LAB VIII

1. Run the following program and examine the output.

```
#include <stdio.h>
#define M 6
#define N 6
void matprint1(double [][N],int,int,char);
void matprint2(double (*)[N],int,int,char);
int main()
{
double a[M][N],*p,*q[4],(*s)[N];
int m,n,i,j;
m=3;            // m actual row dimension
n=4;           //  n actual column dimension
for(i=0;i<m;i++)
  {
    for(j=0;j<n;j++)
    {
      a[i][j]=(i+j+2)*(i+j+2);
    }
  }
matprint1(a,m,n,'A');
printf("\n--------------\n");
printf("%p  %p  %p  %p\n",a,a[0],a+1,a[0]+N);
printf("%0.2lf  %0.2lf  %0.2lf  %0.2lf\n",**a,*a[0],**(a+1),*(a[0]+N));
q[0]=a[1];
q[1]=a[0];
printf("%0.2lf  %0.2lf  %0.2lf  %0.2lf\n",q[0][2],q[1][2],q[0][8],q[1][8]);
p=&a[1][2];
printf("%0.2lf  %0.2lf\n",p[1],p[-7]);
printf("%0.2lf  %0.2lf  %0.2lf\n",*(a[1]+2),a[1][2],*(*a+N*1+2));
printf("%0.2lf  %0.2lf  %0.2lf\n",*(&a[1][0]+2),(*(a+1))[2],*(&a[0][0]+N*1+2));
s=&a[1];
printf("%0.2lf  %0.2lf\n",s[0][2],s[1][2]);
printf("--------------\n");
matprint2(a,m,n,'A');
return 0;
}
void matprint1(double a[][N],int m,int n,char name)
{
int i,j;
printf("The matrix %c is:\n",name);
for(i=0;i<m;i++)
  {
        for(j=0;j<n;j++)
        {
                printf("%0.2lf  ",a[i][j]);
        }
        printf("\n");
  }
```

```
}

void matprint2(double (*a)[N],int m,int n,char name)
{
int i,j;
printf("The matrix %c is:\n",name);
for(i=0;i<m;i++)
  {
        for(j=0;j<n;j++)
        {
                printf("%0.2lf  ",a[i][j]);
        }
        printf("\n");
  }
}
```

2. Create a data file **matA.dat** with data for matrix **A**

```
2 3
1.0  0  4.0
-2.0 4.0  1.0
```

and a data file **matB.dat** with data for matrix **B**

```
3  4
2.0  0.0  5.0    1.0
4.0  0.0  -6.0   1.0
5.0  1.0   2.0   1.0
```

In each data file, the first line contains the row and column dimensions of the matrices and then the matrix elements stored row-wise.

Copy the given code (omitting the comments) with modifications at appropriate places (see the comment parts of the program). After completion of the function **matread**, rowA (resp. rowB) and colA (resp. colB) contain the row and column dimensions of A (resp. B) and the respective components are stored in A and B. These are read from the files matA.dat and matB.dat. The function **matprintt** prints a matrix in the terminal. After completion of the function **matmul**, flag=0 if the matrix multiplication AB is not possible. Otherwise, rowC and colC contain the row and column dimensions of C with C=AB and flag=1. After completion of the function **matprintf**, the matrix C is written in matC.dat with row and column dimensions in the first line and then the matrix components row-wise.

```
#include <stdio.h>
#include <stdlib.h>
#define N 100
//Write the prototypes of the functions matread,matprintt,matprintf,matmul here
int main()
{
  int rowA,colA,rowB,colB,rowC,colC,flag;
  double A[N][N],B[N][N],C[N][N];
```

```
        matread(&rowA,&colA,A,"matA.dat");  //read matrix A
        matprintt('A',rowA,colA,A);          //print matrix A in the terminal
        matread(&rowB,&colB,B,"matB.dat");  //read matrix B
        matprintt('B',rowB,colB,B);          //print matrix B in the terminal
        flag=matmul(rowA,colA,rowB,colB,&rowC,&colC,A,B,C); //C=AB
        if(flag==0)
        {
         printf("Matrices A and B are incompatiable for multiplication\n");
        }
        else
        {
        matprintt('C',rowC,colC,C);             //print matrix C in the terminal
        matprintf(rowC,colC,C,"matC.dat");   //print matrix C in the file "matC.dat"
        }

    return 0;
    }
    //Write details of function matmul here
    //Write details of function matprintt here
    //Write details of function matread here
    //Write details of function matprintf here
```

Expected input:
For matA.dat

```
2 3
1.0  0  4.0
-2.0 4.0  1.0
```

and matB.dat

```
3  4
2.0  0.0  5.0    1.0
4.0  0.0  -6.0   1.0
5.0  1.0   2.0   1.0
```

Expected output:

```
The matrix A is:
1.00  0.00  4.00
-2.00  4.00  1.00
The matrix B is:
2.00  0.00  5.00  1.00
4.00  0.00  -6.00  1.00
5.00  1.00  2.00  1.00
The matrix C is:
22.00  4.00  13.00  5.00
17.00  1.00  -32.00  3.00
```

Content of matC.dat

```
2  4
22.00  4.00  13.00  5.00
17.00  1.00  -32.00  3.00
```

Expected input:
For matA.dat

```
2 4
1.0  0  4.0  5.0
-2.0 4.0  1.0  2.0
```

and matB.dat

```
3  4
2.0  0.0  5.0    1.0
4.0  0.0  -6.0   1.0
5.0  1.0   2.0   1.0
```

Expected output:

```
The matrix A is:
1.00  0.00  4.00  5.00
-2.00  4.00  1.00  2.00
The matrix B is:
2.00  0.00  5.00  1.00
4.00  0.00  -6.00  1.00
5.00  1.00  2.00  1.00
Matrices A and B are incompatiable for multiplication
```