***Assignment No. 8***

11. Implement sparse matrix using array and perform following operations on it:

a) Addition

b) Simple transpose

c) Fast transpose

Roll No: 66

Batch: - S3

#include<stdio.h>

#include <stdlib.h>

#define M 20

void printsparse(int[][3]);

void readsparse(int[][3]);

void transpose(int[][3],int[][3]);

void Fast\_transpose(int B1[M][3],int B2[M][3]);

void addsparse(int b1[M][3],int b2[M][3],int b3[M][3]);

int main()

{

int b1[M][3],b2[M][3],m,n,b3[M][3],op;

do

{

printf("\n1)Read the First Sparse Matrix");

printf("\n2)Read the second sparse matrix");

printf("\n3)Display the first matrix");

printf("\n4)Display the second matrix");

printf("\n5)Addition of two matrices");

printf("\n6)Simple transpose of the first matrix");

printf("\n7)Fast transpose of the first matrix");

printf("\n8)Quit");

printf("\nEnter your choice : ");

scanf("%d",&op);

switch(op)

{

case 1: readsparse(b1);

break;

case 2: readsparse(b2);

break;

case 3: printsparse(b1);

break;

case 4: printsparse(b2);

break;

case 5: addsparse(b1,b2,b3);

printsparse(b3);

break;

case 6: transpose(b1,b3);

printsparse(b3);

break;

case 7: Fast\_transpose(b1,b3);

printsparse(b3);

break;

case 8:

exit(0);

default : printf("Invalid Choice");

break;

}

}while(op!=8);

}

void readsparse(int b[M][3])

{

int i,t,m,n;

printf("\n Enter the size of matrix (rows,columns)");

scanf("%d%d",&m,&n);

b[0][0]=m;

b[0][1]=n;

printf("\nEnter no. of non-zero elements:");

scanf("%d",&t);

b[0][2]=t;

for(i=1;i<=t;i++)

{

printf("\n Enter the next triple(row,column,value) :");

scanf("%d%d%d",&b[i][0],&b[i][1],&b[i][2]);

}

}

void printsparse(int b[M][3])

{

int i,n;

n=b[0][2]; //no of 3-triples

printf("\nrows = %d\tcolumns = %d\tNon Zero Elements=%d",b[0][0],b[0][1],b[0][2]);

printf("\n");

for(i=1;i<=n;i++)

printf("%d\t%d\t%d\n",b[i][0],b[i][1],b[i][2]);

}

void transpose(int b1[][3],int b2[][3])

{

int i,j,k,n;

b2[0][0]=b1[0][1];

b2[0][1]=b1[0][0];

b2[0][2]=b1[0][2];

k=1;

n=b1[0][2];

for(i=0;i<b1[0][1];i++)

for(j=1;j<=n;j++)

if(i== b1[j][1])

{

b2[k][0]=i;

b2[k][1]=b1[j][0];

b2[k][2]=b1[j][2];

k++;

}

}

void Fast\_transpose(int B1[M][3],int B2[M][3])

{

int m,n,t,i,col\_num,loc;

int total[M],index[M];

m=B1[0][0];n=B1[0][1];t=B1[0][2];

B2[0][0]=n;B2[0][1]=m;B2[0][2]=t;

for(i=0;i<n;i++)

total[i]=0;

for(i=1;i<=t;i++)

{

col\_num=B1[i][1];

total[col\_num]++;

}

index[0]=1;

for(i=1;i<n;i++)

index[i]=index[i-1]+total[i-1];

for(i=1;i<=t;i++)

{

col\_num=B1[i][1];

loc=index[col\_num];

index[col\_num]++;

B2[loc][0]=B1[i][1];

B2[loc][1]=B1[i][0];

B2[loc][2]=B1[i][2];

}

}

void addsparse(int b1[M][3],int b2[M][3],int b3[M][3])

{

int t1,t2,i,j,k;

t1=b1[0][2];

t2=b2[0][2];

i=j=k=0;

b3[0][0]=b1[0][0];

b3[0][1]=b1[0][1];

while(i<=t1 && j<=t2)

{

if(b1[i][0] < b2[j][0])

{

b3[k][0]=b1[i][0];

b3[k][1]=b1[i][1];

b3[k][2]=b1[i][2];

k++;

i++;

continue;

}

if(b2[j][0] < b1[i][0])

{

b3[k][0]=b2[j][0];

b3[k][1]=b2[j][1];

b3[k][2]=b2[j][2];

k++;

j++;

continue;

}

if(b1[i][1] < b2[j][1])

{

b3[k][0]=b1[i][0];

b3[k][1]=b1[i][1];

b3[k][2]=b1[i][2];

k++;

i++;

continue;

}

if(b2[j][1] < b1[i][1])

{

b3[k][0]=b2[j][0];

b3[k][1]=b2[j][1];

b3[k][2]=b2[j][2];

k++;

j++;

continue;

}

b3[k][0]=b1[i][0];

b3[k][1]=b1[i][1];

b3[k][2]=b1[i][2]+b2[j][2];

k++;

i++;

j++;

}

while(i<=t1)

{

b3[k][0]=b1[i][0];

b3[k][1]=b1[i][1];

b3[k][2]=b1[i][2];

i++;

k++;

}

while(j<=t2)

{

b3[k][0]=b2[j][0];

b3[k][1]=b1[j][1];

b3[k][2]=b1[j][2];

j++;

k++;

}

b3[0][2]=k-1;

}

---------------OUTPUT-------------

1)Read the First Sparse Matrix

2)Read the second sparse matrix

3)Display the first matrix

4)Display the second matrix

5)Addition of two matrices

6)Simple transpose of the first matrix

7)Fast transpose of the first matrix

8)Quit

Enter your choice : 1

Enter the size of matrix (rows,columns)4 4

Enter no. of non-zero elements:2

Enter the next triple(row,column,value) :0

1

5

Enter the next triple(row,column,value) :3

2

15

1)Read the First Sparse Matrix

2)Read the second sparse matrix

3)Display the first matrix

4)Display the second matrix

5)Addition of two matrices

6)Simple transpose of the first matrix

7)Fast transpose of the first matrix

8)Quit

Enter your choice : 2

Enter the size of matrix (rows,columns)4 4

Enter no. of non-zero elements:3

Enter the next triple(row,column,value) :3

0

8

Enter the next triple(row,column,value) :1

1

9

Enter the next triple(row,column,value) :2

3

5

1)Read the First Sparse Matrix

2)Read the second sparse matrix

3)Display the first matrix

4)Display the second matrix

5)Addition of two matrices

6)Simple transpose of the first matrix

7)Fast transpose of the first matrix

8)Quit

Enter your choice : 3

rows = 4 columns = 4 Non Zero Elements=2

0 1 5

3 2 15

1)Read the First Sparse Matrix

2)Read the second sparse matrix

3)Display the first matrix

4)Display the second matrix

5)Addition of two matrices

6)Simple transpose of the first matrix

7)Fast transpose of the first matrix

8)Quit

Enter your choice : 4

rows = 4 columns = 4 Non Zero Elements=3

3 0 8

1 1 9

2 3 5

1)Read the First Sparse Matrix

2)Read the second sparse matrix

3)Display the first matrix

4)Display the second matrix

5)Addition of two matrices

6)Simple transpose of the first matrix

7)Fast transpose of the first matrix

8)Quit

Enter your choice : 5

rows = 4 columns = 4 Non Zero Elements=5

0 1 5

3 0 8

1 1 9

2 3 5

3 2 15

1)Read the First Sparse Matrix

2)Read the second sparse matrix

3)Display the first matrix

4)Display the second matrix

5)Addition of two matrices

6)Simple transpose of the first matrix

7)Fast transpose of the first matrix

8)Quit

Enter your choice : 6

rows = 4 columns = 4 Non Zero Elements=2

1 0 5

2 3 15

1)Read the First Sparse Matrix

2)Read the second sparse matrix

3)Display the first matrix

4)Display the second matrix

5)Addition of two matrices

6)Simple transpose of the first matrix

7)Fast transpose of the first matrix

8)Quit

Enter your choice : 7

rows = 4 columns = 4 Non Zero Elements=2

1 0 5

2 3 15

1)Read the First Sparse Matrix

2)Read the second sparse matrix

3)Display the first matrix

4)Display the second matrix

5)Addition of two matrices

6)Simple transpose of the first matrix

7)Fast transpose of the first matrix

8)Quit

Enter your choice : 8