**Assignment Number:01**

**Subject:Data Structure And Algorithms**

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**Division:B**

**Batch:B1**

* **PROBLEM STATEMENT:-**

Write C/C++ program for storing matrix. Write functions for

a) Check whether given matrix is upper triangular or not

* Compute summation of diagonal elements
* Compute transpose of matrix
* Add, subtract and multiply two matrices

**Code:-**

#include <iostream>

using namespace std;

struct Matrix

{

int a[5][5],m;

}p;

void accept()

{

cout<<"Enter the order of the square matrix ";

cin>>p.m;

cout<<"Enter the square matrix "<<endl;

for(int i=0;i<p.m;i++)

{

for(int j=0;j<p.m;j++)

cin>>p.a[i][j];

}

}

void trans()

{

cout<<"The transpose of matrix is\n";

for(int i=0;i<p.m;i++)

{

for(int j=0;j<p.m;j++)

{

cout<<p.a[j][i]<<" ";

}

cout<<endl;

}

}

void diagsum()

{

int sum=0;

for(int i=0;i<p.m;i++)

{

for(int j=0;j<p.m;j++)

{

if(i==j)

sum=sum+p.a[i][j];

}

}

cout<<"The sum of diagonal elements of matrix is "<<sum<<endl;

cout<<"\n";

}

void upchk()

{

int upper=0;

for(int i=0;i<p.m;i++)

{

for (int j = 0; j<p.m ; j++)

{

if(i<=j)

{

if (p.a[i][j]==0)

{

upper=1;

}

}

else //i>j

{

if(p.a[i][j]!=0)

{

upper=upper+1;

}

}

}

}

if(upper==0)

{

cout<<"Matrix is an upper triangular matrix "<<endl;

}

else

{

cout<<"Not an upper triangular matrix"<<endl;

}

cout<<"\n\n Matrix :\n";

for(int i=0; i< p.m ; i++)

{

for (int j = 0; j< p.m ; j++)

cout<<p.a[i][j] << " ";

cout<< endl;

}

cout<<"\n";

}

void arit()

{

int b[5][5],c[5][5];

cout<<"Enter the second square matrix ";

for(int i=0;i<p.m;i++)

{

for(int j=0;j<p.m;j++)

cin>>b[i][j];

}

for(int i=0;i<p.m;i++)

{

for(int j=0;j<p.m;j++)

c[i][j]=p.a[i][j]+b[i][j];

}

cout<<"\nThe sum of the matrices are\n";

for(int i=0;i<p.m;i++)

{

for(int j=0;j<p.m;j++)

cout<<c[i][j]<<" ";

cout<<"\n";

}

for(int i=0;i<p.m;i++)

{

for(int j=0;j<p.m;j++)

c[i][j]=p.a[i][j]-b[i][j];

}

cout<<"\nThe difference of the matrices is\n";

for(int i=0;i<p.m;i++)

{

for(int j=0;j<p.m;j++)

cout<<c[i][j]<<" ";

cout<<"\n";

}

for(int i=0;i<p.m;i++)

{

for(int j=0;j<p.m;j++)

{

c[i][j]=0;

for(int k=0;k<p.m;k++)

c[i][j]=c[i][j]+p.a[i][j]\*b[i][j];

}

}

cout<<"\nThe multiplication of the matrices is\n";

for(int i=0;i<p.m;i++)

{

for(int j=0;j<p.m;j++)

cout<<c[i][j]<<" ";

cout<<"\n";

}

}

int main()

{

int ch;

do

{

cout<<"\n\*\*\*\*Choice menu\*\*\*\*\n";

cout<<"1.Enter first matrix \n";

cout<<"2.Transpose matrix\n";

cout<<"3.Diagonal sum of matrix\n";

cout<<"4.Check upper triangle matrix\n";

cout<<"5.Enter another matrix and addition,subtraction,multication of matrices\n";

cout<<"6.Exit\n";

cout<<"Enter your choice : ";

cin>>ch;

cout<<"\n";

switch(ch)

{

case 1:accept();

break;

case 2:trans();

break;

case 3:diagsum();

break;

case 4:upchk();

break;

case 5:arit();

break;

case 6:break;

}

}while(ch!=6);

}

**OUTPUT**

\*\*\*\*Choice menu\*\*\*\*

1.Enter first matrix

2.Transpose matrix

3.Diagonal sum of matrix

4.Check upper triangle matrix

5.Enter another matrix and addition,subtraction,multication of matrices

6.Exit

Enter your choice : 1

Enter the order of the square matrix 3

Enter the square matrix

1 2 3 4 5 6 7 8 9

\*\*\*\*Choice menu\*\*\*\*

1.Enter first matrix

2.Transpose matrix

3.Diagonal sum of matrix

4.Check upper triangle matrix

5.Enter another matrix and addition,subtraction,multication of matrices

6.Exit

Enter your choice : 2

The transpose of matrix is

1 4 7

2 5 8

3 6 9

\*\*\*\*Choice menu\*\*\*\*

1.Enter first matrix

2.Transpose matrix

3.Diagonal sum of matrix

4.Check upper triangle matrix

5.Enter another matrix and addition,subtraction,multication of matrices

6.Exit

Enter your choice : 3

The sum of diagonal elements of matrix is 15

\*\*\*\*Choice menu\*\*\*\*

1.Enter first matrix

2.Transpose matrix

3.Diagonal sum of matrix

4.Check upper triangle matrix

5.Enter another matrix and addition,subtraction,multication of matrices

6.Exit

Enter your choice : 4

Not an upper triangular matrix

Matrix :

1 2 3

4 5 6

7 8 9

\*\*\*\*Choice menu\*\*\*\*

1.Enter first matrix

2.Transpose matrix

3.Diagonal sum of matrix

4.Check upper triangle matrix

5.Enter another matrix and addition,subtraction,multication of matrices

6.Exit

Enter your choice : 5

Enter the second square matrix 9 8 7 6 5 4 3 2 1

The sum of the matrices are

10 10 10

10 10 10

10 10 10

The difference of the matrices is

-8 -6 -4

-2 0 2

4 6 8

The multiplication of the matrices is

27 48 63

72 75 72

63 48 27

\*\*\*\*Choice menu\*\*\*\*

1.Enter first matrix

2.Transpose matrix

3.Diagonal sum of matrix

4.Check upper triangle matrix

5.Enter another matrix and addition,subtraction,multication of matrices

6.Exit

Enter your choice : 6

* **CONCLUSION:**

Through this program we understand concept of 2D array and matrix operations that can be performed on it.