Exam Date & Time: 12-Jun-2019 (09:30 AM - 12:30 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

INTERNATIONAL CENTRE FOR APPLIED SCIENCES IV SEMESTER B.Sc. (APPLIED SCIENCES) IN ENGINEERING END SEMESTER THEORY EXAMINATION-APRIL/MAY 2019

DESIGN AND ANALYSIS OF ALGORITHMS [ICS 244]

Marks: 100

Duration: 180 mins.

Answer 5 out of 8 questions.

Missing data may be suitably assumed

- Illustrate by considering the problem of finding gcd of 2 numbers, that for a given problem there could be more than one algorithm to solve. Mention at least 3 algorithms.
 - ^{B)} With the help of a flowchart, explain the various stages of algorithm design and ⁽¹⁰⁾ analysis process.
- ²⁾ Give the general plan for analyzing the non-recursive algorithms. Also, give (10) the algorithm to find the maximum of N elements in an array, and obtain its time complexity.
 - B) Write the recursive algorithm for the Tower of Hanoi puzzle. Also, obtain the ⁽¹⁰⁾ recurrence relation to find the total number of disk movements in the Tower of Hanoi puzzle and solve the corresponding recurrence relation to obtain the time complexity.
- ³⁾ Give the algorithm for pattern matching using Brute Force technique. Also, ⁽¹⁰⁾ obtain its best case and worst case time complexity. Also, show the matching
 - A) process using the above algorithm, considering the text
 NOBODY_NOTICED_HIM and the pattern NOT
 - ^{B)} Find the optimal solution for the assignment problem given in Table 3B using Brute (10) Force technique. Show all the intermediate steps.

Table 3B

	Job1	Job2	Job3	Job4
Person1	4	3	8	6
Person2	5	7	2	4
Person3	16	9	3	1
Person4	2	5	3	7

Generate all the permutations for 4 items set (1,2,3,4) using the following (10) methods.

i) Johnson Trotter algorithm

^{B)} Apply the topological sorting on the graph given in Fig 4B using Source Removal Method. Show the sequence of steps performed using the Table 4B.

Steps	Stack	u = pop()	Solution T	v = adj(u)	Indegree of jobs					
					0	1	2	3	4	5





- Sort the list of numbers {60, 50, 25, 10, 35, 25, 75, 30, 15, 45} using Quick (10)
 Sort by choosing the first number in the list as pivot element. Show all the intermediate steps.
 - ^{B)} Write the complete algorithm for Merge Sort. Also obtain its time complexity ⁽¹⁰⁾ using MASTER theorem.
- ⁶⁾ What is an AVL tree. Give the rules, using which you decide whether to (10) perform a single rotation or a double rotation. Construct an AVL tree for the list 5, 6, 8, 3, 2, 4, 7, showing all the intermediate steps.
 - ^{B)} Write the algorithm to compute mode of given list of numbers based on (10) transform and conquer method and obtain its worst case time complexity.
- ⁷⁾ Give the algorithm for comparison counting sort. Also, sort the following list of (10) numbers using the above method, showing all the intermediate steps.
 A) 62 31 84 96 19 47
 - B) Explain the different strategies for collision handling. Given the values {2341, (10) 4234, 2839, 430, 22, 397, 3920}, a hash table of size 7, and hash function h(x) = x mod 7, show the resulting tables after inserting the values in the given order with each of these collision strategies.
- B) Give the Floyd's algorithm along with its time complexity. Also, find the shortest ⁽¹⁰⁾ path distance between every pair of vertices for the directed graph given in Fig
 A)
 - 8A using Floyd's algorithm. Show all the intermediate steps.

(10)



^{B)} The characters a to h have the set of frequencies based on the first 8
 Fibonacci numbers as follows: (10)

a : 1, b : 1, c : 2, d : 3, e : 5, f : 8, g : 13, h : 21 A Huffman code is used to represent the characters. What is the sequence of characters corresponding to the following code? 110111100111010

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