

LAB 3 Code

SUBJECT :MATHEMATICS FOR EMBEDDED SYSTEMS

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PROGRAM:

```
#include <iostream>
using namespace std;

int main() {
    float A[50][50],L[50][50],U[50][50],c1 = 0,X[50],b[50],sum;
    int i,j,n,m;
    cout << "Enter the number of variables" << "\n";
    cin >> n;
    cout << "Enter the number of equations" << "\n";
    cin >> m;
    if( m<n)
    {
        cout << "Calculation not possible" << "\n";
        return 0;
    }
    for(i=0;i<m;i++)
    {
        cout << "Enter the equation \n";
        for(j=0;j<=n;j++)
        {
            if(j==i)
            {
                L[i][j] = 1;
            }
            else if(j==(n-1))
            {
                L[i][j] = A[i][j];
            }
            else
            {
                L[i][j] = 0;    // Assigning values to the matrix A and partially to L and U
            }

            cin >> A[i][j];
            U[i][j] = A[i][j];
        }
    }

    for(i=0;i<(m-1);i++)
    {
        for(j=(i+1);j<(m);j++)
        {
            c1 = (A[j][i])/(A[i][i]);
            if(i<j)
            {
                L[j][i] = c1; // Making L matrix of LU
            }
        }
    }
}
```

```

        for(int k=0;k<n;k++)
        {
            A[j][k] = A[j][k] - c1*(A[i][k]); // Making U matrix of LU
            U[j][k] = A[j][k];
        }
    }
}
for(i=0;i<m;i++)
{
    for(j=0;j<=(n-1);j++)
    {
        cout <<A[i][j]<<"\t"; //To display A matrix
    }
    cout << "\n";
}
cout << "\n";
cout << "U = \n";
for(i=0;i<m;i++)
{
    for(j=0;j<=(n-1);j++)
    {
        cout<<U[i][j]<<"\t"; //To display U matrix
    }
    cout<< "\n";
}
cout << " \n L = \n";
for(i=0;i<m;i++)
{
    for(j=0;j<=(n-1);j++)
    {
        cout <<L[i][j]<<"\t"; //To display L matrix
    }
    cout << "\n";
}
cout << "\n";

for(i=0;i<n;i++)
{
    sum=0; //forward substitution method
    for(j=0;j<i;j++)
    {
        sum+=L[i][j]*b[j];
    }
    b[i]=(A[i][m]-sum)/L[i][i];
}
for(i=(m-1);i>=0;i--)
{
    sum = 0;
    for(j=(m-1);j>i;j--)
    {
        sum +=(U[i][j]*X[j]); // backward substitution
    }
    if(U[i][i]==0)
    {
        cout << " Backward substitution not possible in this program";
    }
}

```

```

        return 0;
    }
    else
        X[i] = (b[i]-sum)/U[i][i];
}

for(i=0;i<m;i++)
{
cout <<"b" <<(i+1) << "=" << b[i] <<"\n";           // Display forward
substitution result
}
cout <<"\n";
for(i=0;i<m;i++)
{
cout <<"X" <<(i+1) << "=" << X[i] <<"\n";           // Display final result
}

return 0;
}

```

OUTPUT:

The screenshot shows the Eclipse IDE with the file `LU.cpp` open. The console output is as follows:

```

<terminated> (exit value: 0) LU [C/C++ Application] /home/stebin/eclips
Enter the number of variables
3
Enter the number of equations
3
Enter the equation
1 2 4 3
Enter the equation
3 8 14 13
Enter the equation
2 6 13 4
1 2 4
0 2 2
0 0 3

U =
1 2 4
0 2 2
0 0 3

L =
1 0 0
3 1 0
2 1 1

b1=3
b2=4
b3=-6

X1=3
X2=4
X3=-2

```