

CO322 Data Structures and Algorithms - Lab 5 - Graph ADT

E Number: E/16/267

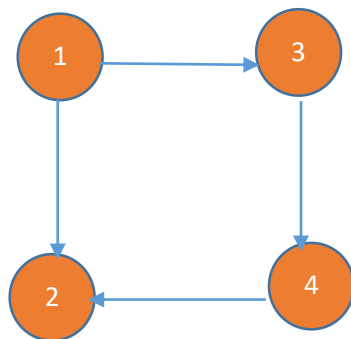
Name: Parackrama G.T.W.

1. Find out what is the *Transitive Closure* of a graph.

Given a directed graph, find out if a vertex j is reachable from another vertex i for all vertex pairs (i, j) in the given graph. Here reachable means that there is a path from vertex i to j . The reachability matrix is called the transitive closure of a graph.

Therefore Transitive Closure is the reachability matrix to reach from vertex u to vertex v of a graph. One graph is given, we have to find a vertex v which is reachable from another vertex u , for all vertex pairs (u, v) . The final matrix is the Boolean type. When there is a value 1 for vertex u to vertex v , it means that there is at least one path from u to v .

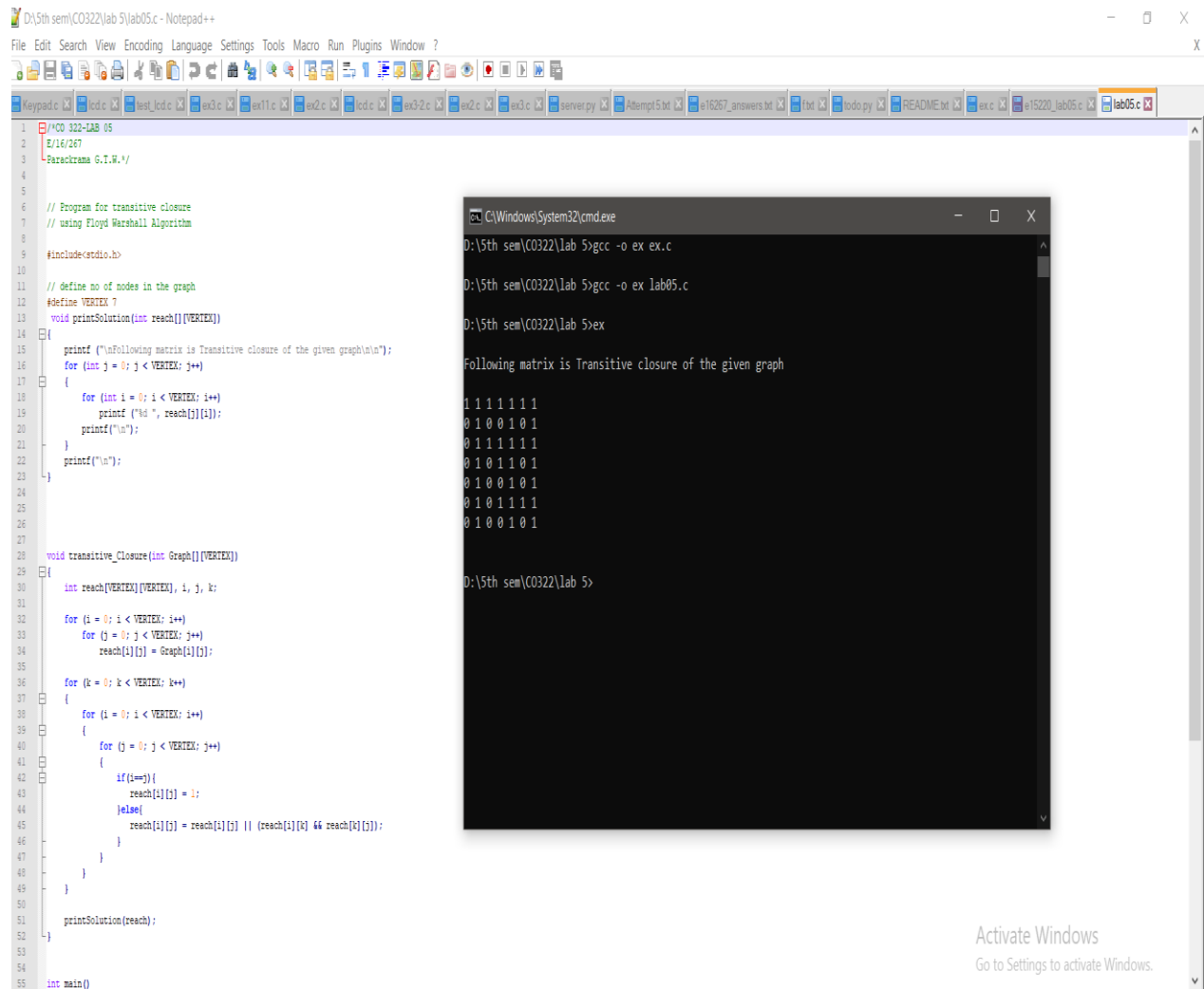
2. Manually compute the Transitive Closure for the following graph:



Transitive Closure for the given graph:

```
1 1 1 1
0 1 0 0
0 1 1 1
0 1 0 1
```

3. Based on the Graph Traversal algorithm discussed in the class, write a C program to compute and print the Transitive Closure of a given graph. Use the following graph to test your program



The image shows a Notepad++ window with a C program and a Windows Command Prompt window showing the program's execution.

C Program Code:

```
1 //CO 302-LAB 05
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3 Parachrama G.T.W./
4
5
6 // Program for transitive closure
7 // using Floyd Warshall Algorithm
8
9 #include <stdio.h>
10
11 // define no of nodes in the graph
12 #define VERTEX 7
13 void printSolution(int reach[][VERTEX])
14 {
15     printf("\nFollowing matrix is Transitive closure of the given graph\n");
16     for (int j = 0; j < VERTEX; j++)
17     {
18         for (int i = 0; i < VERTEX; i++)
19             printf("%d ", reach[j][i]);
20         printf("\n");
21     }
22     printf("\n");
23 }
24
25 void transitive_Closure(int Graph[][VERTEX])
26 {
27     int reach[VERTEX][VERTEX], i, j, k;
28
29     for (i = 0; i < VERTEX; i++)
30         for (j = 0; j < VERTEX; j++)
31             reach[i][j] = Graph[i][j];
32
33     for (k = 0; k < VERTEX; k++)
34     {
35         for (i = 0; i < VERTEX; i++)
36         {
37             for (j = 0; j < VERTEX; j++)
38             {
39                 if (i == j)
40                     reach[i][j] = 1;
41                 else
42                     reach[i][j] = reach[i][k] || (reach[i][k] && reach[k][j]);
43             }
44         }
45     }
46
47     printSolution(reach);
48 }
49
50 int main()
51 {
52 }
```

Command Prompt Output:

```
C:\Windows\System32\cmd.exe
D:\5th sem\CO302\lab 5>gcc -o ex ex.c
D:\5th sem\CO302\lab 5>gcc -o ex lab05.c
D:\5th sem\CO302\lab 5>ex
Following matrix is Transitive closure of the given graph
1 1 1 1 1 1 1
0 1 0 0 1 0 1
0 1 1 1 1 1 1
0 1 0 1 1 0 1
0 1 0 0 1 0 1
0 1 0 1 1 1 1
0 1 0 1 0 1 1
D:\5th sem\CO302\lab 5>
```

Activate Windows
Go to Settings to activate Windows.