

BRAC University (Department of Computer Science and Engineering)
CSE 221 (Algorithms) for Spring 2024 Semester

Quiz 3
Set A

Student ID:

Section:

Name:

Full Marks: 20

Duration: 30 minutes

1. Suppose we have the following social network, Friendsbook where:

Person A is friends with Person B, C, D, and E.

Person B is friends with Person A, C, and F.

Person C is friends with Person A, B, D, and G.

Person D is friends with Person A, C, E, G, and H.

Person E is friends with Person A, D, and H.

Person F is friends with Person B and G.

Person G is friends with Person C, D, F, and H.

Person H is friends with Person D, E, and G.

- A. Draw a graph to represent the network using each user as a node or vertex and the friendships as edges between the nodes. 2
- B. Create the adjacency list and adjacency matrix for the graph representation. 2
- C. For each pair of users, calculate the number of friends they have in mutual. 2
- D. In Friendsbook, a user can share posts. Suppose the CEO of Friendsbook hired you for developing their post display system. You were given the task to implement a system that displays posts from users who are at most two degrees of connection away from the one who is scrolling his feed. After looking at the requirements you came up with an idea to implement the system using a particular algorithm. Now, for person F, simulate your algorithm. Can F see the posts of all other users in his feed? 4

2. Your friend Habib said that all the countries in the world can be colored with only 2 colors where no 2 adjacent (if 2 countries share borders that means they are adjacent) countries have the same colors. You wanted to check whether Habib was correct or not so you took a particular portion of the world map which is described below.

India has border with Nepal, Pakistan, Bangladesh and Myanmar

China has border India, Pakistan, Nepal, Bhutan and Myanmar

Pakistan has border with India and China

Bangladesh has border with India and Myanmar

Myanmar has border with Bangladesh, India and China

Nepal has border with India and China

Bhutan has border with India and China

- a) Draw a graph where each country will represent a Vertex and if they share a border they will have an edge between them. 2
- b) Mention a graph algorithm which you are gonna use to find out whether a graph is a 2-colorable or not and also write a pseudocode/written explanation of your procedure. 4
- c) Simulate the graph in (a) using your pseudo code to find out whether Habib was correct or not. 4