



# Department of Computer Science and Engineering

Faculty of Science & Information Technology

Final Examination, Summer 2021 @ DIU Blended Learning Center

Course Code: CSE214 (Day), Course Title: Algorithm

Level: 2 Term: 2 Section: ALL

Instructor: ALL Modality: Open Book Exam

Date: Sunday 29 August, 2021 Time: 01:30pm - 5:00pm

Three and half hours (3:30), Marks: 40

**Question:1** CO3: Identify which algorithm listed under which algorithmic paradigm. **Compare** among various algorithms/implemented codes and choose the efficient one. [Marks: 10]

a) Create an array with your own name where each character is sorted in Alphabetical order. [4]  
If you are told to search for “S” in your name, which searching algorithm will you apply and why?

Justify your answer with explanation. And show the steps for searching “S” in the array.

b) Write your five most favorite area names located within 10-kilometer distance from your home. Now using these five points and one extra point for your home location draw an undirected and weighted graph. Weights of all the edges will be the number of times in minutes to go from one point to another point. Here put all possible edges in the graph. Make sure no pair of vertices is left without an edge. [6]

**Draw your graph based on your home location**

Now imagine yourself as a network engineer in your city and you have to set up network towers in these areas and make connections among the towers with minimum cost where every tower is connected. Which algorithm will you choose for this scenario to calculate the minimum connection cost? Briefly explain your answer.

**Question:2 CO4:** Break down and describe the **simulation** of various algorithms for [Marks: 15] different input values.

- a) Suppose you are given a character array which is named as your “FullName”. Array size is **10** and you have to fill up the array with the characters of your full name. For example, let’s assume your full name is “**Sakib Hasan**” (All Capital) and fill up the array without any space up to the last index. [5]

Index	0	1	2	3	4	5	6	7	8	9
Value	S	A	K	I	B	H	A	S	A	N

Now apply **Quick Sort** to sort the “FullName” Array in Alphabetic Order. You have to show a simulation for each iteration step.

- b) A Greedy algorithm is one of the problem-solving methods which takes optimal solution in each step. A quotation of Greedy Approach is "Living in the present. Don't overthink about the future". [3]

Suppose, you have an amount in Taka (Bangladeshi Currency) as your **last four digits of your student ID**. You want to make a change for your money and you have a friend in Bangladesh Bank, he will make sure you are getting infinite supply of each dominations as [1, 2, 5, 10, 20, 50, 100, 500, 1000] valued coins/notes. What is the minimum number of coins and notes needed to make the change? You must need to show the simulation of each change.

Does Greedy method give you the optimal Solution for this problem?

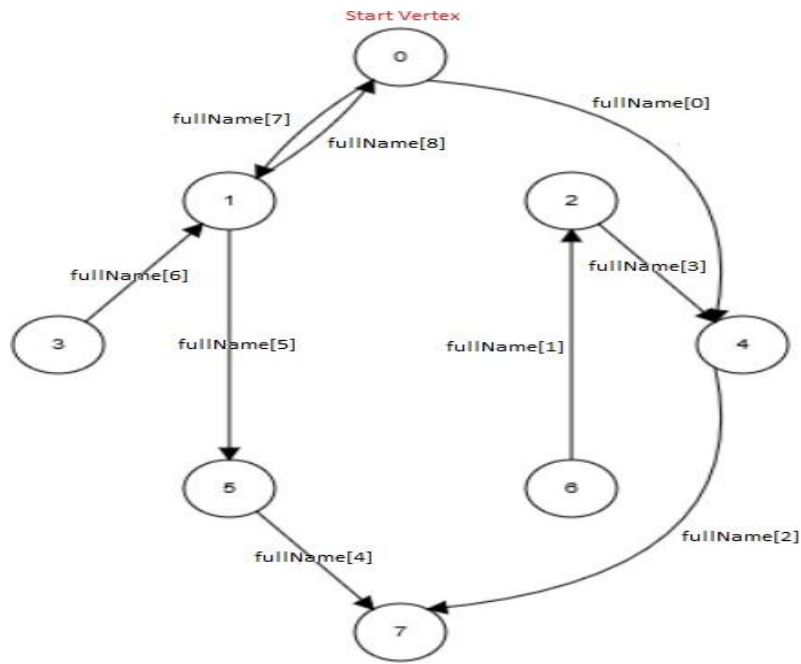
- c) Suppose you are given a character array which is named as “fullName”. Array size is **10** and **you have to fill up the values** in following the example given below. [7]

For example, let’s assume your full name is “**ABDUR RAHMAN**” (All Capital). Now fill up the array with the ASCII values of the characters of your name without any space. Write your Full Name in all Capital Characters and fill up this “**fullName**” array and write in your answer script before starting your answer. ASCII value for A to Z can be found here [link](#).

Index No.	0	1	2	3	4	5	6	7	8	9
Value	A	B	D	U	R	R	A	H	M	A
ASCII	65	66	68	85	82	82	65	72	77	65

Use the “fullName” array’s ASCII values to solve the following problem.

Draw the following graph with the edge values. Start Vertex = 0 and all the edges value are from **fullName** array’s index. Show simulations for each step and find the single source shortest path using Dijkstra’s Algorithm from the graph.



**Question:3** CO5: Design and apply appropriate algorithms to solve real life [Marks: 10] problems

- a) Suppose your friends ask you to let them know the **similarity** between **your first name** [4] and **your father’s first name**. Give them the answer by using any algorithm you have learned so far. What type of algorithm did you choose to get the answer? Also mention the reason behind your choice.?
  
- b) Suppose you are going to Canada to visit your sister. In your flight you will be allowed to carry a small luggage of capacity **7 kg** which you will be allowed to keep with yourself inside the plane. While packing, you want to take the most valuable things from the following items in the carry on. [6]

Item	Camera	Laptop	Accessories	Headphone	Book
Weight (kg)	2	2.5	3	1	1.5
Price (in thousand BDT)	A	B	C	D	E

Price will be the addition of “5” with your individual digit of **last five digits of your id**.  
For example: if your id is “191-15-15209” then your respective five prices are like:

$$A: 1 + 5 = 6$$

$$B: 5 + 5 = 10$$

$$C: 2 + 5 = 7$$

$$D: 0 + 5 = 5$$

$$E: 9 + 5 = 14$$

Now your task is to select the most valuable items in your bag. You have to list the items need to be taken.

**Question:4** CO1: Analyze and calculate **time complexity** and **space complexity** of various algorithms or any written code using mathematical formula and comparison of algorithms. [Marks: 5]

- a) What is the Time Complexity of your Algorithm you applied in **Question-2(a)**? Briefly explain the reason. [2.5]
- b) What is the Time Complexity of your Algorithm you applied in **Question-3(b)**? Briefly explain the reason. [2.5]