Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

IV SEMESTER B.TECH. (COMPUTER SCIENCE & ENGINEERING)

MAKEUP EXAMINATIONS, JUNE 2019

SUBJECT: DESIGN & ANALYSIS OF ALGORITHMS [CSE 2202]

REVISED CREDIT SYSTEM
(11/06/2019)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitable assumed.

1A. With neat diagram define and explain different asymptotic notations along with example for each. **3**

1B. Consider the bubble sort method,

i). Prove that if bubble sort makes no exchanges on its pass through a list, the list is sorted and the algorithm can be stopped.

ii). Write an algorithm of the method that incorporates this improvement.

iii). What is the worst case input of this improved algorithm? Prove that the worst-case efficiency of the improved version is quadratic. **3**

1C. Solve the following recurrence relations.

i) $x(n) = x(n-1) + 5$ for $n > 1$, $x(1) = 0$

ii) $x(n) = x(n-1) + n$ for $n > 0$, $x(0) = 0$

iii) $x(n) = x(n/2) + n$ for $n > 1$, $x(1) = 1$ **4**

2A. Find the value of the optimal solution and the subset for the given instance (Table. 2A) of Knapsack problem with capacity W=16 using exhaustive search method. Clearly show all necessary steps.

Table. 2A

item	weight	value
1	2	20
2	5	30
3	10	50
4	5	10

2

2B. You are given an array of n distinct numbers with an unusual property: the numbers are strictly increasing from the first element to the k-th element, for some unknown integer k, and the numbers are strictly decreasing from the k-th element to the last element. Devise an **O(log n)** algorithm that receives such an array as an input and finds the maximum element in the array. For example, if the input array is: **1 4 7 8 6 3 0** then the output should be **8**. **3**

2C. Starting with vertex **a** and resolving ties by vertex alphabetical order perform the DFS and BFS traversal for the graph given in Fig. 2C. Construct the corresponding DFS and BFS trees showing all kinds of edges.

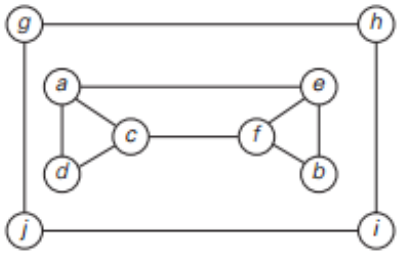

Fig. 2C **5**

3A. A partition is a situation where all the elements before the pivot element are smaller than or equal to pivot and all elements after pivot are greater than or equal to pivot. Write an algorithm that Partitions a subarray by using its first element as a pivot. Also compute its time efficiency. **4**

3B. Construct a max heap for the list 42, 12, 43, 23, 73, 24, 54 by successive insertions using top-down approach. Clearly show the heap after each insertion. **3**

3C. Obtain the time efficiency of heap sort assuming the heap is already constructed. **3**

4A. Solve the Knapsack problem given Table 3C using memory functions in dynamic programming. Capacity of the knapsack is W=6.

Table 3C

Item	Weight	Value ($)
1	3	25
2	2	20
3	1	15
4	4	40
5	5	50

4

4B. Apply Boyer Moore's algorithm to search for the pattern ***ATHIRITH*** in the text ***THIRITH_THWARITH_RITH*** Show bad symbol shift table and good suffix shift table. **3**

4C. Solve the Shortest Path Problem for the given graph in Fig. 4C using Dijkstra's algorithm assuming the source vertex to be 's'.

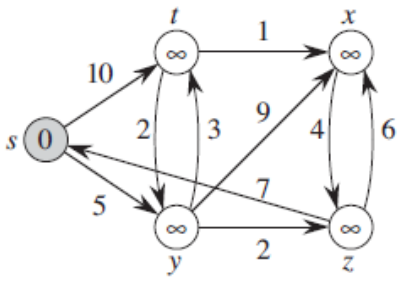

Fig. 4C **3**

5A. With the help of complete steps and using the concept of Backtracking illustrate how 4 Queens can be placed in a 4x4 chessboard such that no two queens attack each other by being in the same row or in the same column or on the same diagonal. **3**

5B. Solve the following Knapsack Problem given in Table 5B using Branch and Bound Technique when the maximum capacity of the Knapsack is 60

Table 5B

Item	Weight	Value
I1	5	30
I2	10	20
I3	20	100
I4	30	90
I5	40	160

4

5C. Define the following

a) Non-deterministic algorithm
b) NP-Complete Problem
c) Polynomial Reducible Problem

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