

Printed Pages: 02

Paper Id: 210102

Sub Code: MTCS102

Roll No.

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**M. TECH.
(SEM-I) THEORY EXAMINATION 2018-19
ADVANCED ALGORITHM**

Time: 3 Hours

Total Marks: 70

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION – A

1. You are required to answer all the parts of this question. (2×7=14 marks)

- a) $T_1(n) = O(f(n))$ and $T_2(n) = O(g(n))$ then, show that
 $T_1(n) + T_2(n) = O(\max(f(n), g(n)))$
- b) Solve the following recurrence
 $T(1) = 1, T(n) = 4T(n/3) + n^2$ for $n \geq 2$ by using Master Method.
- c) Explain and write partitioning algorithm for quick sort.
- d) Explain N-Queen problem in context of 'Backtracking approach.
- e) Show the trace of heap-sort algorithm for following input data 30,50,100,200,60,80,20
- f) Describe the properties and requirements of a good algorithm
- g) Discuss any sorting algorithm that runs in linear time.

SECTION – B

2. Attempt any three parts of the following: (7×3=21 marks)

- (a) What is dynamic programming? Explain any of its application in detail.
- (b) What are different asymptotic notations? Explain in details the Θ -Notation and O -Notation.
- (c) Show that the running time of QUICKSORT is $\theta(n^2)$, when the array A contains distinct elements and is sorted in decreasing order.
- (d) Find the optimal solution to the Knapsack instances $n = 5, w = (20, 30, 40, 10, 7)$ $v = (7, 8, 9, 1,)$ and $w = 80$, by using Greedy approach.
- (e) Write the algorithm of Rabin-Karp string matching. Describe the procedure giving an example; give the running time complexity in worst case.

SECTION – C

3. Attempt any one part of the following: (7×1=7 marks)

- (a) Explain in detail the Hiring problem. Give the necessary algorithms in support of your answer.
- (b) Solve the recurrence $T(n) = T(\sqrt{n}) + 1$.

4. **Attempt any one part of the following:** (7×1=7 marks)
- a) Show the red-black trees that result after recursively inserting the keys 41,38,31,12,19,8 into an initially empty Red-Black tree
 - b) Write the algorithm to solve the knapsack problem using Greedy method. What is the running cost of this algorithm?
5. **Attempt any one part of the following:** (7×1=7 marks)
- (a) What is Binary search tree? Derive an algorithm to search an algorithm in binary search tree.
 - (b) Prove that if the weights on edge of the connected undirected graph are distinct then there is a unique minimum spanning tree. Give an example in this regard.
6. **Attempt any one part of the following:** (7×1=7 marks)
- (a) Use the Build-Max-Heap operation of the given array $A = (17, 10, 84, 19, 6, 22, 9, 15, 35, 30)$.
 - (b) Write a backtracking algorithm for the sum of subset problem using the state space tree corresponding to the variable tuple size formulation.
7. **Attempt any one part of the following:** (7×1=7 marks)
- (a) Explain B-Tree and how it is different from another trees.
 - (b) Explain DFS in detail.

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MTCS102 CORRECTION E 31.12.18

Kindly update in Q.2 d) as

Please consider 'w' with single value (=80) as 'W' (Knapsack Max Weight).

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