Department of Computer Science & Engineering

University of Asia Pacific (UAP)

Program: B.Sc. in Computer Science and Engineering

Final Examination | **Fall 2020** | **2nd Year 2nd Semester**

Course Code: CSE 207 | **Course Title: Algorithm** | **Credits: 3**

Full Marks: 120* (Written) | **Duration: 2 Hours**

* Total Marks of Final Examination: 150 (Written: 120 + Viva: 30)

Instructions:

1. There are **Four (4)** Questions. Answer all of them. All questions are of equal value. Part marks are shown in the margins.
2. Non-programmable calculators are allowed.

1. a) Suppose you have 6 activities with corresponding start and end time, the objective is to compute an execution schedule having maximum number of non-conflicting activities. 20

Activity Name	Start Time	Finish Time
a1	a	b
a2	5	9
a3	c	d
a4	3	4
a5	e	f
a6	3	4

Here, a = Your ID % 2 + 2

b = Your ID % 2 + 4

c = Your ID % 3 + 4

d = Your ID % 3 + 7

e = Your ID % 5 + 4

f = Your ID % 5 + 9

b) Suppose you have to pay your bill of 'x' cent. You can use the following coin to pay the bill-- 10

5 cent, 7 cent, 10 cent, 20 cent, and 1 cent.

Where, x = Your ID % 5 + 10.

Determine the minimum number of coins you could spend to pay the bill. Also, determine the coins you have chosen to pay the bill using Dynamic Programming approach.

2. **a)** Find the complexity of the following algorithm. What will be output for n=5? 10

```
for (i=0; i<n; i++)
        for(j=0; j<i; j+=i)
            print(i+j)
```

Or 10

Write an algorithm of complexity O(m+logn). What will be the output of your algorithm for m=n=5?

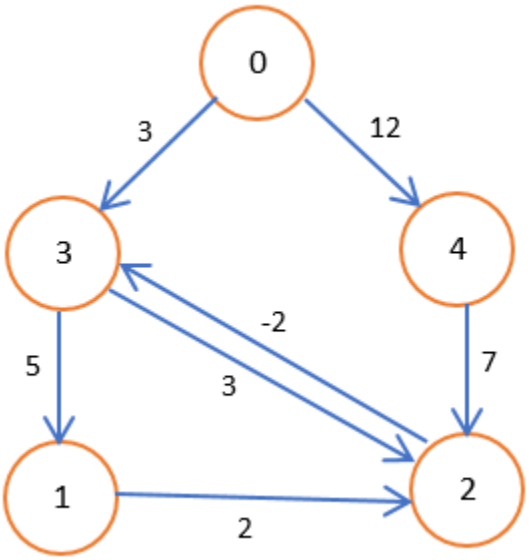
b) Assume an undirected graph is represented using an adjacency matrix, write an O(n) algorithm to identify if a vertex is isolated or not. A vertex is isolated if it is not connected to any other vertex. 20
Generate a graph with 8 vertices and 12 edges and make one of the vertices as isolated. Now generate the adjacency matrix and simulate your algorithm.

Or

Consider a city whose streets are defined by an X*Y grid. We are interested in walking from the upper left-hand corner of the grid to the lower right-hand corner. Unfortunately, the city has bad neighborhoods, which are defined as intersections we do not want to walk in. We are given an X*Y matrix BAD, where BAD[i,j] = "yes" if and only if the intersection between streets i and j is somewhere we want to avoid. 20

Now, give an example of the contents of matrix BAD of dimension n [where n = (5 + id%3)] such that there is no path across the grid avoiding bad neighborhoods. Explain how your example configuration ensures there is no path avoiding bad neighborhoods.

3. **a)** How can you store the following graph in a computer memory? 5



b) Determine the shortest path from vertex '0' to vertex '2' of the above-mentioned graph. 15

c) Illustrate 'Depth First Search' for the above-mentioned graph. 10

4. **a)** Apply Robbin-Karp string matching algorithm for the following 'Text' and 'Pattern'. 15

Text = 'ACFHYRF'
Pattern = 'HYR'

Use, prime number p = 11 for the Hash Operation.

b) "All algorithms of this course are NP Complete" -- Is this statement true or false? Explain your opinion. 5

c) Give an example of P, NP, and NP Complete problem. 10