Daffodil International University

Department of Computer Science and Engineering

Faculty of Science & Information Technology

Final Examination, Fall 2020 @ DIU Blended Learning Center

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

Level: 2 Term: 2 Section: PC-A, PC-B

Instructor: SMAH Modality: Open Book Exam

Date: Thursday 24 Dec, 2020 Time: 09:00am-01:00pm

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

Part 01: [marks:10]

What is the time complexity of the following code segment?

(a) **[marks:03+03]**

(i)
```
for (int t = 1; t <=n; t *= c) {                    // c is a constant
      printf("A beautiful mind");
}
```

(ii)
```
for (int r = n; r > 0; r /= c) {                    // c is a constant
      printf("Catch me if you can");
}
```

(b) **[marks:03+01]**

Design an algorithm for finding whether the summation of the digits in your ID is odd or even. Find out the complexity of your algorithm.

Part 02: [marks:15]

Piash is a second-year student in the university and now he is learning coin changing problem in his algorithm class. Piash understood that coin changing problem can be solved using both greedy and DP approaches. In case of greedy algorithm, the complexity is O(nlogn) + O(total), and in case of DP, thecomplexity is O(n*total), where n is the total number of coins. Piash realizes that, greedy approach is less complex compared to the DP; however, greedy does not provide optimal solution always. Piash started thinking if he looks into the complexity issue, he needs to apply greedy approach and if he wants to guarantee optimality, he needs to apply DP approach. Piash wants to conduct an experiment on the last four digits of his student ID as the available number of coins and considering the total is 10. Now along with Piash, can you do the same with your own ID for the following:

a) Propose whether the greedy approach or DP approach would be suitable in term of giving optimal solution & complexity (if optimal solution is possible otherwise write Not Possible). Consider the last four digits of your ID as available coins (avoid zero & repetition) and total is 10. Consider each coin is abundant. (**10**)

b) Write down the coins those you have finally selected to make the total (with frequency). (**5**)

Part 03: [marks:15]

a) Determine whether the following graph (Fig. 1) is bipartite or not. If bipartite, show the both sets of nodes. **(5)**

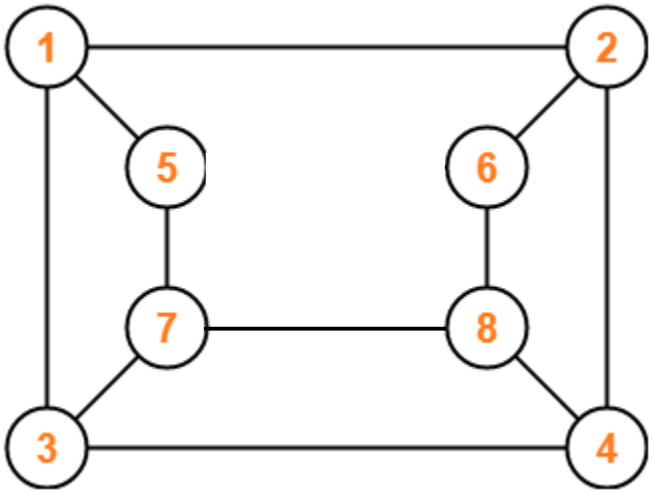

Fig. 1: An un-directed unweighted graph

b) Redraw the above graph (Fig. 1) as follows: **(4)**

i. Replace node 1 with the 1st digit of your ID
ii. Replace node 2 with the 2nd digit of your ID
iii. Replace node 3 with the 3rd digit of your ID
iv. Replace node 4 with the 4th digit of your ID
v. Replace node 5 with the 5th digit of your ID
vi. Replace node 6 with the 6th digit of your ID
vii. Replace node 7 with the 7th digit of your ID
viii. Replace node 8 with the 8th digit of your ID

c) Apply BFS to travel the graph redrawn at question b. Show the queue in correct order. While traveling using BFS, consider the lower number nodes with priority (for example, node 1 gets priority than node 2). **(6)**

----The End---