PAPER ID-311902

Subject Code: MTCS102

Roll No: | | | | | | | | | | | | | |

MTECH
(SEM I) THEORY EXAMINATION 2023-24
ADVANCED ALGORITHM

TIME: 3HRS **M.MARKS: 70**

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x 7 = 14**

a.	What do you understand by stable sort? Name two stable sort algorithms.
b.	What do you understand by in place sorting algorithm?
c.	Explain different techniques for analyzing the algorithm.
d.	Give the recurrence relation for Merge Sort algorithm and also explain its time complexity.
e.	What do you understand by frequency count?
f.	Explain the properties of Max Heap with example.
g.	Define principle of optimality.

SECTION B

2. Attempt any *three* of the following: **7 x 3 = 21**

a.	Prove that if n>=1, then for any n key B-Tree of height h and minimum degree t>=2 h<=$\log_t((n+1)/2)$
b.	Identify the time complexity for the following Recurrences. i) T(n)= T(n-1) + n^3 using Iteration Method ii) T(n)= 2T(n/2) + n^2 using Master Method
c.	What is Knapsack problem? Solve Fractional Knapsack problem using greedy programming for the following four items with their weights w = {3,5, 9, 5} and values P = {45, 30, 45, 10} with Knapsack capacity is 16.
d.	Discuss the statement "The height of a Red-black tree is never more than 2*lg(n+1) where n is the total number of internal nodes in the tree.
e.	Explain Counting sort on the following array { 0, 0 , 1 ,1,1,3,3,5,5,5,3,2,2}

SECTION C

3. Attempt any *one* part of the following: **7 x 1 = 7**

a.	Apply quick Sort on the array {7, 2, 3, 4, 9, 15, 6, 12, 11, 19,20}. What is the worst-case time complexity of quick sort algorithm.
b.	What do you understand by sorting in linear time. Explain with an example.

4. Attempt any *one* part of the following: **7 x 1 = 7**

a.	Discuss the various cases for insertion of key in red-black tree for given sequence of key in an empty red-black tree- {15, 13, 12, 16, 19, 23, 5, 8}.
b.	Create B tree of degree 3 for the following sequence of keys. Show the structure in both cases after every insertion. 21, 30, 56, 17, 19, 48, 29, 24

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5. Attempt any *one* part of the following: 7 x 1 = 7

a.	Explain CREW/EREW algorithm.
b.	What do you understand by parallel algorithm? Explain the performance measure of parallel algorithm.

6. Attempt any *one* part of the following: 7 x 1 = 7

a.	Explain the difference between greedy and dynamic programming approach. Solve any one problem using dynamic programming.
b.	What do you understand by branch and bound technique? Give the solution of 4 queen problem using backtracking.

7. Attempt any *one* part of the following: 7 x 1 = 7

a.	Differentiate BFS and DFS algorithm. Explain with an example.
b.	Explain NP, NP complete and NP hard problems.