# 20MCA135

# DATA STRUCTURES LAB

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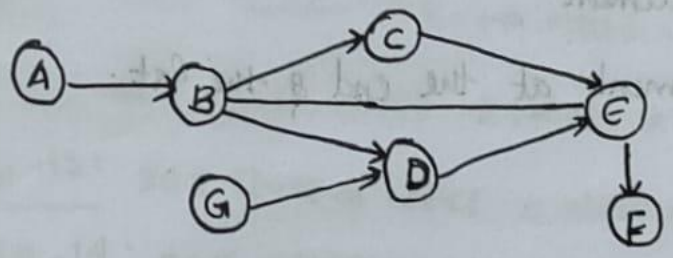
**TKM20MCA-2019**

**Roll no 219**

**TKMCE**

**GITHUB:** https://github.com/harikrsr/Data-Structures

1) Consider a directed ~~acyclic~~ acyclic graph G given in the following figure




Develop a program to implement topological sorting.

Aim :

To Write a program to implement topological sorting of a given directed acyclic graph G

Algorithm :

Step 1 : Identify a node with no incoming edges.

Step 2 : Add that node to the ordering

Step 3 : Remove it from the graph.

Step 4 : Repeat.

## PROGRAM CODE

```
#include <stdio.h>

int main(){
        int i,j,k,n,a[10][10],indeg[10],flag[10],count=0;

        printf("Enter the no of vertices:\n");
        scanf("%d",&n);

        printf("Enter the adjacency matrix:\n");
        for(i=0;i<n;i++){
                printf("Enter row %d\n",i+1);
                for(j=0;j<n;j++)
                        scanf("%d",&a[i][j]);
        }

        for(i=0;i<n;i++){
    indeg[i]=0;
    flag[i]=0;
  }

  for(i=0;i<n;i++)
    for(j=0;j<n;j++)
      indeg[i]=indeg[i]+a[j][i];

  printf("\nThe topological order is:");

  while(count<n){
```

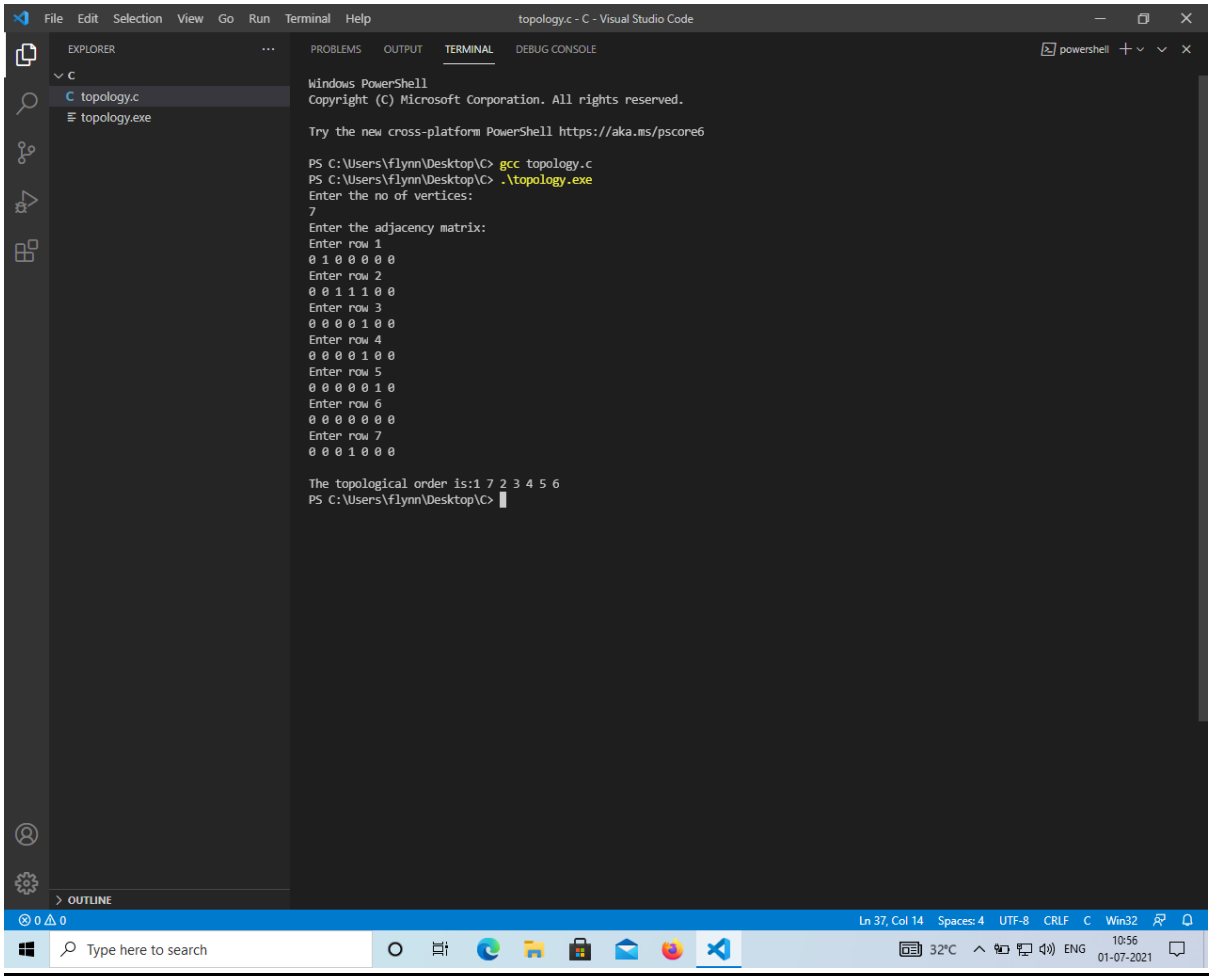
```
        for(k=0;k<n;k++){
            if((indeg[k]==0) && (flag[k]==0)){
                printf("%d ",(k+1));
                flag [k]=1;
            }

            for(i=0;i<n;i++){
                if(a[i][k]==1)
                    indeg[k]--;
            }
        }

        count++;
    }

    return 0;
}
```

topology.c - C - Visual Studio Code

topology.c > main()

```c
#include <stdio.h>

int main(){
    int i,j,k,n,a[10][10],indeg[10],flag[10],count=0;

    printf("Enter the no of vertices:\n");
    scanf("%d",&n);

    printf("Enter the adjacency matrix:\n");
    for(i=0;i<n;i++){
        printf("Enter row %d\n",i+1);
        for(j=0;j<n;j++)
            scanf("%d",&a[i][j]);
    }

    for(i=0;i<n;i++){
        indeg[i]=0;
        flag[i]=0;
    }

    for(i=0;i<n;i++)
        for(j=0;j<n;j++)
            indeg[i]=indeg[i]+a[j][i];

    printf("\nThe topological order is:");

    while(count<n){
        for(k=0;k<n;k++){
            if((indeg[k]==0) && (flag[k]==0)){
                printf("%d ",(k+1));
                flag [k]=1;
            }

            for(i=0;i<n;i++){
                if(a[i][k]==1)
                    indeg[k]--;
            }
        }

        count++;
    }

    return 0;
}
```

# OUTPUT


File Edit Selection View Go Run Terminal Help
topology.c - C - Visual Studio Code
EXPLORER
C
topology.c
topology.exe
PROBLEMS OUTPUT TERMINAL DEBUG CONSOLE
powershell
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.
Try the new cross-platform PowerShell https://aka.ms/pscore6
PS C:\Users\flynn\Desktop\C> gcc topology.c
PS C:\Users\flynn\Desktop\C> .\topology.exe
Enter the no of vertices:
7
Enter the adjacency matrix:
Enter row 1
0 1 0 0 0 0 0
Enter row 2
0 0 1 1 1 0 0
Enter row 3
0 0 0 0 1 0 0
Enter row 4
0 0 0 0 1 0 0
Enter row 5
0 0 0 0 0 1 0
Enter row 6
0 0 0 0 0 0 0
Enter row 7
0 0 0 1 0 0 0
The topological order is:1 7 2 3 4 5 6
PS C:\Users\flynn\Desktop\C>
OUTLINE
Ln 37, Col 14 Spaces: 4 UTF-8 CRLF C Win32
Type here to search
32°C ENG 10:56 01-07-2021

2) Write a program for creating Doubly LL and perform the following operations

A) Insert an element at a particular position

B) Search an element.

C) Delete an element at the end & the last.

## Algorithm

A) Insert an element at a particular position

Step-1 IF PTR = NULL
Go to Step 15

Step-2 : SET NEW_NODE = PTR

Step-3: SET PTR = PTR → NEXT

Step-4: SET NEW_NODE → DATA = VAL

Step 5: SET TEMP = START

Step-6: SET I = 0

Step-7: REPEAT 8 to 10 untill I

Step-8: SET TEMP = TEMP → NEXT

Step-9 : IF TEMP = NULL

Step-10: WRITE "LESS THAN DESIRED NO. OF ELEMENTS"

Goto step 15

Step-11 : SET NEW_NODE → NEXT = TEMP → NEXT

Step-12 : SET NEW_NODE → PREV = TEMP.

Step-13 : SET TEMP → NEXT = NEW_NODE.

Step-14 : SET TEMP → NEXT → PREV = NEW_NODE

Step-15 : EXIT

B) Search an element

Step-1 Input the item which we want to search as data

Step-2 : P = Start.

Step-3 : Repeat while P <> NULL

IF (P ⇒ info = data)

Print the location of node.

c) DELETE AN ELEMENT AT THE END OF THE LIST

Step 1: If HEAD = NULL
Go to step 7.

Step 2: SET TEMP = HEAD.

Step 3: REPEAT STEP 4 WHILE TEMP -> NETT! = NULL

Step 4: SET TEMP = TEMP -> NEXT

Step 5: SET TEMP -> PREV = NULL

Step 6: FREE TEMP

Step 7: EXIT

## PROGRAM CODE

```
#include<stdio.h>

#include<stdlib.h>

struct node

{

   struct node *prev;

   struct node *next;

   int data;

};

struct node *head;

void insert_at_beginning();

void insert_at_specified();

void deletion_at_last();

void display();

void search();

void main ()

{

int choice =0;

   while(choice != 9)

   {

      printf("\n");

      printf("\nChoose one option from the following list");

      printf("\n1.Insert in beginning  2.Insert at a particular position 3.Delete from last
4.Search 5.Show 9.Exit");

      printf("\nEnter your choice? = ");

      scanf("%d",&choice);

      switch(choice)

      {

         case 1:
```

```
            insert_at_beginning();
            break;
            case 2:
            insert_at_specified();
            break;
            case 3:
            deletion_at_last();
            break;
            case 4:
            search();
            break;
            case 5:
            display();
            break;
            case 6:
            exit(0);
            break;
            default:
            printf("Please enter valid choice in the menu");
        }
    }
}
void insert_at_beginning()
{
   struct node *ptr;
   int item;
   ptr = (struct node *)malloc(sizeof(struct node));
   if(ptr == NULL)
   {
```

```
        printf("\nOVERFLOW");
    }
    else
    {
     printf("Enter Item value to insert at beginnning = ");
     scanf("%d",&item);

    if(head==NULL)
    {
        ptr->next = NULL;
        ptr->prev=NULL;
        ptr->data=item;
        head=ptr;
    }
    else
    {
        ptr->data=item;
        ptr->prev=NULL;
        ptr->next = head;
        head->prev=ptr;
        head=ptr;
    }
    printf("Node inserted successfully");
}

}

void insert_at_specified()
{
```

```
struct node *ptr,*temp;
int item,loc,i;
ptr = (struct node *)malloc(sizeof(struct node));
if(ptr == NULL)
{
   printf("\n OVERFLOW");
}
else
{
   temp=head;
   printf("Enter the location  = ");
   scanf("%d",&loc);
   for(i=0;i<loc;i++)
   {
      temp = temp->next;
      if(temp == NULL)
      {
         printf("\n There are less than %d elements in DLL", loc);
         return;
      }
   }
   printf("Enter value to insert = ");
   scanf("%d",&item);
   ptr->data = item;
   ptr->next = temp->next;
   ptr -> prev = temp;
   temp->next = ptr;
   temp->next->prev=ptr;
   printf("\nnode inserted successfully\n");
```

```
  }
}

void deletion_at_last()
{
   struct node *ptr;
   if(head == NULL)
   {
      printf("\n UNDERFLOW");
   }
   else if(head->next == NULL)
   {
      head = NULL;
      free(head);
      printf("\nnode deleted successfully");
   }
   else
   {
      ptr = head;
      while(ptr->next != NULL)
      {
         ptr = ptr -> next;
      }
      ptr -> prev -> next = NULL;
      free(ptr);
      printf("\nnode deleted successfully");
   }
}
```

```
void display()
{
    struct node *ptr;
    printf("\n printing values...");
    ptr = head;
    while(ptr != NULL)
    {
        printf("%d\n",ptr->data);
        ptr=ptr->next;
    }
}
void search()
{
    struct node *ptr;
    int item,i=0,flag;
    ptr = head;
    if(ptr == NULL)
    {
        printf("\nEmpty List");
    }
    else
    {
        printf("\nEnter item which you want to search? : ");
        scanf("%d",&item);
        while (ptr!=NULL)
        {
            if(ptr->data == item)
            {
                printf("\nitem found at location %d ",i+1);
```

```
            flag=0;
            break;
        }
        else
        {
            flag=1;
        }
        i++;
        ptr = ptr -> next;
    }
    if(flag==1)
    {
        printf("\nItem not found");
    }
  }


}
```

## OUTPUT

```
Choose one option from the following list
1.Insert in beginning  2.Insert at a particular position 3.Delete from last  4.Search 5.Show 9.Exit
Enter your choice? = 1
Enter Item value to insert at beginnning = 2
Node inserted successfully

Choose one option from the following list
1.Insert in beginning  2.Insert at a particular position 3.Delete from last  4.Search 5.Show 9.Exit
Enter your choice? = 1
Enter Item value to insert at beginnning = 6
Node inserted successfully

Choose one option from the following list
1.Insert in beginning  2.Insert at a particular position 3.Delete from last  4.Search 5.Show 9.Exit
Enter your choice? = 1
Enter Item value to insert at beginnning = 5
Node inserted successfully

Choose one option from the following list
1.Insert in beginning  2.Insert at a particular position 3.Delete from last  4.Search 5.Show 9.Exit
Enter your choice? = 5

 printing values...5
6
2
```

```
Choose one option from the following list
1.Insert in beginning  2.Insert at a particular position 3.Delete from last  4.Search 5.Show 9.Exit
Enter your choice? = 2
Enter the location  = 2
Enter value to insert = 8

node inserted successfully


Choose one option from the following list
1.Insert in beginning  2.Insert at a particular position 3.Delete from last  4.Search 5.Show 9.Exit
Enter your choice? = 5

 printing values...5
6
2
8


Choose one option from the following list
1.Insert in beginning  2.Insert at a particular position 3.Delete from last  4.Search 5.Show 9.Exit
Enter your choice? = 3

node deleted successfully

Choose one option from the following list
1.Insert in beginning  2.Insert at a particular position 3.Delete from last  4.Search 5.Show 9.Exit
Enter your choice? = 5

 printing values...5
6
2
8
```

```
Choose one option from the following list
1.Insert in beginning  2.Insert at a particular position 3.Delete from last  4.Search 5.Show 9.Exit
Enter your choice? = 4

Enter item which you want to search? : 8

item found at location 4

Choose one option from the following list
1.Insert in beginning  2.Insert at a particular position 3.Delete from last  4.Search 5.Show 9.Exit
Enter your choice? =
```