Daffodil International University
Department of Computer Science and Engineering
Faculty of Science & Information Technology
Final Examination, Fall-2023
Course Code: CSE231, Course Title: Algorithms
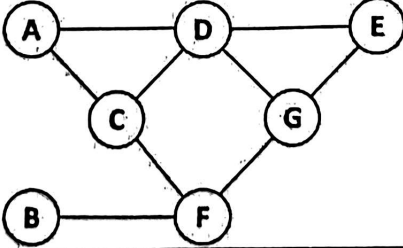### Level: All Term: All   Batch: All

Time: 2 Hour.   Marks: 40

Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1.	a)	Given the following character frequencies: {'A': 5, 'B': 9, 'C': 12, 'D': 13, 'E': 16, 'F': 45} Provide a step-by-step description of how the Huffman tree is constructed for both fixed-length and variable-length Huffman coding. Include the creation of initial nodes, merging nodes, and the final Huffman tree structure for each case.	6	CO2
2.	a)	Can you provide a detailed step-by-step simulation for finding the length of the Longest Increasing Subsequence (LIS) for the given array? [10, 22, 9, 33, 21, 50, 41, 60, 80]	5	CO2
2	b)	Discuss the time complexity of LIS.	1	CO1
3.	a)	You are given an undirected graph. By showing the simulation, perform Depth First Traversal for this graph. Start node: A. 	4	CO3
	b)	Discuss the time complexity of DFS	1	CO1
4.	a)	You are given a directed graph. Find Shortest Paths from Source to all Vertices using Dijkstra's Algorithm. Start node: A. Show the simulation.	4	CO3

	b)	Discuss the time complexity of Dijkstra's Algorithm.	1	
5.	a)	You are given a directed graph. Using the Topological sort algorithm, by showing the simulation, find the order of nodes for this graph.	4	CO3
	b)	Discuss the time complexity of Topological sort	1	CO1
6	a)	You are given an undirected graph. Using the Strongly connected component algorithm, by showing the simulation, find how many SCC exists in this graph.	4	CO4
	b)	Discuss the time complexity of SCC.	1	CO1
7		You are given a weighted, connected graph. Using Prim's algorithm and Kruskal's algorithm, find out the minimum spanning tree (MST) of the given graph.	4*2=8	CO4

Daffodil International University
Department of Computer Science and Engineering
Faculty of Science & Information Technology
Final Examination, Spring 2023
Course Code:CSE 214, Course Title: Algorithm
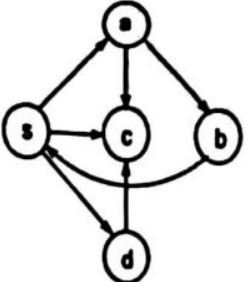Level: 2   Term: 1   Batch: 60

Time: 2 Hrs

Marks: 40

Answer ALL Questions
[The figures in the right margin indicate the full marks and corresponding course outcomes.
All portions of each question must be answered sequentially.]

1.	a) A man wants to go different places in the world. He has listed them down all. But there are some places where he wants to visit before some other places. Suppose he has started his visit from location A. In the following graph Location (A) before location (B) means there's an edge from A to B. What application of graph can he used to determine that? Suppose the man will start his visiting from A. Now apply the algorithm for the following graph and determine the order of the places he visited one by one.	[5]	[CO4]

	b) Apply the appropriate algorithm to find the shortest path from S to other connected nodes	[5]	

	c) Suppose you have the above graph to consider and you going to make a Spanning Tree by picking the highest weighted edge before picking the low weighted edge. Now what kind of approach you will use for solving the problem.Apply appropriate algorithm based on the criteria mentioned here.	[5]	
2.	a) Suppose you have a list of ages for a number of students as below. Now list them in an order such that the ages are arranged in Increasing order. Now find the total number of students and the list of the students that support the decreasing order using DP

A[ ]=[4, 12, 2, 10, 6, 14, 1, 9, 5, 13, 3]. | [5] | [CO3] |

	b) Suppose your friends ask you to let them know the similarity between your Last name and your mother'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? Simulate the appropriate algorithm to find the matching characters.	[5]	
3.	Identify the Tree, Forward, Back and cross edges from the following graph.	[5]	[CO2]
4.	a) 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. Built your graph based on your home location and find the following a) Choose the kind of graph have you drawn? b) Identify the adjacency matrix and list for the graph. b) Suppose you have entered a mysterious cave with a knapsack of capacity 10 Kg. You have found the following valuables in the cave: Item Name Diamond Ruby Turquoise Emerald Sapphire Weight (kg) 3 4 3 6 2 Price (in million BDT per kg) 8 3 5 7 6 Here you cannot break any of the items. Either you can take an item entirely or you cannot (0/1). Identify your maximum profit. Solve the total profit and also find which items you will choose?	[5] [5]	[CO4]

Daffodil International University
Department of Computer Science and Engineering
Faculty of Science & Information Technology
Final Examination, Fall 2022

Course Code: CSE214   Course Title: Algorithm
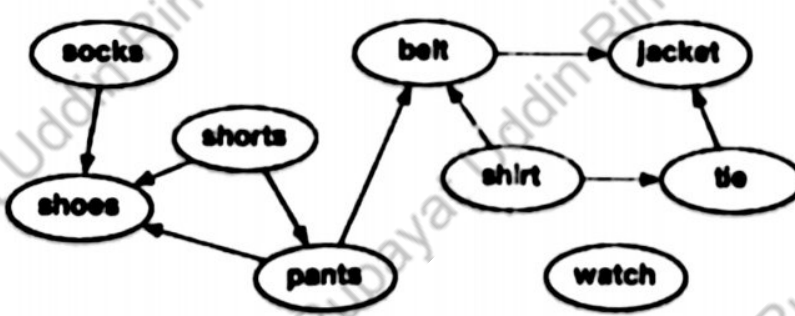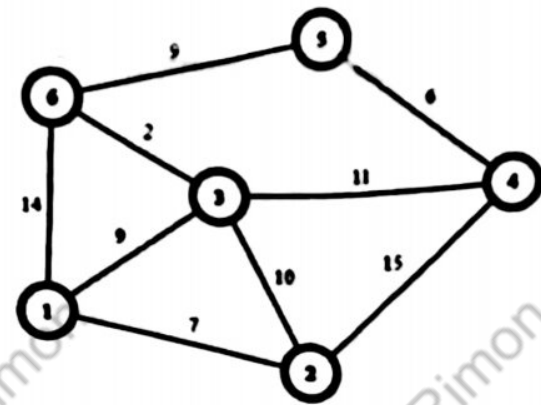
Level: 2   Term: 1   Batch: 58, 59, Old Syllabus

Time: 2 Hrs   Marks: 40

Answer ALL Questions *[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]*

1.	a) Consider the following algorithm and the given array. Now run the algorithm on the array and demonstrate how the array will be updated at each iteration. **Construct every single step.**
	
	A[5] = {4, 7 ,2 ,6, 8, 3, 1, 5};
	
	``
	for(j=0; j<8; j++){
	    min = a[j];
	    position = j;
	    for(i=j+1; i < n; i++)
	    {
	        if(min>a[i])
	        {
	            min = a[i];
	            position = i;
	        }
	    }
	    temp = a[j];
	    a[j] = a[position];
	    a[position] = temp;
	}
	``
		[6]	CO1

	b) **Analyze** the Big-Oh(O) complexity of the above code snippet.	[2]	

2.	You are given with the Adjacency Matrix of 3 graphs as follows. Now for each of the following graphs you need to **categorize** if the graph is:
	  (i) Directed?
	  (ii) Weighted?
	  (iii) Connected?
	  (iv) Tree?
	
	a) <table><tr><td>0</td><td>2</td><td>7</td><td>0</td></tr><tr><td>2</td><td>0</td><td>0</td><td>3</td></tr><tr><td>7</td><td>0</td><td>0</td><td>5</td></tr><tr><td>0</td><td>3</td><td>5</td><td>0</td></tr></table> b) <table><tr><td>0</td><td>1</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr></table> c) <table><tr><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>0</td><td>0</td><td>1</td></tr></table>
		[8]	CO2

3.	a) **Build** the tree for the call **fibonacci(5)** using both dynamic programming and divide and conquer approach.	[4]	CO3

b) Suppose you have written the word **spire** while composing a document in a word processor. The spell checker has reported it as an invalid word and suggested the following replacement words: | [6]

1) **expire**
2) **sapphire**

Your first task is to construct the Longest Common Subsequence of the two replacement words with **spire**. In other word you have to construct 2 LCS values:
1) **spire, expire**
2) **spire, sapphire**

c) Now based on the LCS values, you have to **choose** which one of the two replacement words is more likely to be the correct word? | [2]

| 4. | **a)** Absent-minded Makhon has a problem when getting ready to go to work in the morning. He sometimes dresses out of order. For example, he might put his shoes on before putting the socks on, so he'll have to take the shoes off, put the socks on and then the shoes back on. There's also a shirt, tie, belt, shorts, pants, watch and jacket that have to be put on in a certain order. The order between different parts of clothing forms a graph. Shirt before tie means there's an edge from shirt to tie. Now help Makhon to find a complete order of clothing and getting ready for office. Construct the complete order. | [7] | CO4 |

b) What is the name of your algorithm in 4.a)? | [1]

c) Consider the following graph. Here each vertex denotes an airport and each edge denotes the duration of a flight between two consecutive airports. You have to determine the fastest route from airport 1 to 5. | [4]

    i.   Identify the problem you are going to solve.
    ii.   Select appropriate algorithm for solving this problem.

Daffodil International University
Department of Computer Science and Engineering
Faculty of Science & Information Technology
Final Examination, Spring 2022
Course Code: CSE 214 / CSE 221(Day) Course Title: Algorithm

Time: 2:00 Hrs   **Marks: 40**

Answer ALL Questions
[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1. a) Demonstrate the error & after correcting the following codes, compute the time complexity using Big-O notation: **[6] CO1**

```
include<stdio.h>
int main
{
    int a,b,
    scanf(%d,&a)
    for(i=0;i<a/2,i++)
    {
        print("hello, I am a programmer")
        a=a/2
    }
    for(j=0;j<=a;j++)
    {
        printf("world is so beautiful");
    }
    return;
}
```

2. a) Find out the length of the longest increasing subsequence in the given sequence. **[6] CO4**

10, 22, 9, 33, 21, 50, 41, 60, 80,4,3,85

3. a) You have *N* items that you want to put them into a knapsack. Item *i* has value v_i and weight w_i. **[6] CO5**

N=5
Knapsack size = 15

Item	Value	Weight
1	10	2
2	12	6
3	18	3
4	20	10
5	15	5

Find the maximum total value of items in the knapsack using greedy knapsack algorithm.

4. a) There is a bus service that runs only between two cities and uses the road that directly connects them. Mr. G. has a map showing the cities and the roads connecting them. For example, consider the following road map of seven cities and the edges connecting the cities represent the roads. Apply BFS and DFS technique for the following graph and find the output path of this graph? [10] CO3
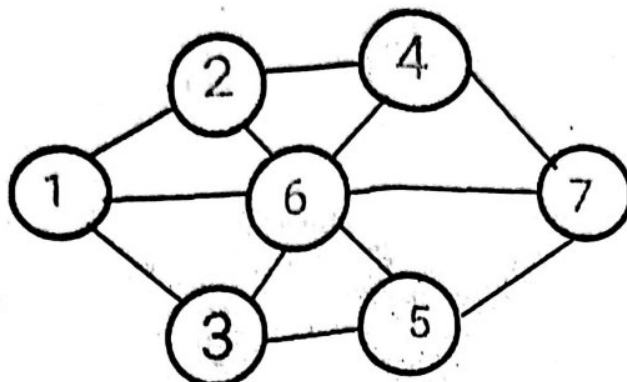
5. a) For a given weighted graph $G(V, E)$ and source A, identify the shortest path to each vertex from the source. Which algorithm will you apply? [6] CO3
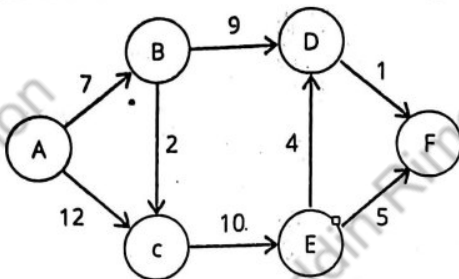
After finding the shortest path for each node, represent the graph in a matrix (adjacency matrix).

b) For a given weighted graph $G(V, E)$, construct the MST of the following graph using **Prim's & Kruskal's** Algorithm. [6]
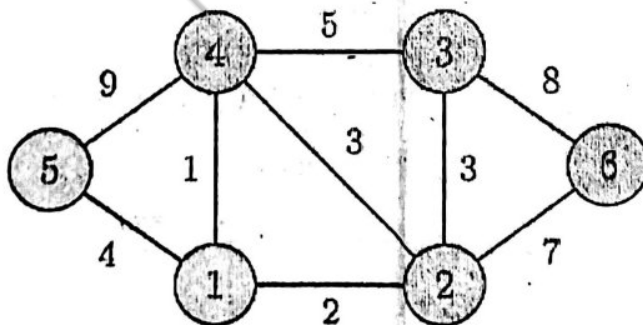
Daffodil International University

Department of Computer Science and Engineering

Faculty of Science & Information Technology

Final   Examination, Fall 2021

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

Level: 2   Term: 2   Section: All

Instructor: All   Two hours (2:00)   Marks: 40

Question: 1	**CO1:**		**5**

a) **Analyze and calculate time complexity of the following code:**   2.5

```c
#include <stdio.h>
int main() {
  int exam, final;
  scanf("%d %d", &final, &exam);
  while(final > 0)    {
    if(exam == 0)
       break;
    final --;
    exam %= 1;
  }
  return 0;
}
```

b) **What will be the output of the following code:**   2.5

```c
#include <stdio.h>
void inPerson (int  me) {
  printf("Run\n");
}
int main  ( ) {
       int cse = 15;
       for(int you = 1; you < cse; you *= 2 ) {
         if( cse % you == 3) break:
         inPerson(you);
       }
       return 0;
}
```

Question: 2   CO4: Break down and describe the simulation of various algorithms for   **35**
different input values.

5

a)   What is the time complexity of Longest Decresing Sequence (LDS)? For the
following set of integers what will be the length of LDS? Show the simulation.

5   2   3   6   4   1   5   7   1

b) Define Longest common sequence? What will be the LCS of the following two strings? Determine by showing the simulation.   **5**

"AKASHER"   "KAHINI"

c) What will be the DFS and BFS traversal output for the following graph if the starting vertex is 2? How many cycle is there in the provided graph? How did you determined the no of cycles from this given graph?   **10**
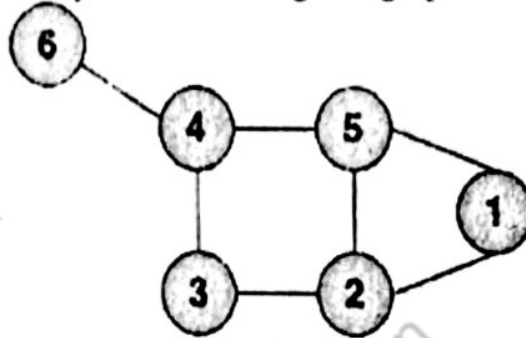
d) How many ways do you know to determine the minimum spanning tree for a given graph? Illustrate prim algorithm for the given graph below.   **5**

e) For the given graph in question 2.d. show the simulation of **single source shortest path(SSSP)** algorithm. You can show any one of the SSSP algorithm that you know of.   **5**

f) Illustrate Top sort for the given graph in question 2.d.   **5**

Daffodil International University
Department of Computer Science and Engineering
Faculty of Science and Information Technology
Final examination, Semester: Summer 2019

Course Code: CSE 221   **Course Title: Algorithms**

Total Marks: 40   **Time: 2 hours**

Give specific answers to all the questions.
(The figure of the right margin indicates the full marks)

1. a) Find the Longest Increasing Subsequence(LIS) of the following sequence of numbers: 6
   [1, 8, 5 , 3, 6, 2, 10, 9, 12,0,4]

   b) Does LIS follow greedy approach or dynamic approach? What the Time Complexity   2
   in Big-O notation?

   c) Can we consider [8, 6, 12] as a subsequence of the given sequence of numbers in 1(a)?   2
   Give proper reason behind your opinion.

2. a) "Topological Sort is an application of Breadth First Search (BFS) algorithm" – do   2
   you think the statement is valid? Justify your answer.

   b) Can we apply Topological Sort algorithm to any directed graph? Give proper reason   2
   behind your answer.

   c) Apply Topological Sort algorithm to the following graph (Show necessary steps):   6
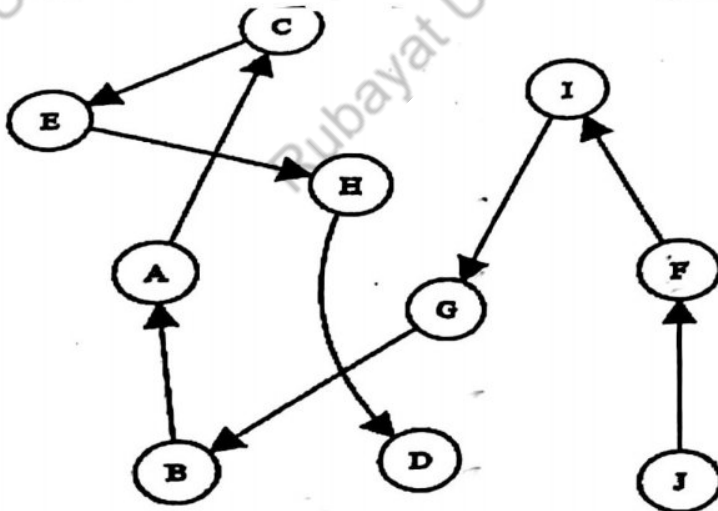
3. a) Suppose 'Let's Go Tour and Travel Agency' is going to organize a trip from Dhaka to Cox's   4
   Bazar by car. Each car has capacity of carrying 6 people. Seven groups of people have already
   registered to join the trip. Corresponding size of five groups are 4, 2, 3, 5, 6, 1, and 3. You have
   to help the agency to distribute each group in various cars. Remember you cannot separate
   group members.

   (i)Calculate the minimum number of cars required to arrange the trip (Lower bound).
   Show the distribution using (ii) First Fit (iii) Non-Increasing First Fit and (iv) Best Fit
   Algorithm.

Page 1 of 2

b) Ms. Sokhina has got Black Friday offer from samsung Electronics showroom! According to the offer, she will be allowed to carry a small suitcase of capacity 9 kg and she can take away any of the selected items from the showroom by putting it inside her suitcase for free! Like most other people, she wants to get the maximum advantage of the offer. Therefore, she wants to put the most valuable things from the following items into the suitcase. Now your task is to help her select the most valuable items.   6

[You have to enlist the items to need to be taken and also show the maximum profit.]

Item	Camera	Laptop	Oven	Dryer	TV
Weight (kg)	1	3	3	4	5
Price (Thousand in Taka)	5	15.	12	9	30

4. a) Apply Dijkstra's Algorithm to the following graph considering A as the source vertex and also show the shortest path between vertex A and C.   5
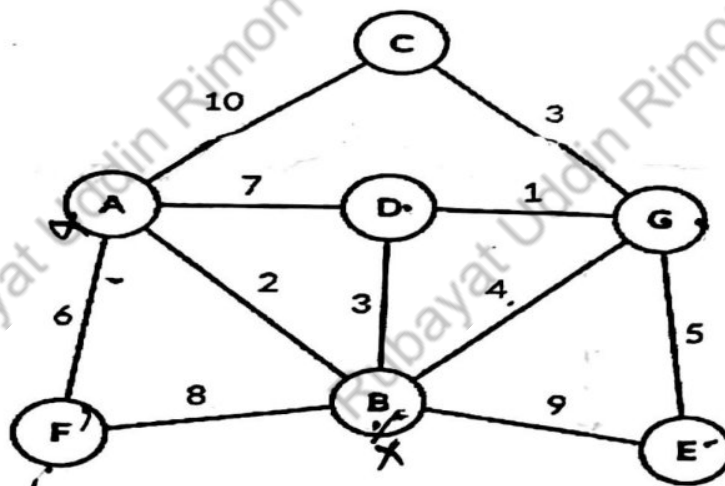
b) Prove that Dijkstra's Algorithm does not work properly when there is negative weight in the graph by representing an appropriate scenario.   3

c) Consider the following Adjacency Matrix representation of a graph.   2

0	1	0	0
1	0	0	0
0	0	0	1
0	0	1	0

(i)   Is the graph directed?
(ii) Is the graph connected?

"In algorithms, as in life, persistence usually pays off."
— Steven S. Skiena

Daffodil International University
Department of Computer Science and Engineering
Faculty of Science and Information Technology
Final Examination, Semester: Fall 2018

Course Code: CSE 221   Course Title: Algorithms
Section: All   Level & Term: L2-T2   Course Teacher: All

Time: 2:00 Hours   Total Marks: 40

Answer any Four out of Five questions

Read the questions carefully.

1. a) Run Insertion sort algorithm to sort the following list. Show each necessary steps.   **4**
        [7 3 2 9 11 10 5 6 9 2]
    b) What is the complexity of the algorithm in 1.(a)?   **1**
    c) Alibaba has entered the mysterious cave with a knapsack of capacity **12 Kg**. He found the   **5**
        following valuables in the cave:

Item Name	Diamond	Ruby	Turquoise	Emerald	Sapphire
Weight (kg)	8	4	3	6	2
Price (in million BDT per kg)	5	3	5	7	6

If you cannot break the items then which items will you chose to fill your knapsack? What
will be your maximum profit? Demonstrate how your algorithm works.

2. a) You have unlimited supplies of **500 taka, 50 taka, 10 taka, 5 taka** and **1 taka** notes. Find   **2**
        a way to pay someone 319 taka using minimum number of notes.
    b) Suppose you were writing in a file and made a typing mistake and wrote a wrong word   **8**
        brogitht. The spell checker suggested you two words **brought** and **bright**. Among the
        two words, which word is more similar to your wrong word? [hint: you need to calculate
        two LCS values]

3. a) You are given two integer arrays sorted in ascending order. Devise an algorithm to merge   **3+1**
        the elements of the two arrays into a single sorted array. What is the complexity of your
        solution?
    b) You are given with the Adjacency Matrix of 3 graphs as follows. Now for each of the   **2*3=6**
        following graphs you need to tell if the graph is:
        (i) Directed?
        (ii) Weighted?
        (iii) Connected?
        (iv) Tree?

1.

0	2	7	0
2	0	0	3
7	0	0	5
0	3	5	0

2.

0	1	0	0
0	0	1	1
0	0	0	0
0	0	0	0

3.

1	1	0	0
0	0	0	0
0	0	0	1
0	0	0	1

4. a) Consider the following graph. How will you detect the presence of cycle within it? Which algorithm will you choose? Write down the steps and simulate the steps for the following graph.   4

   b) Find out the **strongly connected component graph** from the following graph.   5

   c) Is it possible to solve the problem in 4.a) using BFS algorithm?   1

5. a) Use **Dijkstra's algorithm** to find the cost of the cheapest path between a and g in the following weighted graph.   6
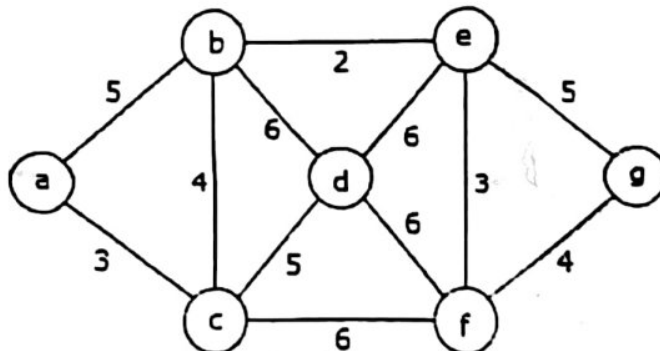
   b) Is your algorithm in 5.a) a greedy algorithm or dynamic programming?   1
   c) Is it possible to calculate the cheapest path if the graph is directed?   1
   d) If the graph contains negative weighted edge, do you need to change your algorithm to find the cheapest path?   2

Department of Computer Science and Engineering
Faculty of Science and Information Technology
Final Examination, Semester: Summer 2018
Course Code: CSE 221   Course Title: Algorithms
Section: All   Level & Term: L2-T2   Course Teacher: All

Time: 2 Hours   **Total Marks: 40**

Answer any Four out of Five questions. Read the questions carefully.

1. a) Devise an algorithm which will find out the average of the odd elements from an n sized array.   3

    b) What is the **run time complexity** of your algorithm in **Big(O)** notation?   1

    c) Define **searching** and **sorting** problems with their real life applications.   4

    d) What do you understand by $O(n)$ and $\Omega(n)$?   2

2. a) Find the **Longest Decreasing Subsequence** of the following sequence of numbers using dynamic programming. Show the steps.   5

    [21 10 5 6 9 2 3 4 8 6 11 7 12 1]

    b) Consider the following two sequences. Find the **length of longest subsequence present in both of them.** A subsequence is a sequence that appears in the same relative order, but not necessarily contiguous. Also find out the **longest common subsequence.**   5

    X = 1 2 5 9 8
    Y = 2 5 4 6 8 7

3. a) Suppose you have to payback someone with 8 taka and you want to make the change using minimum number of notes. You have infinite supply of each types of notes of 1 taka, 4 taka, 5 taka and 10 taka. Find out, how you will pay him back with 16 taka using minimum number of notes.   4

    b) You are given with the **Adjacency Matrix of 2 graphs** as follows. Now for each of the following graphs you need to tell if the graph is-   6

    (i) Directed?
    (ii) Weighted?
    (iii) Tree?

1.

0	2	7	0
2	0	0	3
7	0	0	5
0	3	5	0

2.

0	1	0	0
0	0	1	1
0	0	0	0
0	0	0	0

a) Absent-minded **Makhon** has a problem when getting ready to go to work in the morning. He sometimes dresses out of order. For example, he might put his shoes on before putting the socks on, so he'll have to take the shoes off, put the socks on and then the shoes back on. There's also a shirt, tie, belt, shorts, pants, watch and jacket that have to be put on in a certain order. The order between different parts of clothing forms a **graph**. Shirt before tie means there's an edge from shirt to tie. Now help **Makhon** to find a **complete order** of clothing and getting ready for office.   **7**

b) What is the name of your algorithm in 4.a)   **1**
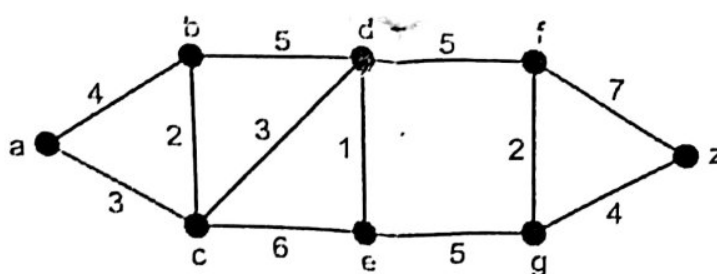c) Define **Shortest Path Problem** with example.   **2**

. a)

Fig. 3

Find the **Minimum Spanning Tree (MST)** from the above graph.   **6**

b) What is the **name** of your algorithm? Is your algorithm in 5. (a) a Greedy algorithm?   **2**

c) Write down the applications of MST.   **2**

Department of Computer Science and Engineering
Faculty of Science and Information Technology
Final Examination, Semester: Spring 2018
Course Code: CSE 221   Course Title: Algorithms
Section: All   Level & Term: L2-T2   Course Teacher: All

Time: 2 Hours   **Total Marks: 40**

Answer any Four out of Five questions. Read the questions carefully.

1. a) Devise an **algorithm** which will find out the largest element from an **n** sized array.   2

   b) What is the **run time complexity** of your algorithm in **Big(O)** notation?   1

   c) You are given two integer arrays sorted in ascending order. Please devise an **algorithm** to merge the elements of the two arrays into a single sorted array.   3

   d) Suppose you have to payback someone with **17 taka** and you want to make the change using minimum number of notes. You have infinite supply of each types of notes of **1 taka, 2 taka, 5 taka, 10 taka, 20 taka** and **25 taka**. Find out, how you will pay him back with **17 taka** using **minimum number of notes**.   3

   e) Is your algorithm in 1.d) a greedy algorithm or dynamic programming?   1

2. a) Find the **Longest Increasing Subsequence** of the following sequence of numbers using dynamic programming. Show the steps.   5
   $$[11.7\ 3\ 2\ 9\ 11\ 10\ 5\ 6\ 9\ 2\ 3\ 4\ 8\ 6]$$

   b) Consider the following two sequences. Find the **length of longest subsequence** present in both of them. A subsequence is a sequence that appears in the same relative order, but not necessarily contiguous. Also find out the **longest common subsequence**.   5
   $$X = ABCBDAB$$
   $$Y = BDCABA$$

3. a) **Graph** is a very useful tool in modeling various real life computational problems. Give an example of a **real life problem** modeled using graph.   3

   b) Suppose you are given with two vertices of a graph, and the graph is represented in adjacency list method. You need to findout whether these two vertices are adjacent or not? Devise an **algorithm** to solve this problem.   2

   c) What is the **run time complexity** of your algorithm in **Big(O)** notation?   1

   d) Define MST with appropriate figure.   2

   e) Is it possible to find out the MST of a graph if the graph is   2
      i) Directed?
      ii) Negative weighted?

4. a) Consider the following graph. BFS algorithm can detect cycle from undirected unweighted graph. Show the steps, how **BFS** will detect the **existence of cycle** from the following graph (Fig. 1)   3
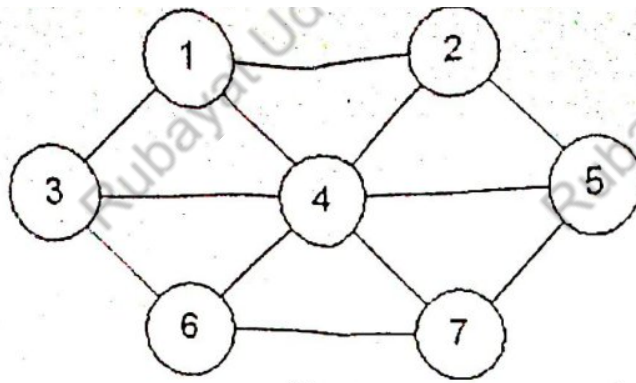
Fig. 1

b) Run **DFS** algorithm to detect the tree edges, back edges, forward edges and cross edges from the above graph (Fig. 1). [It is not necessary that all types of edges will exit. Just find out the existing ones.]   3

c) Find out the **strongly connected component** graph of the following graph of Fig. 2.   4
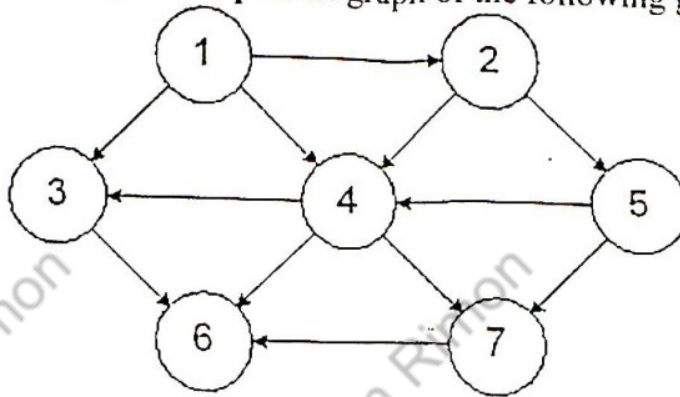
Fig. 2

5. a)
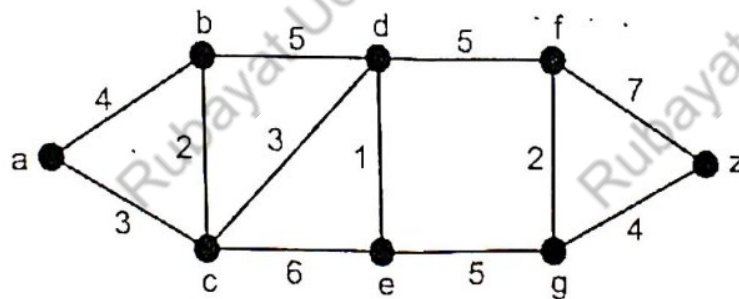
Fig. 3

Consider the above graph. Here each vertex denotes an **airport** and each edge denotes the duration of a **flight** between two consecutive airports. Your task is to determine the fastest route from airport a to z.   5

b) What is the **name** of your algorithm? Is your algorithm in 5. (a) a Greedy algorithm?   2

c) What is the **run time complexity** of your algorithm?   1

d) Will you need to change your **algorithm** if some of the edge weights in the graph in 5. (a) is **negative**? Explain your answer.   2

Daffodil International University
Department of Computer Science and Engineering
Faculty of Science and Information Technology
Final Examination, Semester: Summer 2017
Course Code: CSE 221   **Course Title: Algorithms**
Section: All   **Level & Term: L2-T2**   **Course Teacher: All**

Time: 2 Hours   **Total Marks: 40**

Answer any Four out of Five questions. Read the questions carefully.

1. a) Write an algorithm to find the second smallest and second largest element of an array.   **4**

    b) What is the **complexity** of your algorithm in 1.a)?   **2**

    c) What will be the **Big-O complexity** of the following code snippets?   **4**

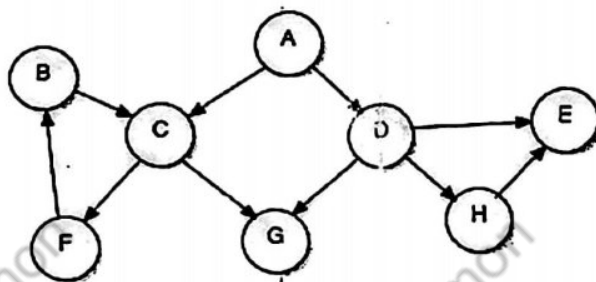 | i) void main()
{
    int i, n;
    scanf("%d", &n);
    for(i=0; i<=10; i++){
        for(j=0; j<=100; j++){
            printf("CSE");
        }
    }
} | ii) void main()
{
    int i, n;
    scanf("%d", &n);
    for(i=0; i<= n ; i++){
        for(j=0; j<= n; j++){
            printf("CSE");
        }
    }
} |
    |---|---|

2. a) Find the **Longest Increasing Subsequence** of the following sequence of numbers using dynamic programming. Show the steps.   **5**

    [7 3 2 9 11 10 5 6 9 2 3 4 8 6]

    b) Consider the following two sequences. Find the **length of longest subsequence** present in both of them. A subsequence is a sequence that appears in the same relative order, but not necessarily contiguous. Also find out the **longest common subsequence**.   **3+2**

    X = GXTXAYB
    Y = AGGTAB

3. a) Suppose you need to make change for 87 Taka. You have to do this using the **fewest number of notes possible**. Assume that there will be unlimited supply of 100 Taka, 50 Taka, 20 Taka, 10 Taka, 5 Taka, 2 Taka and 1 Taka notes. How will you find it? What will be your answer?   **3**

    b) Is your algorithm in **3.a)** a greedy or a Dynamic Programming algorithm?   **1**

    c) Now assume that you need to pay someone 16 Taka and you have unlimited supply of 1 Taka, 5 Taka, 12 Taka and 25 Taka notes. How will you find it? How will you pay?   **5**

    d) Is your algorithm in **3.c)** a greedy or a Dynamic Programming algorithm?   **1**

4. a) You are given with the **Adjacency Matrix of 2 graphs** as follows. Now for each of the following graphs you need to tell if the graph is-   **2+2**

    (i) Directed?
    (ii) Weighted?
    (iii) Connected?
    (iv) Tree?

1.

0	2	7	0
2	0	0	3
7	0	0	5
0	3	5	0

2.

| 0	1	0	0
0	0	1	1
0	0	0	0
0	0	0	0

b) Identify the **tree edges, back edges, forward edges** and **cross edges** from the following graph.   **4**

c) Which algorithm have you used in **4.b)**? What is **the runtime complexity** of your algorithm?   **1+1**

5. a) Define **Minimum Spanning Tree** with appropriate figure. A minimum spanning tree can be unique. When? Show an example?   **2+2**

b) The following **directed graph** represents the road network between a city and a suburb of that city. You live in the suburb and need to go to your office every day which is located in the city. Apply **Dijkstra's algorithm** to find the shortest path from Suburb to city.   **5**
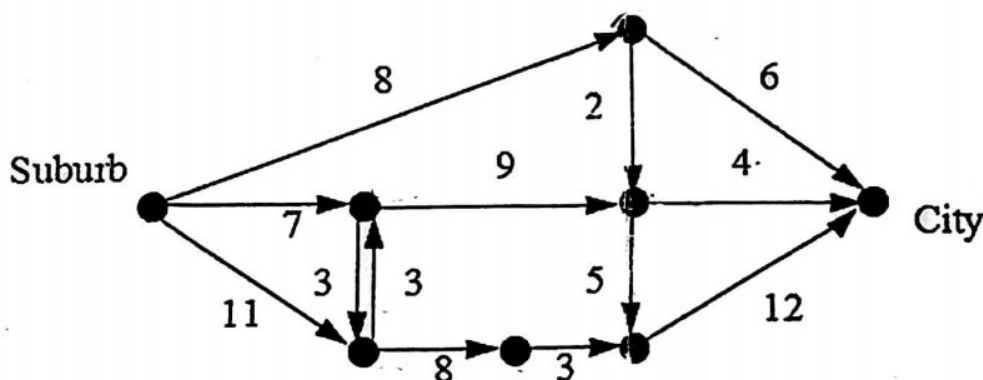
c) Is your algorithm in **5.b)** a greedy or a Dynamic Programming algorithm?   **1**

Daffodil International University
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Final Examination, Semester: Spring 2017

Course Code: CSE 221   Course Title: Algorithms
Section: All   Level & Term: L2-T2   Course Teacher: All

Total Marks: 40

Time: 2:00 Hours

Answer any Four out of Five questions
Read the questions carefully.

1. a) Find the Longest Increasing Subsequence of the following sequence of numbers.   **3**

   [7 3 2 9 11 10 5 6 9 2 3 4 8 6]

   b) What is the complexity of your algorithm in (a)?   **1**

   c) Now, find the Longest Decreasing Subsequence of the sequence in (a)?   **3**

   d) Draw the Fibonacci tree of Fib(5) with and without using Dynamic Programming.   **3**

2. a) You have unlimited supplies of 50 taka, 10 taka, 5 taka and 1 taka coins. Find a way to pay someone 339 taka using minimum number of coins.   **3**

   b) Let's say the DNA sequence of cat, tiger, cheetah and lion are CCATT, CCTT, CTAGT and GTGT respectively. Which one of tiger, cheetah and lion do you think are most similar to cat? You can assume that the more similar two animals are, the longer the common subsequence between their DNAs will be.   **7**

3. a) You are given two integer arrays sorted in ascending order. Please devise an algorithm to merge the elements of the two arrays into a single sorted array. What is the complexity of your solution?   **3+1**

   b) You are given with the Adjacency Matrix of 3 graphs as follows. Now for each of the following graphs you need to tell if the graph is: **2*3=6**
      (i) Directed?
      (ii) Weighted?
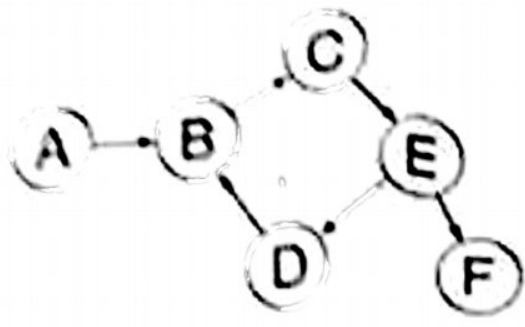   (iii) Connected?
      (iv) Tree?

1.

0	2	7	0
2	0	0	3
7	0	0	5
0	3	5	0

2.

0	1	0	0
0	0	1	1
0	0	0	0
0	0	0	0

3.
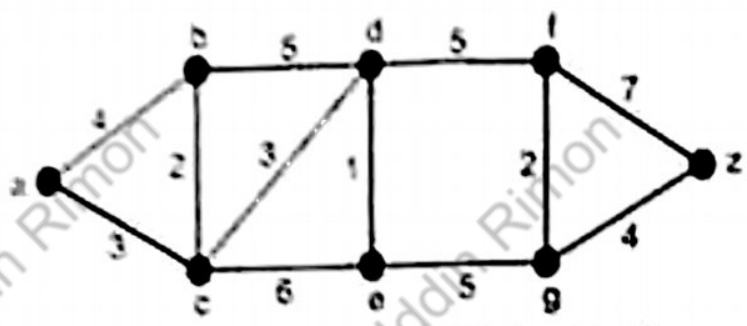
1	1	0	0
0	0	0	0
0	0	0	1
0	0	0	1

a) Consider the following graph. How will you detect the presence of cycle within it? Which algorithm will you choose? Write down the steps and simulate the steps for the following graph. **4**
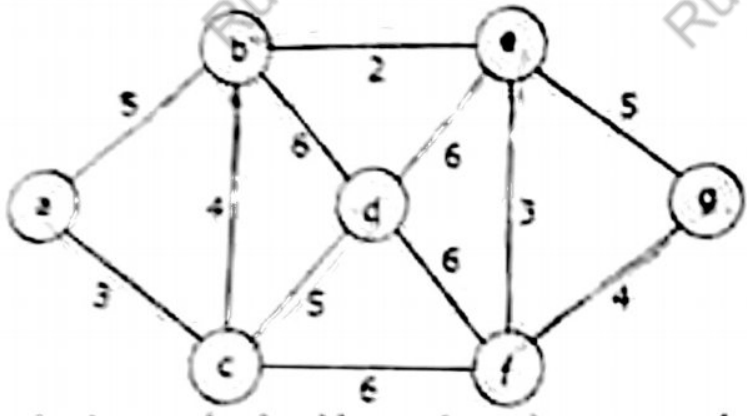

Use Dijkstra's algorithm to find the cost of the cheapest path between a and z in the following weighted graph. **5**

c) Is it possible to solve the problem in b) using BFS algorithm? **1**

a) Calculate the minimum spanning tree for the following graph. Show each necessary steps. **6**

b) Is your algorithm in a) a greedy algorithm or dynamic programming? **1**
c) Is it possible to calculate the MST for directed graph? **1**
d) If the graph contains negative weighted edge, do you need to change your algorithm to find the MST? **2**