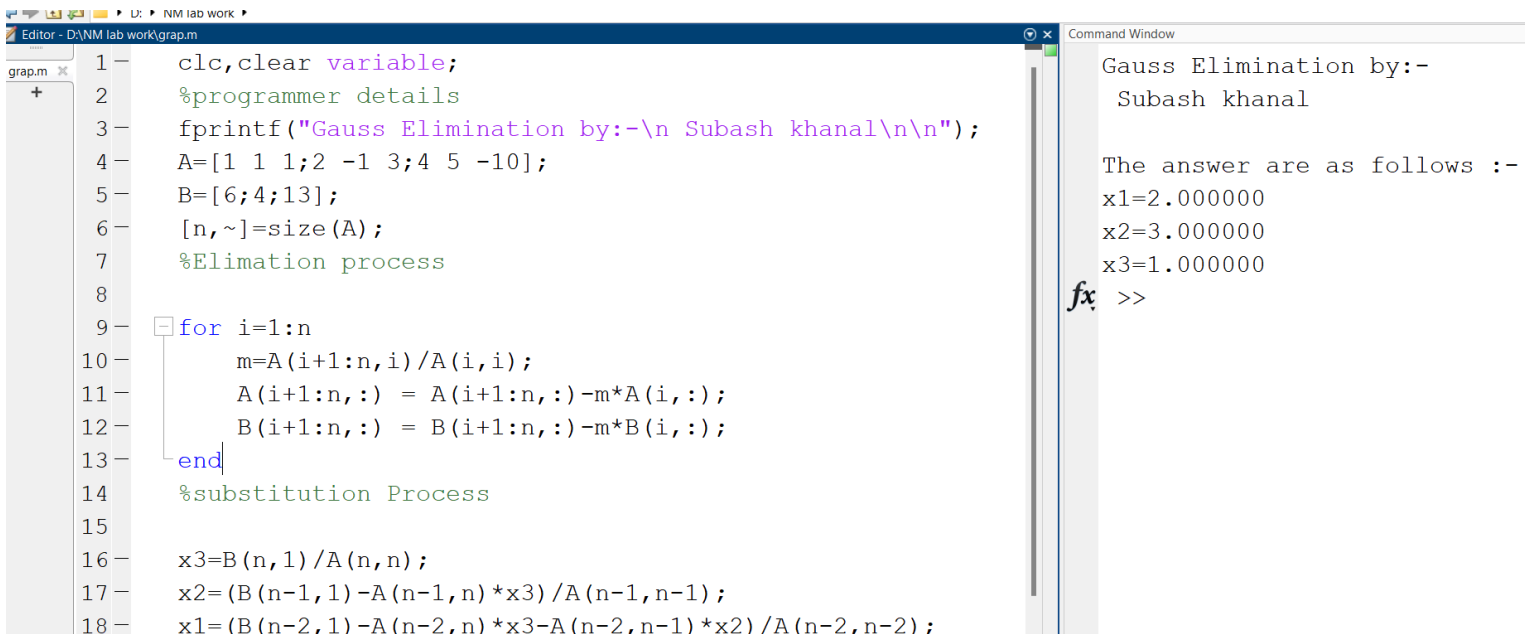
Syntax:-

```
clc,clear variable;
%programmer details
fprintf("Gauss Elimination by:-\n Subash
khanal\n\n");
A=[1 1 1;2 -1 3;4 5 -10];
B=[6;4;13];
[n,~]=size(A);
%Elimination process

for i=1:n
    m=A(i+1:n,i)/A(i,i);
    A(i+1:n,:)=A(i+1:n,:)-m*A(i,:);
    B(i+1:n,:)=B(i+1:n,:)-m*B(i,:);
end
%substitution Process

x3=B(n,1)/A(n,n);
x2=(B(n-1,1)-A(n-1,n)*x3)/A(n-1,n-1);
x1=(B(n-2,1)-A(n-2,n)*x3-A(n-2,n-1)*x2)/A(n-
2,n-2);
disp('The answer are as follows :-');
fprintf('x1=%f\nx2=%f\nx3=%f\n ',x1,x2,x3);
```


Output:-



The screenshot shows a MATLAB editor window with a script named 'grap.m'. The script implements a Gauss Elimination algorithm. It starts with clearing the workspace and displaying the programmer's name. It then defines matrices A and B, and proceeds with the elimination process using a for loop. After the elimination, it calculates the values of x1, x2, and x3 using back substitution. The command window on the right shows the output of the script, which matches the results mentioned in the text.

```
1 clc,clear variable;  
2 %programmer details  
3 fprintf("Gauss Elimination by:-\n Subash khanal\n\n");  
4 A=[1 1 1;2 -1 3;4 5 -10];  
5 B=[6;4;13];  
6 [n,~]=size(A);  
7 %Elimination process  
8  
9 for i=1:n  
10     m=A(i+1:n,i)/A(i,i);  
11     A(i+1:n,:)=A(i+1:n,:)-m*A(i,:);  
12     B(i+1:n,:)=B(i+1:n,:)-m*B(i,:);  
13 end  
14 %substitution Process  
15  
16 x3=B(n,1)/A(n,n);  
17 x2=(B(n-1,1)-A(n-1,n)*x3)/A(n-1,n-1);  
18 x1=(B(n-2,1)-A(n-2,n)*x3-A(n-2,n-1)*x2)/A(n-2,n-2);
```

Gauss Elimination by:-
Subash khanal

The answer are as follows :-
x1=2.000000
x2=3.000000
x3=1.000000
fx >>

Using Matlab the value of x_1 x_2 x_3 are found to **2, 3, 1** respectively.

Description:-

From above program of c-programming and Matlab it was clear that value are same using Gauss Elimination method. So, using above program we can find the x_1 x_2 x_3 are found to 2, 3, 1 respectively.

Conclusion:-

Hence, from above we can implement and calculate the value using the Gauss Elimination on Matlab and C-programming.