Printed Pages: 02 **Sub Code: MTCS102**

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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.