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SE-C Comp,Viit,Pune

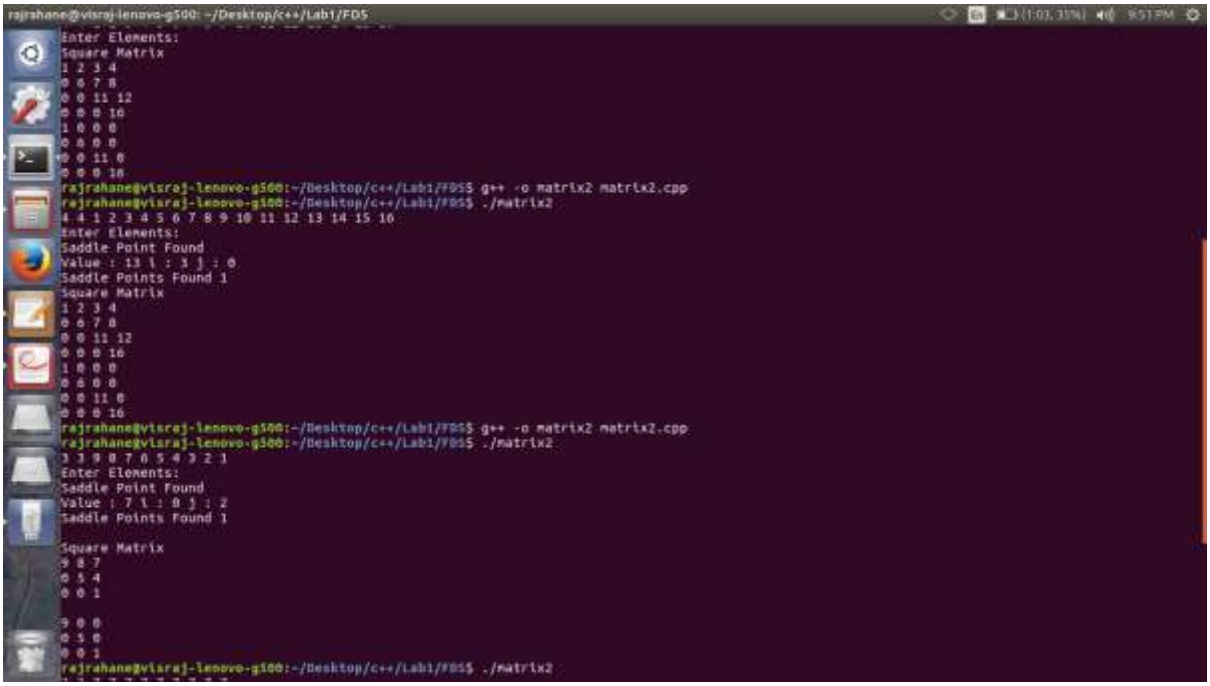
Aim- To find Upper and Lower Triangular Matrix and Saddle Point

CODE:

```
#include<iostream>
using namespace std;
typedef struct Matrix{
	int *matrix;
	int rows,columns;
}Matrix;
enum TriangularMatrix{FULL=0,UPPER=1,LOWER=2};
Matrix createMatrix(int rows,int columns){
	Matrix m;
	m.matrix=new int[rows*columns];
	m.rows=rows;
	m.columns=columns;
	cout<<"Enter Elements:\n";
	for(int i=0;i<rows;i++){
		for(int j=0;j<columns;j++){
			cin>>*((m.matrix+i*columns) + j);
		}
	}
	return m;
}
void printMatrix(Matrix m){
	for(int i=0;i<m.rows;i++){
		for(int j=0;j<m.columns;j++)
			cout<<*((m.matrix+i*m.columns)+ j)<<" ";
		cout<<endl;
	}
}
Matrix getTriangularMatrixOf(Matrix m,TriangularMatrix matrixType){
	for(int i=0;i<m.rows;i++){
		for(int j=0;j<m.columns;j++){
			if(matrixType==UPPER){
				if(j<i)
					*((m.matrix+i*m.columns)+j)=0;
			}
			else if(matrixType==LOWER){
				if(i<j)
					*((m.matrix+i*m.columns)+j)=0;
			}
		}
	}
	return m;
}
void findSaddlePoints(Matrix m){
	int saddlePoints=0,i,j,k;int minElementInRow,columnIndexOfMinElement;
	if(m.rows==m.columns)
	{for(i=0;i<m.rows;i++){

	minElementInRow=*((m.matrix+i*m.columns)+0);columnIndexOfMinElement=0
;
		for(j=1;j<m.columns;j++){		//find the min element in
i'th row
			if(minElementInRow>*((m.matrix+i*m.columns)+j)){
				minElementInRow=*((m.matrix+i*m.columns)+j);
```

```
                        columnIndexOfMinElement=j;          //set the
column of that min element
                  }
            }
            for(k=0;k<m.rows;k++){

      if(minElementInRow<*((m.matrix+k*m.columns)+columnIndexOfMinElement))
{
                        break;            //not a saddle point,not a max
element in its column
                  }
            }
            if(k==m.rows){          //saddle point found
                  saddlePoints++;
                  cout<<"Saddle Point Found\n";
                  cout<<"Value : "<<minElementInRow<<" i : "<<i<<" j :
"<<columnIndexOfMinElement<<endl;
            }
      }
      }
      cout<<"Saddle Points Found "<<saddlePoints<<endl;
}
/*void findSaddlePoint(Matrix m){
      int minInRow[m.rows]={0},maxInColumn[m.columns]={0};
      for(int i=0;i<m.rows<i++){
            for(int j=0;j<m.columns;j++){
                  if(*((m.matrix+i*m.columns)+j)>maxInColumn[i])
                        maxInColumn[i]=*((m.matrix+i*m.columns)+j);
                  if(*((m.matrix+j*m.columns)+i)<minInRow[i])
                        minInRow[i]
            }
      }
}*/

int main(){
      int r,c;
      cin>>r>>c;
      Matrix matrix=createMatrix(r,c);
      findSaddlePoints(matrix);
      if(r==c){
            cout<<"\nSquare Matrix\n";
            Matrix utMatrix=getTriangularMatrixOf(matrix,UPPER);
            printMatrix(utMatrix);cout<<endl;
            Matrix ltMatrix=getTriangularMatrixOf(matrix,LOWER);
            printMatrix(ltMatrix);
      }
      else{
            cout<<"Not a Sqare Matrix";
      }
      return 0;
}
```

Output:


rajrahane@visraj-lenovo-g500: ~/Desktop/c++/Lab1/FDS
Enter Elements:
Square Matrix
1 2 3 4
0 6 7 8
0 0 11 12
0 0 0 16
1 0 0 0
0 6 0 0
0 0 11 0
0 0 0 16
rajrahane@visraj-lenovo-g500:~/Desktop/c++/Lab1/FDS$ g++ -o matrix2 matrix2.cpp
rajrahane@visraj-lenovo-g500:~/Desktop/c++/Lab1/FDS$ ./matrix2
4 4 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Enter Elements:
Saddle Point Found
Value : 13 i : 3 j : 0
Saddle Points Found 1
Square Matrix
1 2 3 4
0 6 7 8
0 0 11 12
0 0 0 16
1 0 0 0
0 6 0 0
0 0 11 0
0 0 0 16
rajrahane@visraj-lenovo-g500:~/Desktop/c++/Lab1/FDS$ g++ -o matrix2 matrix2.cpp
rajrahane@visraj-lenovo-g500:~/Desktop/c++/Lab1/FDS$ ./matrix2
3 3 9 8 7 6 5 4 3 2 1
Enter Elements:
Saddle Point Found
Value : 7 i : 0 j : 2
Saddle Points Found 1
Square Matrix
9 8 7
0 5 4
0 0 1
9 0 0
0 5 0
0 0 1
rajrahane@visraj-lenovo-g500:~/Desktop/c++/Lab1/FDS$ ./matrix2