INSTITUTE OF

INFORMATION AND COMMUNICATION TECHNOLOGY (IICT)

Assignment (2)

On

DIJKSTRA'S algorithm

Course Name:	**Data Structure and Algorithm**
Course No:	**ICT 5102**

Submited By:

Sk. Md. Zubayer-Al-Mahmud

Student ID: 1017311014

Session: Oct, 2017

PGD in IICT ,BUET

Bangladesh University of Engineering and Technology (BUET)

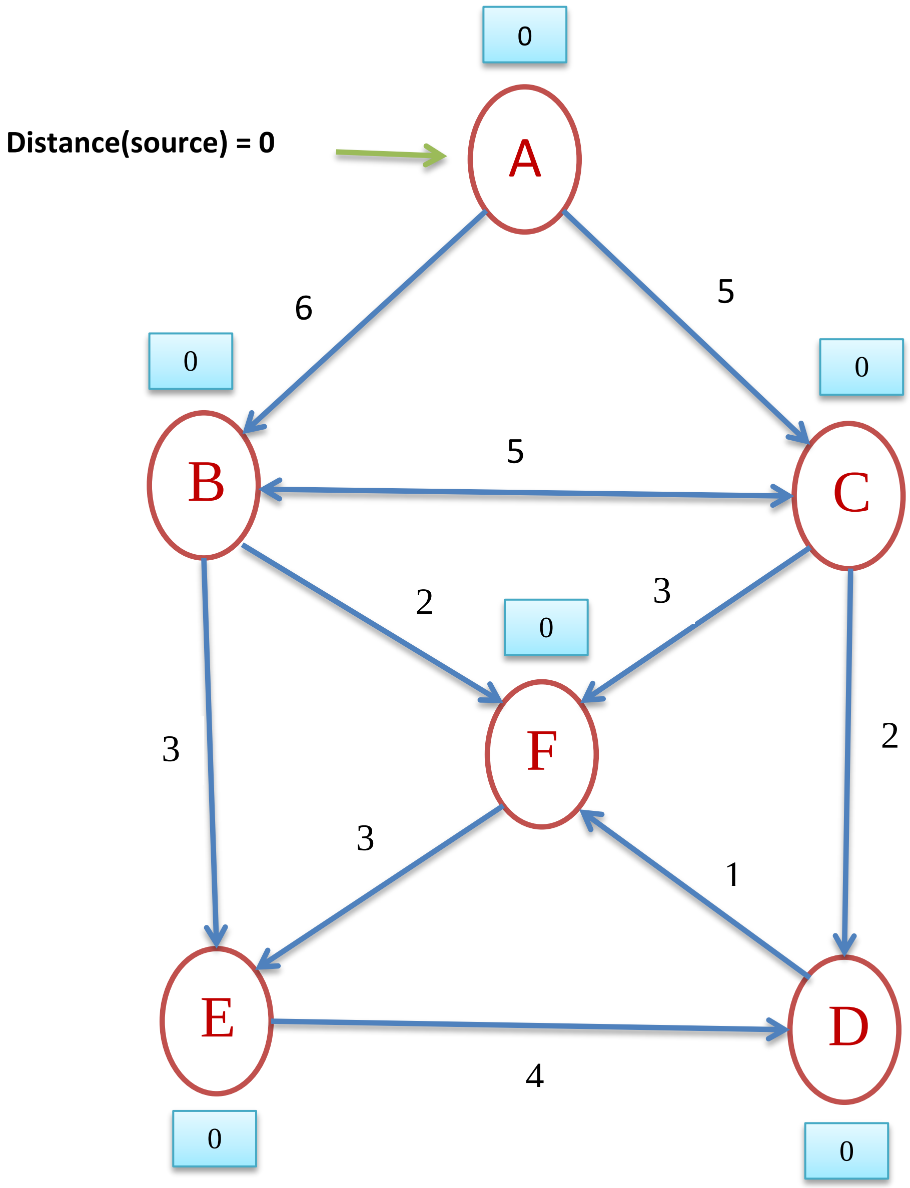
[PAGE INDEX]

1. DIJKSTRA’S algorithm to find the longest path of a graph :

```
Dijkstra(v1, v2):
    for each vertex v:                // Initialization
        v's distance := 0.
        v's previous := none.

    v1's distance := 0.
    List := {all vertices}.

    while List is not empty:
        v := Remove List vertex with maximum distance.
            mark v as known.
        for each unknown neighbor n of v:
        dist:= v's distance + edge (v, n)'s weight.

        if dist is larger than n's distance:
            n's distance := dist.
            n's previous := v.

reconstruct path from v2 back to v1, following previous pointers.
```

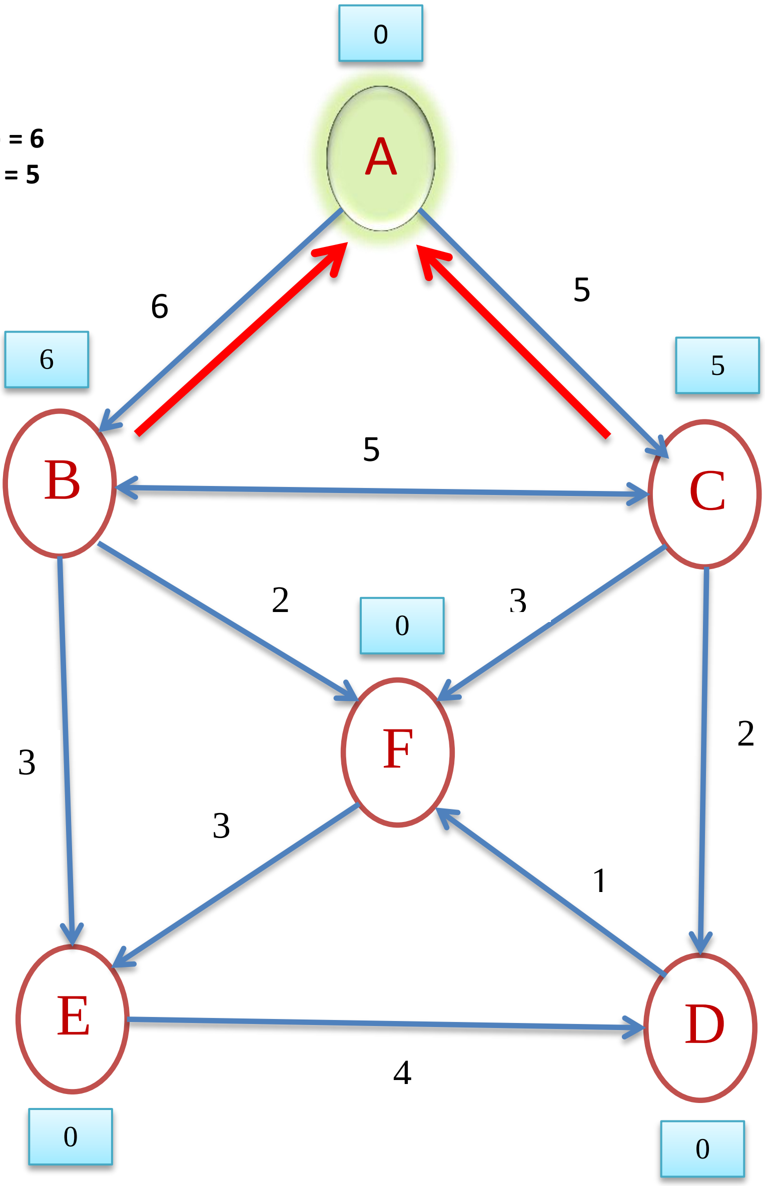
2. DIJKSTRA'S Graphical view to step by step for the longest path:

i) Example: Initialization



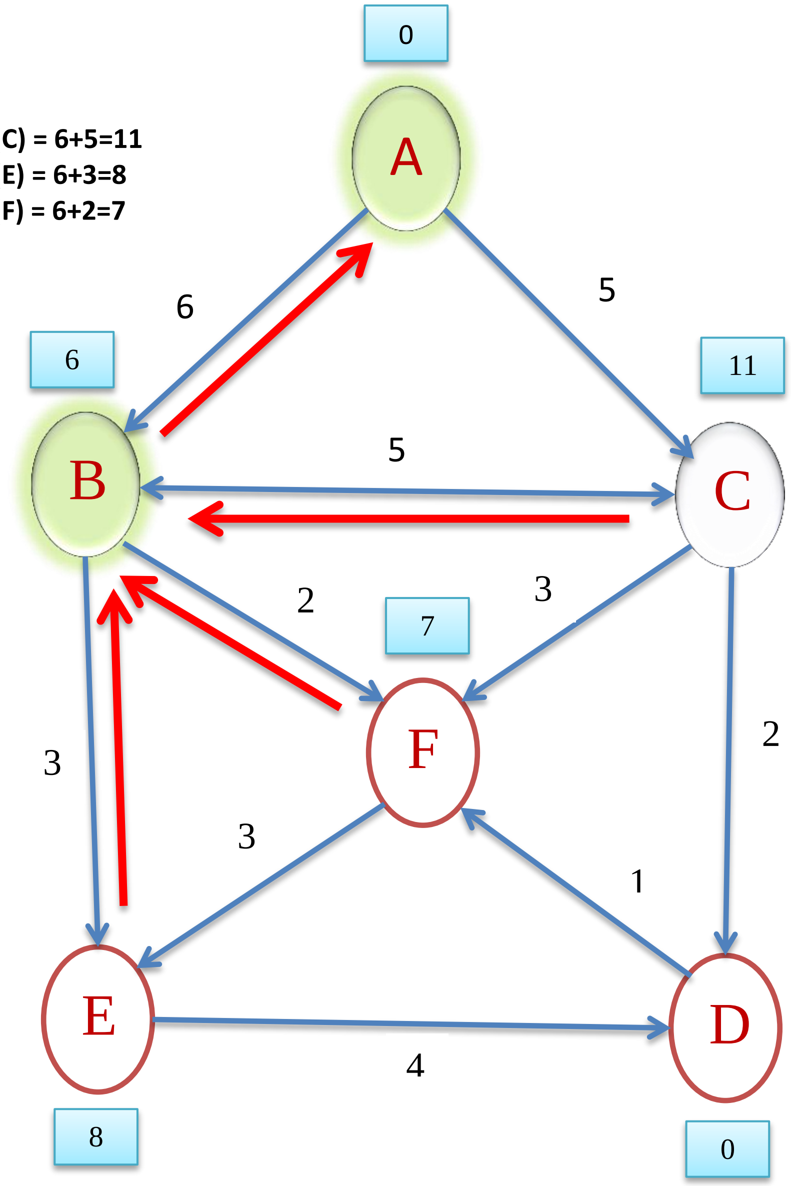
ii) Example: Update neighbors' distance

Distance(B) = 6
Distance(c) = 5



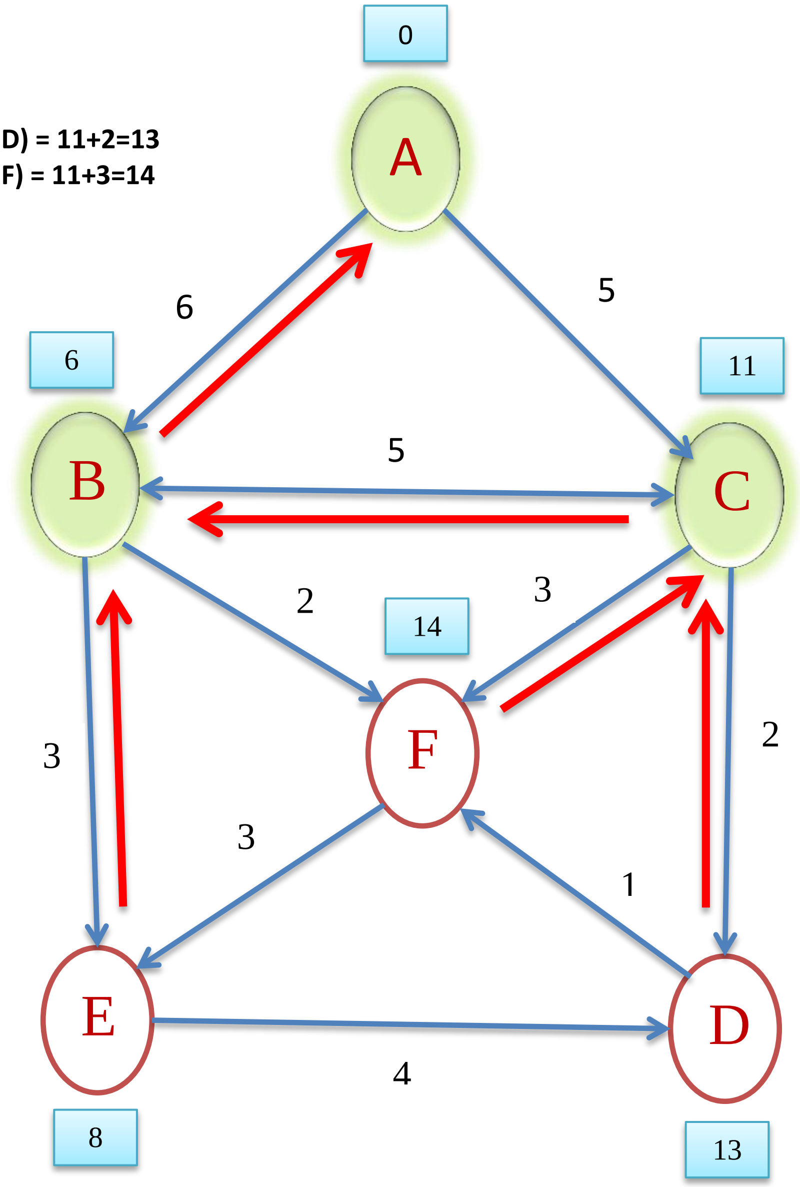
iii) Example: Remove List vertex with maximum distance(B) and update neighbors

Distance(C) = 6+5=11
Distance(E) = 6+3=8
Distance(F) = 6+2=7



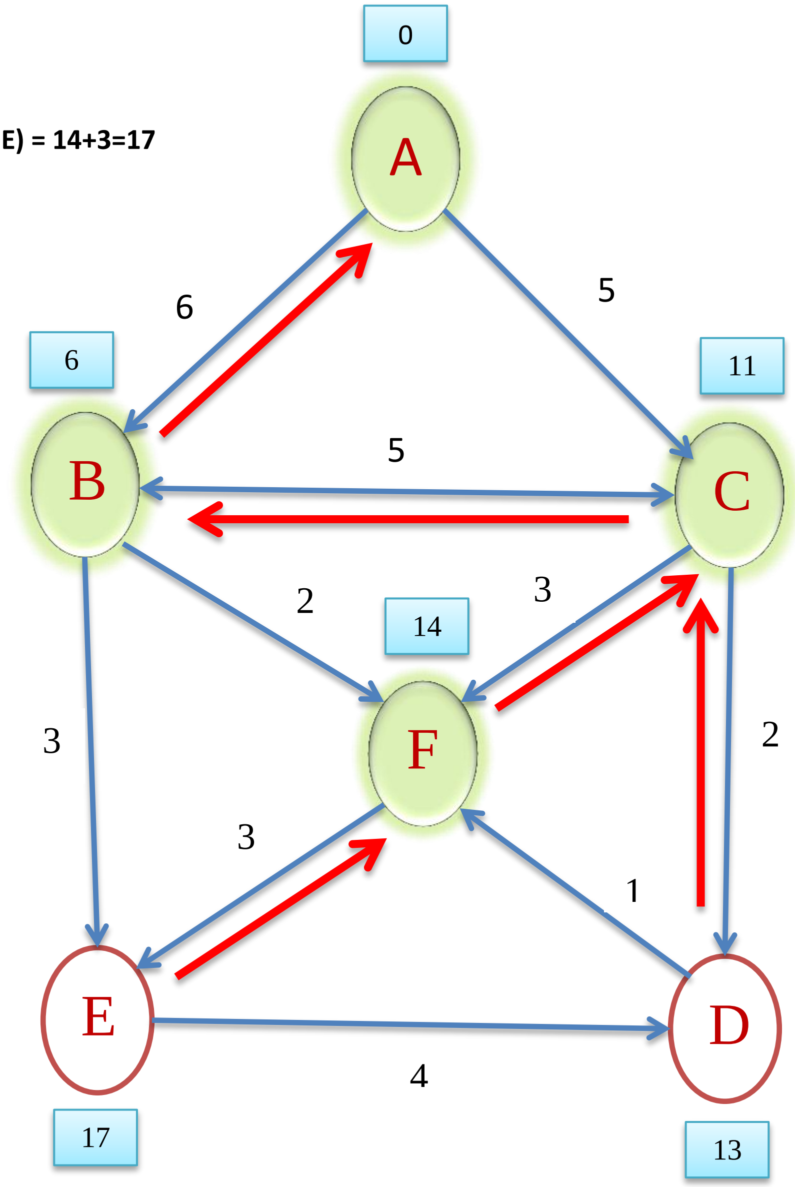
iv) Example: Remove List vertex with maximum distance(C) and update neighbors

Distance(D) = 11+2=13
Distance(F) = 11+3=14



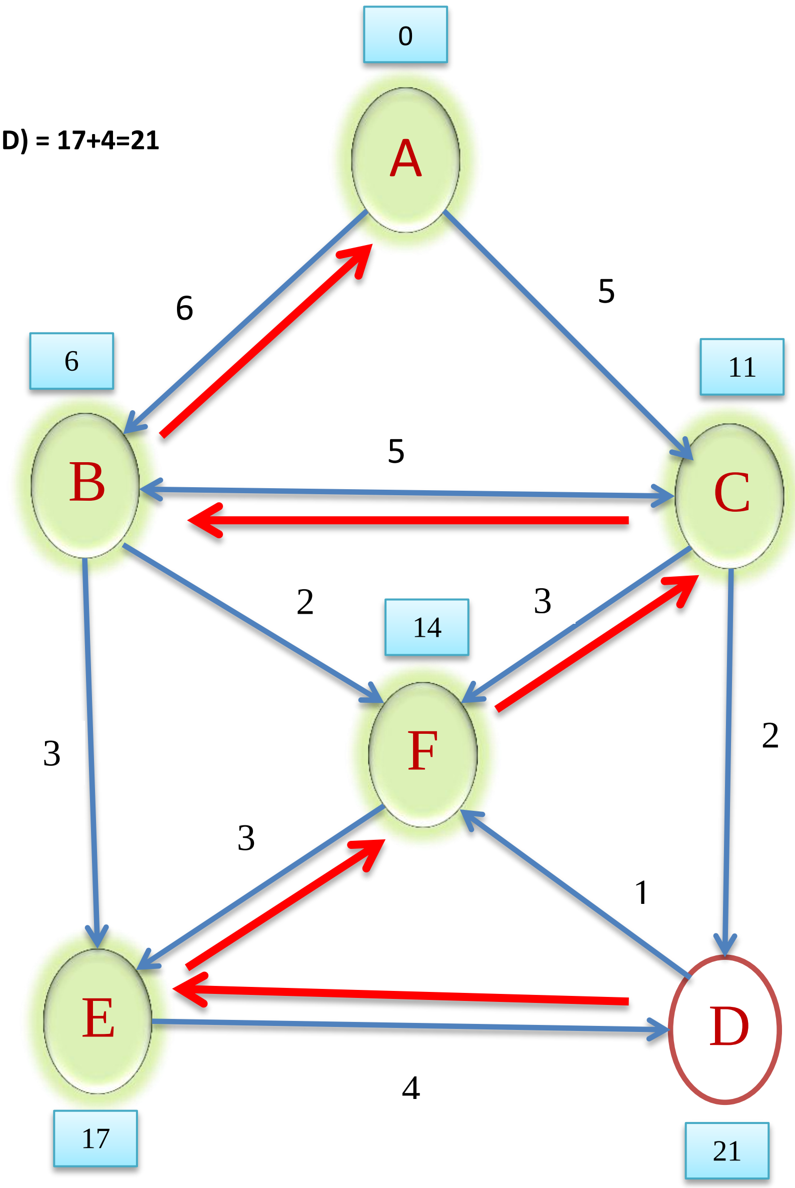
v) Example: Remove List vertex with maximum distance(F) and update neighbors

Distance(E) = 14+3=17

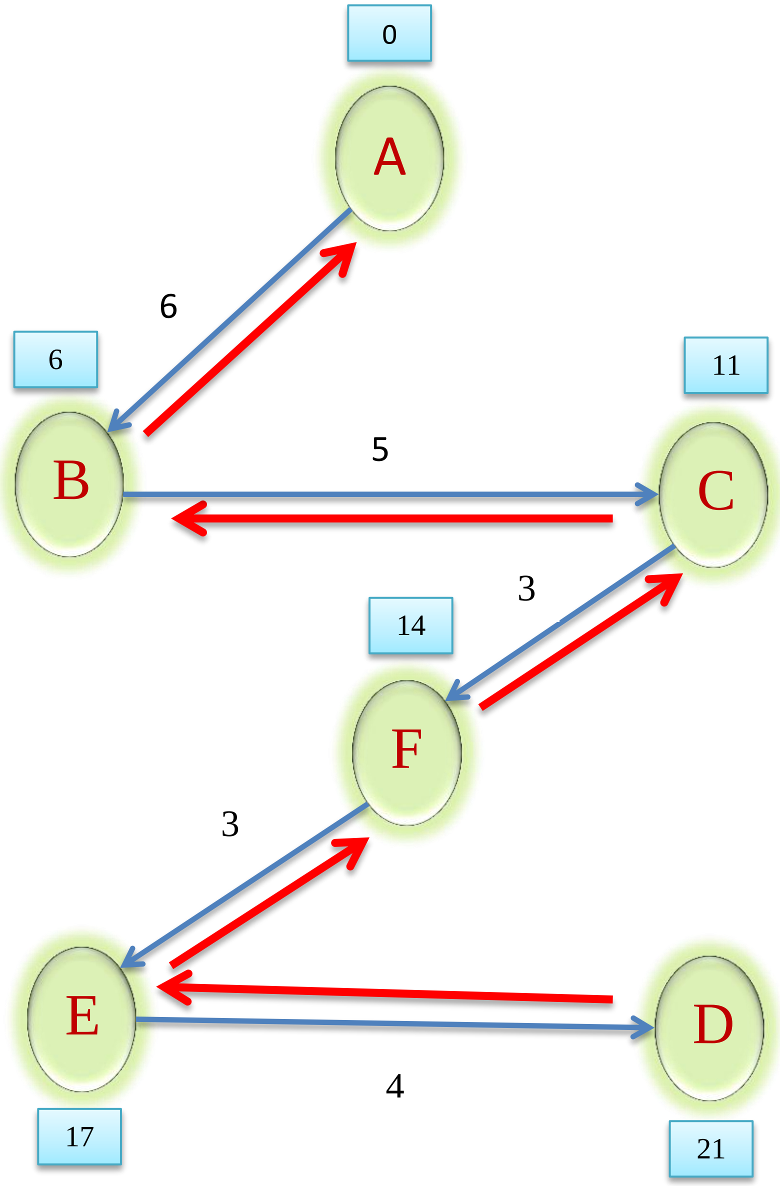


vi) Example: Remove List vertex with maximum distance(E) and update neighbors

Distance(D) = 17+4=21



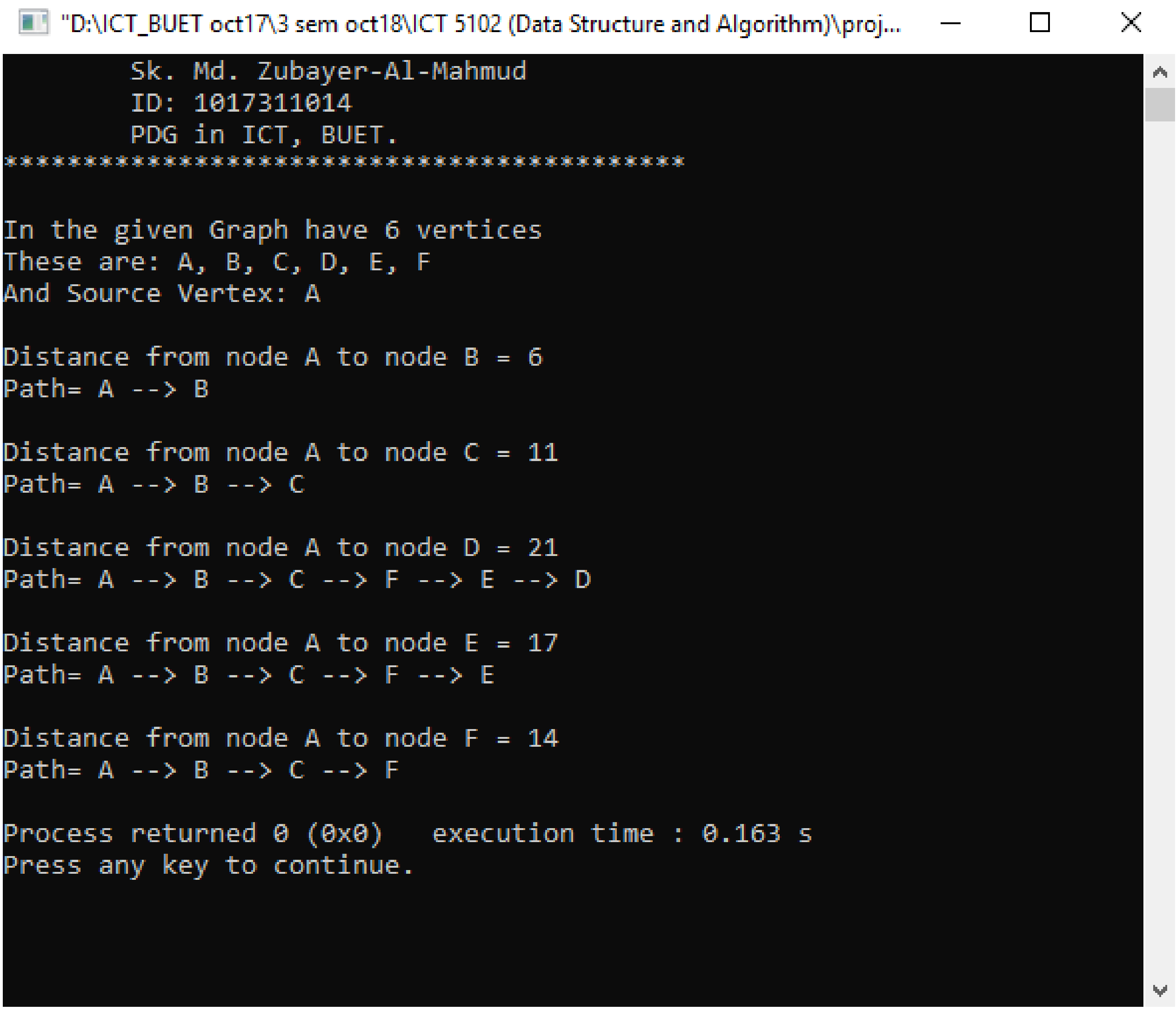
vii)Example: Remove List vertex with maximum distance(D) and final path



3. Implement DIJKSTRA’S algorithm Code for the longest path:

```
#include<stdio.h>
#define MAX 6

void dijkstra(int G[MAX][MAX],int n,int startnode);

int main()
{
    printf("\tSk. Md. Zubayer-Al-Mahmud\n\tID: 1017311014\n\tPDG in
ICT, BUET.\n");
    printf("*******************************************\n\n");

    printf("In the given Graph have 6 vertices \nThese are: A, B, C, D,
E, F \nAnd Source Vertex: A\n");

      int G[MAX][MAX]={{0,6,5,0,0,0},{0,0,5,0,3,2},{0,5,0,2,0,3},
{0,0,0,0,0,1},{0,0,0,4,0,0},{0,0,0,0,3,0}};
      int n=6,u=0;

      dijkstra(G,n,u);

      return 0;
}

void dijkstra(int G[MAX][MAX],int n,int startnode)
{   char s[6]={'A','B','C','D','E','F'};
      int distance[MAX],pred[MAX];
      int visited[MAX],count,maxdistance,nextnode,i,j;

      //pred[] stores the predecessor of each node
      //count gives the number of nodes seen so far
      //initialize pred[],distance[] and visited[]
      for(i=0;i<n;i++)
      {
            distance[i]=G[startnode][i];
            pred[i]=startnode;
            visited[i]=0;
      }

      distance[startnode]=0;
      visited[startnode]=1;
      count=1;

      while(count<n-1)
      {
            maxdistance=0;//  max =0;

      //nextnode gives the node at maximum distance
            for(i=0;i<n;i++)

      if(distance[i]>maxdistance&&!visited[i])//...........>
                  {
                        maxdistance=distance[i];
                        nextnode=i;
                  }
      //check if a better path exists through nextnode
                  visited[nextnode]=1;
                  for(i=0;i<n;i++)
                        if(!visited[i])

      if(maxdistance+G[nextnode][i]>distance[i])//.......
                              {

      distance[i]=maxdistance+G[nextnode][i];
                                    pred[i]=nextnode;
                              }
            count++;
      }

      //print the path and distance of each node
      for(i=0;i<n;i++)
            if(i!=startnode)
            {
                  printf("\nDistance from node %c to node %c =
%d",s[0],s[i],distance[i]);

             printf("\nPath= ");
                  j=i;
                  int k=0;
                  char p[6]={};
                  do
                  {
                        j=pred[j];
                        p[k]=s[j];
                        k++;
                  }while(j!=startnode);

// print by for loop
             int m;
                  for (m=k-1;m>=0;m--)
             {
                 printf("%c --> ",p[m]);
             }

             printf("%c",s[i]);
                  printf("\n");
      }
}
```

4. Output Program of DIJKSTRA’S algorithm Code for the longest path:


"D:\ICT_BUET oct17\3 sem oct18\ICT 5102 (Data Structure and Algorithm)\proj...

```
        Sk. Md. Zubayer-Al-Mahmud
        ID: 1017311014
        PDG in ICT, BUET.
*******************************************


In the given Graph have 6 vertices
These are: A, B, C, D, E, F
And Source Vertex: A

Distance from node A to node B = 6
Path= A --> B

Distance from node A to node C = 11
Path= A --> B --> C

Distance from node A to node D = 21
Path= A --> B --> C --> F --> E --> D

Distance from node A to node E = 17
Path= A --> B --> C --> F --> E

Distance from node A to node F = 14
Path= A --> B --> C --> F

Process returned 0 (0x0)   execution time : 0.163 s
Press any key to continue.
```