2021

DATA STRUCTURE& ANALYSIS OF ALGORITHMS LAB [kca-253]

ACCURATE INSTITUTE OF MANAGEMENT & TECHNOLOGY |  GREATER NOIDA 201306

**SHUBHAM PATKAR**

MCA 1ST YEAR

 Accurate institute of management & technology

Session 2020-21

Practical file

DATA STRUCTURE& ANALYSIS OF ALGORITHMS LAB [kca-253]

Under guidance of:- Submitted by :-

Prof. v.k pallaw Shubham patkar

Mca dept. Mca 1st

h.o.d

**INDEX**

|  |  |  |  |
| --- | --- | --- | --- |
| **SR. NO.** | **PROGRAM** | **PAGE NO.** | **TEACHER REMARKS** |
| **1.** | To implement addition and multiplication of two 2D arrays**.** | **4-9** |  |
| **2** | To transpose a 2D array | **10-11** |  |
| **3** | To implement stack using array | **12-14** |  |
| **4** | To implement queue using array**.** | **15-16** |  |
| **5** | To implement circular queue using array. | **17-19** |  |
| **6** | To implement stack using linked list. | **20-22** |  |
| **7** | To implement queue using linked list**.** | **23-26** |  |
| **8** | To implement BFS using linked list**.** | **27-28** |  |
| **9** | To implement DFS using linked list. | **29-31** |  |
| **10** | To implement Linear Search**.** | **32-33** |  |
| **11** | To implement Binary Search**.** | **34-35** |  |
| **12** | To implement Bubble Sorting. | **36** |  |
| **13** | To implement Selection Sorting**.** | **37** |  |
| **14** | To implement Insertion Sorting. | **38** |  |
| **15** | To implement Merge Sorting.**.** | **39-40** |  |
| **16** | To implement Heap Sorting**.** | **41-42** |  |
| **17** | To implement Matrix Multiplication by strassen’s algorithm**.** | **43-44** |  |
| **18** | Find Minimum Spanning Tree using Kruskal’s Algorithm**.** | **45-46** |  |

# PROGRAM-1

**To implement addition and multiplication of 2D arrays**.

**ADDITION:-**

#include<stdio.h>

#include<stdlib.h>

#include<conio.h>

#define row 10

#define col 10

int i,j;

int row1, col1;

int row2, col2;

float mat1[row][col];

float mat2[row][col];

float mat\_res[row][col];

void mat\_add(float mat1[row][col],int,int,float mat2[row][col],int,int,float mat\_res[row][col]);

void display(float mat[row][col],int,int); void input(float mat[row][col],int,int);

void mat\_add(float mat1[row][col], int row1,int col1,float mat2[row][col],int row2, int col2, float mat\_res[row][col]);

{

int i,j;

if((row1==row2)&&(col1==col2))

{

printf("\nAddition is possible and Result is as follows\n"); for(i=0;i<row;i++)

for(j=0;j<col;j++)

mat\_res[i][j]=mat1[i][j]+mat2[i][j];

display(mat\_res,row1,col1);

}

else

printf("\nAddition is not possible\n");

exit(0);

}

void display(float mat[row][col],int r,int c)

{

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

{

for(j=0;j<c;j++)

{

printf("%f",mat[i][j]);

}

printf("\n");

} }

void input(float mat[row][col],int r,int c)

{

for(i=0;i<r;i++) { for(j=0;j<c;j++) {

printf("Input value for: %d:%d:",i+1,j+1);

scanf("%f",&mat[i][j]);

}

} } void main()

{

clrscr(); int row1,col1; int row2,col2;

float mat1[row][col];

float mat2[row][col];

float mat\_res[row][col];

printf("\nInput the row of the matrix->1:");

scanf("%d",&row1);

printf("\nInput the col of the matrix->1:");

scanf("%d",&col1); printf("\nInput data for matrix-> 1\n"); input(mat1,row1,col1);

printf("\nInput the row of the matrix->2:");

scanf("%d",&row2);

printf("\nInput the col of the matrix->2:");

scanf("%d",&col2);

printf("\nInput data for matrix-> 2\n");

input(mat2,row2,col2);

printf("\nEntered Matrix First is as follows:\n"); display(mat1,row1,col1);

printf("\nEntered Matrix Two is as follows:\n"); display(mat2,row2,col2);

mat\_add(mat1,row1,col1,mat2,row2,col2,mat\_res);

}

## OUTPUT:-

Input the row of the matrix->1:3

Input the col of the matrix->1:3

Input data for matrix->1

Input value for : 1 : 1: 11

Input value for : 1 : 2: 22

Input value for : 1 : 3: 33

Input value for : 2 : 1: 44

Input value for : 2 : 2: 55

Input value for : 2 : 3: 66

Input value for : 3 : 1: 77

Input value for : 3 : 2: 88

Input value for : 3 : 3: 99

Input the row of the matrix->2:3

Input the col of the matrix->2:3

Input data for matrix->2

Input value for : 1 : 1: 1

Input value for : 1 : 1: 2

Input value for : 1 : 1: 3

Input value for : 2 : 2: 4

Input value for : 2 : 2: 5

Input value for : 2 : 2: 6

Input value for : 3 : 3: 7

Input value for : 3 : 3: 8

Input value for : 3 : 3: 9 Entered Matrix First is as follows:

11 22 33

44 55 66

77 88 99

Entered Matrix Two is as follows:

1 2 3

4 5 6

7 8 9

Addition is possible and Result is as follows:

12 24 36

48 60 72

84 96 108

**MULTIPLICATION:-**

include<stdio.h>

#include<stdlib.h>

#include<conio.h>

#define row 10

#define col 10

int i,j;

int row1, col1;

int row2, col2;

float mat1[row][col];

float mat2[row][col];

float mat\_res[row][col];

void mat\_mult(float mat1[row][col],int,int,float mat2[row][col],int,int,float mat\_res[row][col]);

void display(float mat[row][col],int,int);

void input(float mat[row][col],int,int);

void mat\_mult(float mat1[row][col], int row1,int col1,float mat2[row][col],int row2, int col2, float mat\_res[row][col])

{

int i,j,k; if((col1==row2)

{

printf("\nMultiplication is possible and Result is as follows\n"); for(i=0;i<row1;i++)

for(j=0;j<col2;j++)

mat\_res[i][j]=0; f

or(k=0;k<col1;k++)

{

mat\_res[i][j]+=mat1[i][k]\*mat2[k][j

} }

display(mat\_res,row1,col2);

}

else

printf("\nMultiplication is not possible\n");

exit(0); }

void display(float mat[row][col],int r,int c)

{

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

{

for(j=0;j<c;j++)

{

printf("%f",mat[i][j]);

}

printf("\n");

} }

void input(float mat[row][col],int r,int c)

{

for(i=0;i<r;i++) { for(j=0;j<c;j++) {

printf("Input value for: %d: %d:",i+1,j+1);

scanf("%f",&mat[i][j]);

}

} } void main()

{

clrscr(); int row1,col1;

int row2,col2;

float mat1[row][col];

float mat2[row][col];

float mat\_res[row][col];

printf("\nInput the row of the matrix->1:");

scanf("%d",&row1);

printf("\nInput the col of the matrix->1:");

scanf("%d",&col1);

printf("\nInput data for matrix-> 1\n");

input(mat1,row1,col1);

printf("\nInput the row of the matrix->2:");

scanf("%d",&row2);

printf("\nInput the col of the matrix->2:");

scanf("%d",&col2);

printf("\nInput data for matrix-> 2\n");

input(mat2,row2,col2);

printf("\nEntered Matrix First is as follows:\n"); display(mat1,row1,col1);

printf("\nEntered Matrix Two is as follows:\n"); display(mat2,row2,col2);

mat\_mult(mat1,row1,col1,mat2,row2,col2,mat\_res);

}

## OUTPUT:-

Input the row of the matrix->1:3

Input the col of the matrix->1:3

Input data for matrix->1

Input value for : 1 : 1: 1

Input value for : 1 : 2: 2

Input value for : 1 : 3: 3

Input value for : 2 : 1: 4

Input value for : 2 : 2: 5

Input value for : 2 : 3: 6

Input value for : 3 : 1: 7

Input value for : 3 : 2: 8

Input value for : 3 : 3: 9

Input the row of the matrix->2:3

Input the col of the matrix->2:3

Input data for matrix->2

Input value for : 1 : 1: 8

Input value for : 1 : 1: 9

Input value for : 1 : 1: 7

Input value for : 2 : 2: 6

Input value for : 2 : 2: 5

Input value for : 2 : 2: 4

Input value for : 3 : 3: 3

Input value for : 3 : 3: 2

Input value for : 3 : 3: 1

Entered Matrix First is as follows:

1 2 3

4 5 6

1. 8 9

Entered Matrix Two is as follows:

1. 9 7

6 5 4

3 2 1

Multiplication is possible and Result is as follows:

29 25 18

80 73 54

131 121 90

**PROGRAM:-2**

**To implement transpose of matrix**

#include<stdio.h>

int i,j; int value;

int mat[10][10];

void display(int,int);

void display\_o(int transp[10][10],int,int);

void input(int transp[10][10],int,int);

void transpose(int transp[10][10],int,int);

void transpose(int transp[10][10],int row,int col)

{ for(i=0;i<row;i++) { for(j=0;j<col;j++)

{

mat[i][j]=transp[j][i];

}

} }

void display(int row,int col)

{ for(i=0;i<row;i++) { for(j=0;j<col;j++) {

printf("%d",mat[i][j]);

}

printf("\n");

} }

void display\_o(int transp[10][10],int row,int col)

{ for(i=0;i<row;i++) { for(j=0;j<col;j++) {

printf("%d",transp[i][j]);

}

printf("\n");

} }

void input(int transp[10][10],int row,int col)

{ for(i=0;i<row;i++) { for(j=0;j<col;j++) {

printf("Input Value for: %d: %d:",i+1,j+1);

scanf("%d",&value);

transp[i][j]=value;

}

} }

void main() {

int row,col;

int transp[10][10];

printf("\nInput the number of rows:");

scanf("%d",&row);

printf("\nInput the number of cols:");

scanf("%d",&col);

input(transp,row,col);

printf("\nEntered Matrix is as follows:\n"); display\_o(transp,row,col);

transpose(transp,col,row);

printf("\nTranspose of above matrix is as follows:\n");

display(col,row); }

**OUTPUT-**

Input the number of rows: 3

Input the number if cols: 4

Input value for : 1 : 1: 1

Input value for : 1 : 2: 2

Input value for : 1 : 3: 3

Input value for : 1 : 4: 4

Input value for : 2 : 1: 5

Input value for : 2 : 2: 6

Input value for : 2 : 3: 7

Input value for : 2 : 4: 8

Input value for : 3 : 1: 9

Input value for : 3 : 2: 10

Input value for : 3 : 3: 11

Input value for : 3 : 4: 12

Entered Matrix is as follows:

1 2 3 4

5 6 7 8

9 10 11 12

Transpose of above Matrix is as follows:

1. 5 9
2. 6 10
3. 7 11
4. 8 12

# PROGRAM-3

**To implement stack using array.**

#include <stdio.h>

#include<conio.h> #define MAXSIZE 5

struct stack {

int stk[MAXSIZE];

int top;

};

typedef struct stack STACK; STACK s;

void push (void); int pop(void);

void display (void); void main () {

int choice;

int option = 1; clrscr ();

s.top = -1;

printf ("STACK OPERATION\n");

while (option) {

printf (" 1 PUSH \n");

printf (" 2 POP \n");

printf (" 3 DISPLAY \n");

printf (" 4 EXIT \n");

printf ("Enter your choice\n");

scanf ("%d", &choice);

switch (choice)

{

case 1: push();

break;

case 2: pop();

break;

case 3: display();

break;

case 4: return;

}

fflush (stdin);

printf ("Do you want to continue(Type 0 or 1)?\n");

scanf ("%d", &option);

} }

void push ()

{

int num;

if (s.top ==(MAXSIZE - 1))

{

printf ("Stack isFull\n"); return;

}

else {

printf ("Enter the element to be pushed\n");

scanf ("%d", &num);

s.top = s.top + 1;

s.stk[s.top] = num; }

return; } int pop () {

int num; if (s.top == - 1) {

printf ("Stack is Empty\n");

return (s.top); }

else {

num = s.stk[s.top];

printf ("poped element is = %d\n", s.stk[s.top]);

s.top = s.top - 1;

}

return(num);

}

void display ()

{

int i; if (s.top == -1) {

printf ("Stack is empty\n");

return; }

else

{

printf ("\nThe status of the stack is\n");

for (i = s.top; i >= 0; i--) {

printf ("%d\n", s.stk[i]);

}

}

printf ("\n");

}

**OUTPUT:**

STACK OPERATION

1 PUSH

2 POP

3 DISPLAY

4 EXIT

Enter your choice :

1

Enter the element to be Pushed

12

Do you want to continue (Type 0 or 1)?

1

1 PUSH

2 POP

3 DISPLAY

4 EXIT

Enter your choice :

1

Enter the element to be Pushed

32

Do you want to continue (Type 0 or 1)?

1

1 PUSH

2 POP

3 DISPLAY

4 EXIT

Enter your choice :

1

Enter the element to be pushed

24

Do you want to continue (Type 0 or 1)?

1

1 PUSH

2 POP

3 DISPLAY

4 EXIT

Enter your choice :

3

The status of Stack is :

12

24

32

Do you want to continue (Type 0 or 1)?

1

1 PUSH

2 POP

3 DISPLAY

4 EXIT

Enter your choice :

2

Popped element is =12 Do you want to continue (Type 0 or 1)?

1

1 PUSH

2 POP

3 DISPLAY

4 EXIT

Enter your choice : 3

The status of Stack is :

24

32

Do you want to continue (Type 0 or 1) 0

## PROGRAM-4

**To implement queue using array.**

#include<stdio.h>

#include<conio.h>

#define MAX 50 int queue\_array[MAX];

int rear=-1;

int front=-1;

void main() {

int choice;

while(1) {

printf("1. Insert element to queue :\n");

printf("2. Delete element from queue :\n");

printf("3. Display all elements of quque :\n");

printf("4. Quit :\n");

printf("Enter your choice:");

scanf("%d",&choice);

switch(choice) {

case 1:

insert();

break; case 2:

delete();

break; case 3:

display();

break;

case 4: exit(1);

default:

printf("Wrong choice :\n");

}

}

}

insert()

{ int add\_item;

if(rear==MAX-1) printf("Queue Overflow :\n");

else { if(front==-1) front=0;

printf("Insert the element in queue :\n "); scanf("%d",&add\_item); rear=rear+1;

queue\_array[rear]= add\_item;

}}

delete() {

if(front==-1 && front>rear)

{

printf("Queue Underflow :\n");

return;

}

else {

printf("Elements deleted from quque is : %d\n",queue\_array[front]);

front= front+1;

}

}

display()

{

int i; if(front==-1)

printf("Queue is empty :\n\t");

else {

printf("Queue is :\n");

for(i=front;i<=rear;i++)

printf("%d",queue\_array[i]);

printf("\n");

}

}

**}**

## OUTPUT:-

MENU :

1.Insert into the queue

2.Delete from the queue

3.Display

4.Exit

Enter your choice :

1

Enter the item inserted :

45

After inserting queue is :

Node 1 : 45

Enter your choice :

25

Your choice is wrong

MENU :

1.Insert into the queue

2.Delete from the queue

3.Display

4.Exit

Enter your choice : 3

The queue is :

Node 1: 45

MENU :

1.Insert into the queue

2.Delete from the queue

3.Display

4.Exit

Enter your choice :

4

Exit

# PROGRAM-5

**To implement circular queue using array.**

#include<stdio.h>

#include<conio.h>

#define size 5 void insertq(int[], int); void deleteq(int[]);

void display(int[]);

int front =- 1;

int rear =- 1;

int main() {

int n, ch; int queue[size];

do

{

printf("\n\n Circular Queue:\n1. Insert \n2. Delete\n3. Display\n0. Exit");

printf("\nEnter Choice 0-3? : ");

scanf("%d", &ch); switch (ch) {

case 1: printf("\nEnter number: ");

scanf("%d", &n); insertq(queue, n);

break;

case 2: deleteq(queue);

break;

case 3: display(queue);

break; }while (ch != 0);

}

void insertq(int queue[], int item)

if ((front == 0 && rear == size - 1) || (front == rear + 1))

{

printf("queue is full");

return;

}

else if (rear == - 1)

{

rear++;

front++;

}

else if (rear == size - 1 && front > 0)

{

rear = 0;

}

else {

rear++;

}

queue[rear] = item;

}

void display(int queue[])

{

int i;

printf("\n");

if (front > rear)

{

for (i = front; i < size; i++)

{

printf("%d ", queue[i]);

}

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

printf("%d ", queue[i]);

}

else

{

for (i = front; i <= rear; i++)

printf("%d ", queue[i]);

} }

void deleteq(int queue[])

{

if (front == - 1)

{

printf("Queue is empty ");

}

else if (front == rear)

{

printf("\n %d deleted", queue[front]);

front = - 1;

rear = - 1;

}

else {

printf("\n %d deleted", queue[front]);

front++;

}

## OUTPUT-

Circular Queue :

1.Insert

2.Delete

3.Display

0.Exit

Enter choice 0-3 ? 1

Enter number : 20

Circular Queue :

1.Insert

2.Delete

3.Display

0.Exit

Enter choice 0-3 ? 1

Enter number : 40

Enter number : 20

Circular Queue :

1.Insert

2.Delete

3.Display

0.Exit

Enter choice 0-3 ?

3

20 40

Circular Queue :

1.Insert

2.Delete

3.Display 0.Exit

Enter choice 0-3 ?

**PROGRAM-6**

**To implement stack using linked list.**

#include<stdio.h> #include<stdlib.h>

struct Node { int data;

struct Node \*next;

}

\*top = NULL; // Initially the list is empty

void push(int);

void pop();

void display();

int main() {

int choice, value;

printf("\nIMPLEMENTING STACKS USING LINKED LISTS\n");

while(1){

printf("1. Push\n2. Pop\n3. Display\n4. Exit\n");

printf("\nEnter your choice : ");

scanf("%d",&choice); switch(choice)

{

case 1: printf("\nEnter the value to insert: ");

scanf("%d", &value);

push(value);

break;

case 2: pop();

break;

case 3: display();

break;

case 4: exit(0);

break;

default:

printf("\nInvalid Choice\n");

}}}

void push(int value)

{

struct Node \*newNode;

newNode = (struct Node\*)malloc(sizeof(struct Node));

newNode->data = value; // get value for the node

if(top == NULL)

newNode->next = NULL;

else

newNode->next = top; // Make the node as TOP top = newNode;

printf("Node is Inserted\n\n");

}

void pop()

{

if(top == NULL)

printf("\nEMPTY STACK\n");

else{

struct Node \*temp = top;

printf("\nPopped Element : %d", temp->data);

printf("\n");

top = temp->next; // After popping, make the next node as TOP

free(temp); }}

void display()

{

if(top == NULL)

printf("\nEMPTY STACK\n");

else {

printf("The stack is \n");

struct Node \*temp = top;

while(temp->next != NULL){

printf("%d--->",temp->data);

temp = temp -> next;

}

printf("%d--->NULL\n\n",temp->data);

}}

## OUTPUT:-

IMPLEMENTING STACK USING ARRAY

1. Push
2. Pop
3. Display
4. Exit

Enter your choice : 1

Enter the value to insert : 15

Node is inserted

1. Push
2. Pop
3. Display
4. Exit

Enter your choice : 1

Enter the value to insert : 30

Node is inserted

1.Push

2.Pop

3.Display

4.Exit

Enter your choice : 3

The stack is

30---->15--->NULL

1.Push

2.Pop

3.Display

4.Exit

Enter your choice : 2 Popped elements :15

1.Push

2.Pop

3.Display

4.Exit

Enter your choice : 2

STACK UNDERFLOW

1.Push

2.Pop

3.Display

4.Exit

Enter your choice : 4

# PROGRAM-7

**To implement of queue using linked list.**

#include<stdio.h>

#include<conio.h>

struct Node

{

int data;

struct Node \*next;

}

\*front = NULL,\*rear = NULL;

void insert(int);

void delete();

void display();

void main()

{

int choice, value;

clrscr();

printf("\n:: Queue Implementation using Linked List ::\n");

while(1){

printf("\n\*\*\*\*\*\* MENU \*\*\*\*\*\*\n");

printf("1. Insert\n2. Delete\n3. Display\n4. Exit\n");

printf("Enter your choice: ");

scanf("%d",&choice);

switch(choice){

case 1: printf("Enter the value to be insert: ");

scanf("%d", &value);

insert(value);

break;

case 2: delete();

break;

case 3: display();

break;

case 4: exit(0);

default: printf("\nWrong selection!!! Please try again!!!\n");

}

} }

void insert(int value)

{

struct Node \*newNode; newNode = (structNode\*)malloc(sizeof(structNode));

newNode->data = value;

newNode -> next = NULL;

if(front == NULL)

front = rear = newNode;

else{

rear -> next = newNode; rear = newNode;

}

printf("\nInsertion is Success!!!\n");

}

void delete()

{

if(front == NULL)

printf("\nQueue is Empty!!!\n");

else{

struct Node \*temp = front;

front = front -> next;

printf("\nDeleted element: %d\n", temp->data);

free(temp);

} }

void display()

{

if(front == NULL)

printf("\nQueue is Empty!!!\n"); else{

struct Node \*temp = front;

while(temp->next != NULL){

printf("%d--->",temp->data);

temp = temp -> next;

}

printf("%d--->NULL\n",temp->data);

}

}

## OUTPUT-

Queue Implementation using Linked List ::

\*\*\*\*\*\* MENU \*\*\*\*\*\*

1. Insert
2. Delete
3. Display 4. Exit

Enter your choice:1

Enter the value to be insert:10 Insertion is Success!!!

\*\*\*\*\*\* MENU \*\*\*\*\*

1.Insert

2.Delete

3.Display

4.Exit

Enter your choice:1

Enter the value to be insert:20

10--->20--->NULL

\*\*\*\*\*\* MENU \*\*\*\*\*

1.Insert

2.Delete

3.Display

4.Exit

Enter your choice:2

Deleted element:10

\*\*\*\*\*\* MENU \*\*\*\*\*

1.Insert

2.Delete

3.Display

4.Exit

Enter your choice:3

20--->NULL

\*\*\*\*\*\* MENU \*\*\*\*\*

1.Insert

2.Delete

3.Display

4.Exit

Enter your choice:4

## PROGRAM-8

**To implement BFS using linked list.**

#include<stdio.h>

#include<conio.h>

int a[20][20], q[20], visited[20], n, i, j, f = 0, r = -1;

void bfs(int v) {

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

if(a[v][i] && !visited[i]) q[++r] = i;

if(f <= r) {

visited[q[f]] = 1;

bfs(q[f++]);

} }

void main() {

clrscr();

int v;

printf("Enter the number of vertices: "); scanf("%d",&n);

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

q[i] = 0;

visited[i] = 0;

}

printf("\nEnter graph data in matrix form:\n");

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

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

scanf("%d", &a[i][j]);

} }

printf("Enter the starting vertex: ");

scanf("%d", &v); bfs(v);

printf("\nThe node which are reachable are:");

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

if(visited[i])

printf(" %d", i);

else {

printf("\nBFS is not possible. All nodes are not reachable!");

break; }

}

getch();

}

**OUTPUT:-**

Enter the number of vertices:3

Enter graph data in matrix form:

2 4 5 2 3 4 1 7 8

Enter the starting vertex:2

The node which are reachable are:1 2 3

## PROGRAM-9

**To implement DFS using linked list.**

#include<stdio.h>

#include<stdlib.h>

#define scan(a) scanf("%d", &a)

#define print(a) printf("%d", a)

#define nline printf("\n")

#define fl(i,a,b) for(i=a; i<b; i++)

#define rev(i,a,b) for(i=a; i>=b; i--) #define sspace printf(" ") typedef struct listnode

{ int data; struct listnode\* next; }listnode; typedef struct list { listnode \*head;

}list;

typedef struct graph

{

int vertices; list\* array;

}

graph;

int visited[1000];

graph\* creategraph(int n)

{

int i;

graph\* G=(graph \*)(malloc(sizeof(graph)));

G->vertices = n;

G->array = (list \*)malloc(n \* sizeof(struct list));

fl(i,0,n)

G->array[i].head = NULL; return G;

}

void addedge(graph\* G, int src, int dest)

{

listnode\* newnode;

newnode=(listnode \*)(malloc(sizeof(listnode)));

newnode->data=dest; newnode->next=G->array[src].head;

G->array[src].head=newnode;

}

void traverse(graph\* G, int n)

{

graph\* temp=G;

int i; list\* temp\_list; listnode\* temp\_node;

fl(i,0,n)

{ temp\_node=temp->array[i].head; while(temp\_node!=NULL)

{

printf("%d -> %d\t", i, temp\_node->data); temp\_node=temp\_node->next;

}

nline;

}

return;

}

void dfs(graph\* G, int v)

{

int i, j;

printf("%d ", v);

visited[v]=1;

listnode\* temp\_node=G->array[v].head;

while(temp\_node!=NULL)

{

if(!visited[temp\_node->data])

{

dfs(G,temp\_node->data);

}

temp\_node=temp\_node->next;

}

return;

}

int main() {

int n, i, j, k, temp, m, a, b;

printf("Enter the number of nodes : ");

scan(n);

printf("Enter the number of edges : ");

scan(m);

printf("Enter the edges : ");

nline;

int ini=n+1;

graph\* G=creategraph(n+1);

fl(i,0,m) {

scan(a);

scan(b);

addedge(G,a,b);

if(a<ini)

int=a;

}

printf("Traversing the adjacency list : ");

nline;

traverse(G,n);

nline;

printf("DFS traversal starting with %d : ", ini);

nline;

dfs(G,ini);

nline;

return 0;

}

## OUTPUT:-

Enter the number of nodes : 9

Enter the number of edges :15

Enter the edges :

0 1

1. 3
2. 2

1 4

1. 5
2. 3
3. 5
4. 6
5. 7
6. 6

5 7

1. 8
2. 9
3. 8
4. 9

Traversing the adjacency list :

0->3 0->1

1->4 1->5 1->2

2->5 2->3

3->6

4->7

5->6 5->7 5->8

6->9

7->8

8->9

DFS traversal starting with:0

0 3 6 9 1 4 7 8 5 2

**PROGRAM-10**

**To Implement Linear Search.**

#include<stdio.h> #include<conio.h>

void main() {

int arr[10];

int i,num,a,found=0;

clrscr();

printf("Enter the value of num\n");

scanf("%d",&num);

printf("Enter the elements one by one\n"); for(i=0;i<num;i++) {

scanf("%d",&arr[i]);

}

printf("Input array is\n");

for(i=0;i<num;i++) {

printf("%d\n",arr[i]);

}

printf("Enter the elements to be searched\n"); scanf("%d",&a); for(i=0;i<num;i++) {

if(a==arr[i])

{ found=1;

break;

} } if(found==1)

printf("Element is present in the array \n");

else

printf("Element is not present in the array \n");

getch();

}

## OUTPUT-

Enter the value of num

4

Enter the elements one by one :-

2

7

9

5

Input array is :2

7

9

5

Enter the number to be searched:7

Element is present in the array

## PROGRAM-11

**To implement Binary Search.**

#include<stdio.h>

#include<conio.h>

void main() {

int c,first,last,middle,n,search,arr[100];

clrscr();

printf("Enter numbers of elements :\n");

scanf("%d",&n);

printf("Enter %d integer \n",n);

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

scanf("%d",&arr[c]);

printf("Enter value to find \n");

scanf("%d",&search);

first=0;

last=n-1;

middle=(first+last)/2;

while(first<=last)

{

if(arr[middle]<search) first=middle+1;

else

if(arr[middle]==search)

{

printf("%d Found at location \n",search,first);

break;

}

else last=middle-1;

middle=(first+last)/2;

}

if(first>last)

printf("Not found ! %d don't present in the list\n",search);

getch();

}

## OUTPUT-

Enter the numbers of elements:4

Enter 4 integers :26

87

54

22

Enter value to find out:-

87

87 Found at location

Enter the numbers of elements:4

Enter 4 integers:34

59

85

20

Enter value to find out:-

95

Not Found! 95 don’t present in the list

**PROGRAM-13**

**To implement Bubble Sort.**

#include<stdio.h>

int main() {

int array[100], n, i, j, swap;

printf("Enter number of elementsn");

scanf("%d", &n);

printf("Enter %d Numbers:n", n);

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

scanf("%d", &array[i]);

for(i = 0 ; i < n - 1; i++) {

for(j = 0 ; j < n-i-1; j++)

{

if(array[j] > array[j+1]) {

swap=array[j];

array[j]=array[j+1];

array[j+1]=swap;

}

} }

printf("Sorted Array:n");

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

printf("%dn", array[i]);

return 0;

}

## OUTPUT-

Enter number of elements: 5

Enter 5 Numbers:

7

4

2

9

15 Sorted Array:

2

4

7

9

15

**PROGRAM-13**

**To implement Selection Sort**

#include<stdio.h>

#include<conio.h>

void main() {

int arr[100],n,c,d,position,swap;

clrscr();

printf("Enter number of elements :-\n");

scanf("%d",&n);

printf("Enter %d integers :-\n",n);

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

scanf("%d",&arr[c]);

for(c=0;c<(n-1);c++)

{

position=c;

for(d=c+1;d<n;d++) {

if(arr[position]>arr[d]) position=d;

}

if(position!=c) {

swap=arr[c];

arr[c]=arr[position];

arr[position]=swap;

}

printf("Sorted List In Ascending Order :-\n");

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

printf("%d\n",arr[c]);

getch();

}

**OUTPUT:**

Enter total number of elements;5

Enter 5 elements:55

96

23

48

2

Sorted list in Ascending Order:2

23

48

55

96

**PROGRAM-14**

**To Implement Insertion Sort**

#include<stdio.h>

#include<conio.h>

void main()

{

int i,j,num,temp,arr[20];

clrscr();

printf("Enter total elements :\n");

scanf("%d",&num);

printf("Enter %d elements :\n",num);

for(i=0;i<num;i++) {

scanf("%d",&arr[i]);

}

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

{

temp=arr[i];

j=i-1;

while(temp<arr[j]&&(j>=0))

{

arr[j+1]=arr[j];

j=j-1; } arr[j+1]=temp;

}

printf("After Sorting :\n");

for(i=0;i<num;i++) {

printf("%d\n",arr[i]);

}

getch();

}

## OUTPUT:-

Enter total numbers of elements:-5 Enter 5 elements:

12

6

15

3

9

After sorting:3

6

9

12

15

## PROGRAM-15

**To implement Merge Sort**

#include<stdio.h>

#include<conio.h>

#define max 10

int a[11]={10,14,19,26,27,31,33,35,42,45,1};

int b[10];

void merging(int low,int mid,int high)

{

int l1,l2,i;

clrscr();

for(l1=low,l2=mid+1,i=low;l1<=mid&&l2<=high;i++)

{

if(a[l1]<=a[l2]) b[i]=a[l1++];

else b[i]=a[l2++];

}

while(l1<=mid) b[i++]=a[l1++];

while(l2<=high) b[i++]=a[l2++];

for(i=low;i<=high;i++) a[i]=b[i];

}

void sort(int low,int high)

{

int mid;

if(low<high)

{

mid=(low+high)/2;

sort(low,mid);

sort(mid+1,high);

merging(low,mid,high);

}

else {

return;

} }

void main()

{

int i;

printf("List Before Sorting :\n");

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

printf("\t%d",a[i]);

sort(0,max);

printf("\nList After Sorting :\n");

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

printf("\n%d",a[i]);

getch();

}

**OUTPUT:-**

List before Sorting:10

14

# 19

26

27

31

33

35

42

45

1

List After Sorting:1

10

14

19

26

27

31

33

35

42

45

**PROGRAM-16**

**To Implement Heap Sort.**

#include<stdio.h>

#include<conio.h>

void create(int[]);

void down\_adjust(int[],int);

void main() {

int n,i,heap[30],last,temp;

clrscr();

printf("\nEnter number of elements :-");

scanf("%d",&n);

printf("\nEnter the elements :-\n");

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

scanf("%d",&heap[i]);

heap[0]=n;

create(heap);

while(heap[0]>1) {

last=heap[0];

temp=heap[1];

heap[1]=heap[last];

heap[last]=temp; heap[0]--;

down\_adjust(heap,1);

}

printf("Array after Sorting :-\n");

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

printf("%d",heap[i]);

getch();

}

void create(int heap[])

{

int i,n;

n=heap[0];

for(i=n/2;i>=1;i--)

down\_adjust(heap,i);

}

void down\_adjust(int heap[],int i)

{

int j,n,temp,flag=1;

n=heap[0];

while(2\*i<=n&&flag==1)

{

j=2\*i;

if(j+1<=n&&heap[j+1]>heap[j])

j=j+1;

if(heap[i]>heap[j])

flag=0;

else {

temp=heap[i];

heap[i]=heap[j];

heap[j]=temp;

i=j;

}

}

}

## OUTPUT:-

Enter number of elements:-

5

Enter the elements;12

8

11

27

30

After Sorting:-

8

11

12

27

30

## PROGRAM-17

**To implement Matrix Multiplication by Strassen’s algorithm.**

#include<stdio.h>

#include<conio.h>

int main()

{

int a[2][2],b[2][2],c[2][2],i,j;

int m1,m2,m3,m4,m5,m6,m7;

printf("Enter the 4 elements of first matrix: ");

for(i=0;i<2;i++)

for(j=0;j<2;j++)

scanf("%d",&a[i][j]);

printf("Enter the 4 elements of second matrix: ");

for(i=0;i<2;i++)

for(j=0;j<2;j++)

scanf("%d",&b[i][j]);

printf("\nThe first matrix is\n");

for(i=0;i<2;i++) {

printf("\n"); for(j=0;j<2;j++)

printf("%d\t",a[i][j]);

}

printf("\nThe second matrix is\n");

for(i=0;i<2;i++) {

printf("\n");

for(j=0;j<2;j++)

printf("%d\t",b[i][j]); }

m1= (a[0][0] + a[1][1])\*(b[0][0]+b[1][1]);

m2= (a[1][0]+a[1][1])\*b[0][0];

m3= a[0][0]\*(b[0][1]-b[1][1]);

m4= a[1][1]\*(b[1][0]-b[0][0]);

m5= (a[0][0]+a[0][1])\*b[1][1];

m6= (a[1][0]-a[0][0])\*(b[0][0]+b[0][1]);

m7= (a[0][1]-a[1][1])\*(b[1][0]+b[1][1]);

c[0][0]=m1+m4-m5+m7;

c[0][1]=m3+m5;

c[1][0]=m2+m4;

c[1][1]=m1-m2+m3+m6;

printf("\nAfter multiplication using \n");

for(i=0;i<2;i++) {

printf("\n");

for(j=0;j<2;j++)

printf("%d\t",c[i][j]);

}

return 0;

}

## OUTPUT-

Enter the 4 elements of first matrix:

1 2

3 4

Enter the 4 elements of second matrix:

5 6

7 8

The first matrix is:

1 2

3 4

The second matrix is:

5 6

7 8

After multiplication using :

19 22

43 50

**PROGRAM-18**

**Find Minimum Spanning Tree using Kruskal’s Algorithm.**

#include <iostream>

#include <vector>

#include <unordered\_map>

#include <algorithm> using namespace std;

struct Edge {

int src, dest, weight;

};

struct compare {

bool operator() (Edge const &a, Edge const &b) const {

return a.weight > b.weight;

}

};

class DisjointSet

{ unordered\_map<int, int> parent;

public:

void makeSet(int N)

{

for (int i = 0; i < N; i++) {

parent[i] = i;

} }

int Find(int k) {

if (parent[k] == k) {

return k;

}

return Find(parent[k]);

}

void Union(int a, int b)

{

int x = Find(a);

int y = Find(b);

parent[x] = y;

}

};

vector<Edge> kruskalAlgo(vector<Edge> edges, int N)

{

vector<Edge> MST;

DisjointSet ds;

ds.makeSet(N);

sort(edges.begin(), edges.end(), compare());

while (MST.size() != N - 1)

{

Edge next\_edge = edges.back();

edges.pop\_back();

int x = ds.Find(next\_edge.src);

int y = ds.Find(next\_edge.dest);

if (x != y)

{

MST.push\_back(next\_edge);

ds.Union(x, y);

} }

return MST;

}

int main() {

vector<Edge> edges = {

{ 0, 1, 7 }, { 1, 2, 8 }, { 0, 3, 5 }, { 1, 3, 9 },

{ 1, 4, 7 }, { 2, 4, 5 }, { 3, 4, 15 }, { 3, 5, 6 },

{ 4, 5, 8 }, { 4, 6, 9 }, { 5, 6, 11 }};

int N = 7;

vector<Edge> e = kruskalAlgo(edges, N);

for (Edge &edge: e) {

cout << "(" << edge.src << ", " << edge.dest << ", "<< edge.weight << ")" << endl;

}

return 0;

}

## OUTPUT:-

(2, 4, 5)

(0, 3, 5)

(3, 5, 6)

(1, 4, 7)

(0, 1, 7)

(4, 5, 8)