PAPER ID-410073

Subject Code: NCS501

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

B. TECH.
(SEM V) THEORY EXAMINATION 2021-22
DESIGN & ANALYSIS OF ALGORITHM

Time: 3 Hours ***Total Marks: 100***

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

SECTION A

1. Attempt *all* questions in brief. 2 x 10 = 20

a. What is the importance of average case analysis of algorithm?
b. What do you understand by stable sort?
c. Explain left rotation in RB tree.
d. Write down the properties of Binomial Heap.
e. Explain Divide and conquer approach.
f. What do you mean by convex hull?
g. Write down the Floyd Warshal algorithm.
h. What is Dynamic programming?
i. Explain Randomized algorithm in brief.
j. Write naïve string matching algorithm.

SECTION B

2. Attempt any *three* of the following: 10 x 3 = 30

a. Write insertion sort algorithm also derive the time complexity of insertion sort in best, average and worst case.
b. Discuss the various cases for insertion of key in red-black tree for given sequence of key in an empty red-black tree- **{10, 9, 8, 7, 6, 5, 4, 3, 2, 1}**
c. Write down the Dijkstra algorithm to solve the single source shortest path problem also write its time complexity.
d. Write an algorithm for graph coloring problem. Draw a state space tree for graph coloring problem using backtracking? Let **n=4** and **m=3**.
e. Write the Rabin karp string matching algorithm also write its time complexity.

SECTION C

3. Attempt any *one* part of the following: 10 x 1 = 10

(a) Solve the recurrence
  i) $T(n) = 2T(n/2) + n^2$
  ii) $T(n) = n + T(n/2)$ (Given $T(1)=1$)
(b) Sort the following sequence {25, 57, 48, 36, 12, 91, 86, 32} using Quick sort.

4. Attempt any *one* part of the following: 10 x 1 = 10

(a) What are the difference between Binary heap and Binomial Heap? Write down the algorithm for Decrease key operation in Binomial Heap.
(b) Perform the insertion operation using the keys F, S, Q, K, C, L, H, T, V, W, M, R, N, P, A, B in order into an empty B-tree. Use t=3, where t is the minimum degree of B- tree.

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5. Attempt any *one* part of the following: 10 x 1 = 10

(a) Write and explain the Kruskal algorithm to find the Minimum Spanning Tree of a graph with suitable example.

(b) What is Knapsack problem? Solve Fractional knapsack problem using greedy programming for the following five items with their weights w = **{5, 10, 20, 30, 40}** and values P = **{30, 20, 100, 90, 160}** with knapsack capacity is **60**.

6. Attempt any *one* part of the following: 10 x 1 = 10

(a) Discuss Travelling Salesman Problem with respect to Dynamic programming technique.

(b) Discuss Sum of subset problem using Backtracking approach with suitable example.

7. Attempt any *one* part of the following: 10 x 1 = 10

(a) Write and explain the algorithm to solve set cover problem using approximation algorithm.

(b) Explain P, NP, NP-Complete and NP-Hard problems in detail.