Thank you for taking the Week 5: Assignment 5.

Week 5: Assignment 5

Your last recorded submission was on 2023-02-28, 23:09 IST Due date: 2023-03-01, 23:59 IST.

1) Which of the following statement(s) is/are **true** about **Breadth First Search (BFS)** on an undirected and connected graph? ***1 point***

- [x] BFS systematically computes reachability from the given source vertex in graphs.
- [ ] Complexity of BFS is $O(V^2)$ using adjacency matrix and $O(V * E)$ using adjacency list. where V is number of vertices and E is number of edges.
- [x] BFS can be used to check for cycles in the graph.
- [x] BFS can be used to identify the shortest path from given source vertex s to every other vertex in the graph, in terms of number of edges.

2) Which of the following statement(s) is/are **true** about **Depth First Search (DFS)** on an undirected graph? ***1 point***

- [x] DFS can be used to detect cycles in the graph.
- [x] DFS can be used to identify connected components in an undirected graph.
- [x] Using an adjacency list instead of an adjacency matrix can improve the worst case complexity to $O(V+E)$, where V is number of vertices and E is number of edges.
- [ ] DFS can be used to identify the shortest path from s (if DFS starting from a vertex s) to every other vertex in the graph, in terms of number of edges.
- [x] DFS always produces the same number of tree edges for connected undirect graph irrespective of the order in which the vertices are considered for DFS.

- Mahmoud and Ehab and the bipartiteness (unit?unit=53&lesson=56)
- Cover It! (unit?unit=53&lesson=57)
- Diamond Inheritance (unit?unit=53&lesson=58)
- Practice: Week 5: Assignment 5(Non Graded) (assessment?name=149)
- Week 5 Feedback Form: Getting Started with Competitive Programming (unit?unit=53&lesson=168)
- **Quiz: Week 5: Assignment 5 (assessment?name=198)**
- Week 5 Practice Programming Assignment 1 (/noc23_cs30/progassignm name=199)
- Week 5 Practice Programming Assignment 2 (/noc23_cs30/progassignment?name=200)
- Week 5 Programming Assignment Q1 (/noc23_cs30/progassignment?name=201)
- Week 5 Programming

3) Let $G = (V, E)$ be a simple undirected,unweighted and connected graph. Given a source vertex s, for $x \in V$, let $d(x)$ denote the length of a shortest path from s to x in G in terms of the number of edges. A breadth first search (BFS) is performed starting at s. Let T be the resultant BFS tree. If (u, v) is an edge of G that is not in T, then which one of the following **cannot** be the value of $d(u) - d(v)$? ***1 point***

- ○ -1
- ○ 0
- ○ 1
- ◉ 2

4) Consider an undirected graph G. Let T be a depth first search traversal tree. Let `u` be a vertex in G and let `v` be the next visited vertex after visiting `u` in the traversal. Which of the following statements is always **true** ? ***1 point***

- ○ (u, v) must be an edge in G, and u is a descendant of v in T
- ○ (u, v) must be an edge in G and v is a descendant of u in T
- ◉ If (u, v) is not an edge in G then u is a leaf in T
- ○ If (u, v) is not an edge in G then u and v must have the same parent in T

Question 5 & 6

Consider a directed graph representing all flights of an airline, with cities/airports represented as vertices and any direct flight between them as edges in the graph. Direct flight information are given in the form of adjacency list `Fligth_Info` given as follow:-

```
Fligth_Info = {
source_city : [destination_city_1, destination_city_2,...],
.
.
}
```

5) A Traveler wants to travel from source city A to Destination city B with the minimum number of stoppages in between. What algorithm can be used to find the route with minimum stoppage? ***1 point***

- ◉ Breadth-first search.
- ○ Depth-first search.

Assignment Q2 (/noc23_cs30/progassignm name=202)

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6) Consider that direct flight information in between10 cities (labeled from 0 to 9) is given below:

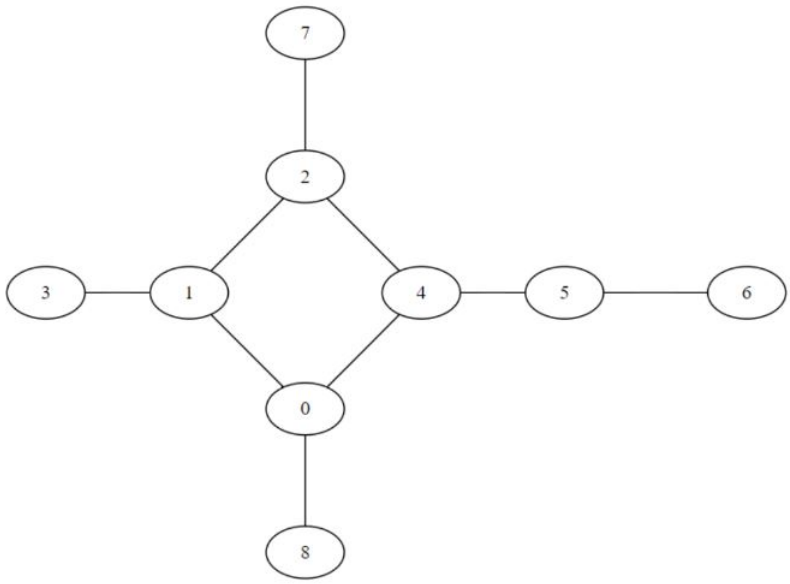
```
Fligth_Info = {
            0: [8],
            8: [0, 9],
            1: [3, 5, 8],
            3: [1, 7, 2],
            5: [4],
            2: [8, 9],
            9: [1],
            7: [8],
            4: [2, 6],
            6: [9]
    }
```

If a traveler wants to travel from city 8 to city 7, what would be the minimum number of stoppages in the traveling route between city 8 to city 7(excluding 8 and 7)?

3

1 point

7) Consider that there are 9 routers (0,..,8) connected in network as shown in the figure given below. ***1 point***



For the reliability of the network, the Network administrator wants to make this network that way so that if a single router goes down, the rest of the network remains connected.

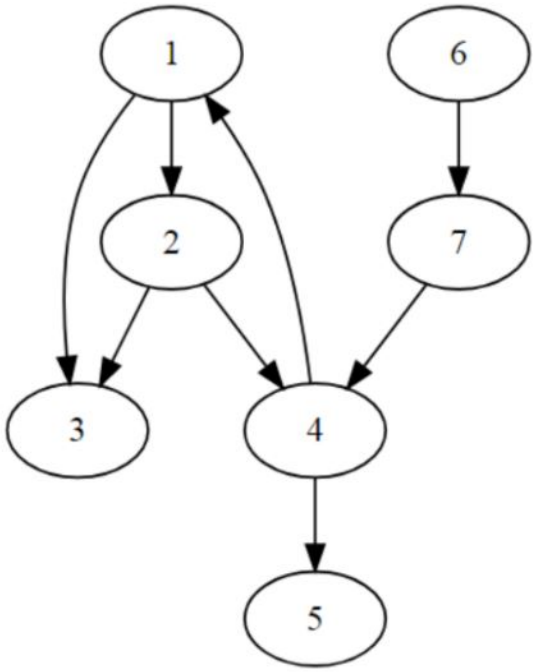
Which of the following set of connections, should be added to the network so that if a single router goes down, the rest of the network remains connected?

- ○ {(3,7), (5,7), (3,8)}
- ○ {(3,7), (6,7)}
- ◉ {(3,7), (6,7), (3, 8)}
- ○ {(2,5), (1,8), (1,7)}

Assessment submitted.
X

8) A Directed Acyclic Graph(DAG) is a directed graph with no directed cycles. That is, it consists of vertices and edges, with each edge directed from one vertex to another, such that following those directions will never form a closed loop. ***1 point***

In the given directed graph, removing one edge e makes it a directed acyclic graph(DAG). Which of the following can be the possible values of e?



- [ ] 1 -> 3
- [x] 2 -> 4
- [ ] 7 -> 4
- [x] 4 -> 1
- [x] 1 -> 2
- [ ] None, this is already direct acyclic graph.

Question 9 & 10

There are 11 courses offered in a program. Few courses require other courses to be completed as a prerequisite. The below table gives the prerequisite of all courses. All prerequisites of a course must be completed before opting for that course in any semester.

Assessment submitted.
X

Course	Prerequisite
Course 1	Course 8
Course 2	Course 8
Course 3	Course 1, Course 2, Course 11
Course 4	Course 1, Course 3
Course 5	Course 9
Course 6	Course 7
Course 7	Course 4, Course 2
Course 8	None
Course 9	Course 4
Course 10	None
Course 11	Course 10

9) If a student wishes to complete all 11 courses, what is the minimum number of semester in which the student can do so? There is no constraint on how many courses a student can take in a semester.

6

1 point

10) Select all the possible orders of courses that can be opted by a student if he/she wishes to complete all 11 courses. Parenthesis represents all courses opted in the same semester. ***1 point***

- [ ] (8, 10) -> (9, 1, 2) -> (11, 3) -> (4) -> (7, 5, 6)
- [ ] (8) -> (1, 2) -> (3) -> (10, 4) -> (9, 7, 11) -> (5, 6)
- [x] (8, 10) -> (1, 2, 11) -> (3) -> (4) -> (9, 7) -> (5, 6)
- [x] (8) -> (10, 1, 2) -> (11) -> (3) -> (4) -> (9, 7) -> (5, 6)

You may submit any number of times before the due date. The final submission will be considered for grading.

Submit Answers