Date -
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PRACTICAL 9

- **Objective:** To write a C++ program for finding the solution of equations using Gauss Elimination method.

- **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

- **Practical Code:**

```
#include<iostream>
#include<iomanip>
#include<math.h>
#include<stdlib.h>
#define SIZE 10
using namespace std;

int main() {
   float a[SIZE][SIZE], x[SIZE], ratio;
   int i,j,k,n;
   cout<< setprecision(3)<< fixed;
   cout<<"Enter number of unknowns: ";
   cin>>n;
   cout<<"Enter Coefficients of Augmented Matrix: "<< endl;
   for(i=1;i<=n;i++) {
      for(j=1;j<=n+1;j++) {
         cout<<"a["<< i<<"]["<< j<<"]= ";
         cin>>a[i][j];
      }
   }
   for(i=1;i<=n-1;i++) {
      if(a[i][i] == 0.0) {
         cout<<"Mathematical Error!";
         exit(0);
      }
      for(j=i+1;j<=n;j++) {
         ratio = a[j][i]/a[i][i];
               for(k=1;k<=n+1;k++) {
            a[j][k] = a[j][k] - ratio*a[i][k];
         }
      }
   }
   x[n] = a[n][n+1]/a[n][n];
```

```
    for(i=n-1;i>=1;i--) {
       x[i] = a[i][n+1];
       for(j=i+1;j<=n;j++) {
          x[i] = x[i] - a[i][j]*x[j];
       }
            x[i] = x[i]/a[i][i];
    }

    cout<< endl<<"Solution: "<< endl;
    for(i=1;i<=n;i++) {
       cout<<"x["<< i<<"] = "<< x[i]<< endl;
    }

    return 0;
}
```

- **Output:**

```
Enter number of unknowns: 3
Enter Coefficients of Augmented Matrix:
a[1][1]= 2
a[1][2]= -1
a[1][3]= 3
a[1][4]= 9
a[2][1]= 1
a[2][2]= 1
a[2][3]= 1
a[2][4]= 6
a[3][1]= 1
a[3][2]= -1
a[3][3]= 1
a[3][4]= 2

Solution:
x[1] = 1.000
x[2] = 2.000
x[3] = 3.000
```

- **Application:**

a. Used for solving system of linear equations.