Daffodil International University

Department of Computer Science and Engineering

Faculty of Science & Information Technology

Final Exam Examination, Summer 2020 @ DIU Blended Learning Center

Course Code: CSE213 (Evening), Course Title: Algorithm

Section: PC-A

Instructor: FRS **Modality: Open Book Exam**

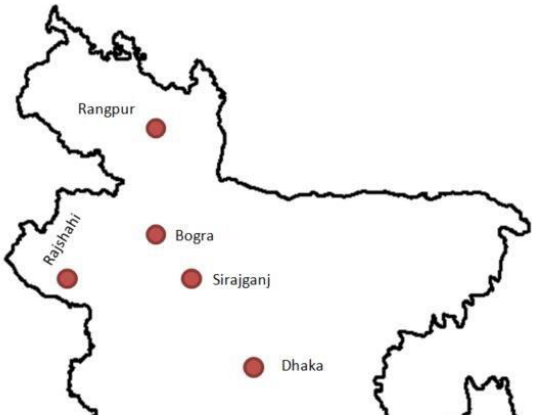
Date: Sunday 23 August, 2020 **Time: 07:00-11:00pm**

Four hours (4:00) to support online open/case study based assessment **Marks: 40**

Directions:

- **Students need to go through the CASE STUDY shown in this exam paper.**
- **Analyze and answer specific section based on your own thinking and work.**
- **Do not share as this will be treated as plagiarism by Blended Learning Center.**

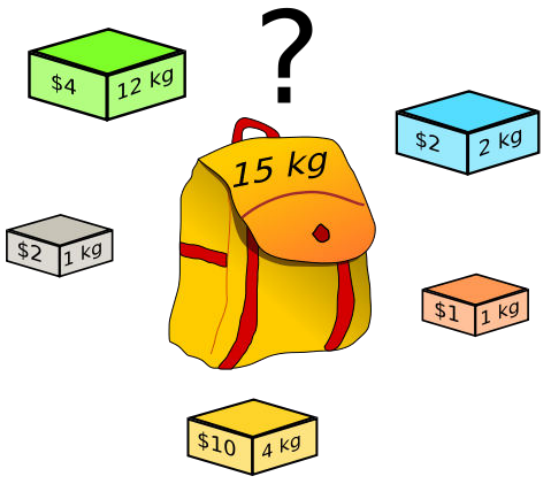
01. Mr. ABC is a government employee. His workplace is in Dhaka city and Rangpur is his hometown. All his family members are in Rangpur. Suddenly in this pandemic situation, his father got sick and he is planning to reach his destination in the shortest possible time. He can choose different routes to reduce the distance to reach faster. Distance between Dhaka and Sirajganj **110 km**, Distance between Sirajganj and Bogra **54 km**, Distance between Bogra and Rangpur **100 km**, Distance between Dhaka and Rajshahi **198 km**, Distance between Rajshahi and Rangpur **165 km**. Also a map given to understand the placement of these cities. Now answer the below questions with the help of the scenario.



a) Construct a weighted undirected graph from the scenario where the vertices will be the cities and the corresponding distance will be their weights. **03**

b) Which will be the shortest route for Mr. ABC to reach his hometown in a shortest possible time? Explain your answer with the help of appropriate Algorithm. **07**

02. The Infinity Super Shop offering an unbelievable prize for their top customers. You have been shortlisted for the prize. But they gave a funny question to solve to own the prize. They will give you a bag of a specific capacity and you will have to choose a number of items. You should pick items in a way that it does not exceed the capacity of the bag and the total amount of your picked items is maximum then other customers. Remember, you can choose one item only once.



a) Solve the problem stated in the scenario using Dynamic Programming Algorithm. **07**

b) Does Greedy Algorithm always provide optimal solution for this type of problem? Explain with proper example. **05**

03. One of the most popular applications of "Longest Common Subsequence" problem we learned in class is comparing how similar two DNA strings are. **07**

Given two DNA strings X and Y, you need to find a third string Z with maximum length in which the bases (i.e., symbols, A, T, C, G) appear in both original strings in the same order but not necessarily continuously.

$$X = AGACTGTC$$
$$Y = TAGTCACG$$

04. A family tree, or pedigree chart, is a chart representing family relationships in a conventional tree structure. Family trees are often presented with the oldest generations at the top and the newer generations at the bottom.

a) Construct your **own family tree** where the root will be your grandfather. Your father, uncle & aunties will be in level 1. Considering your father as parent according to tree structures, you and your brothers and sisters will be in level 2. Also place your cousins at level 2 as child of their parent. Finally at level 3, place persons if you or your siblings have child. Each node will be the first name of the person. **05**

b) Find the height & degree of the constructed tree. And list the persons in order using **breath first search (BFS)** traversal. **06**