Question Paper Code : 8389

B.Tech. (Semester-VI) Examination, 2021-22

DESIGN AND ANALYSIS OF ALGORITHM

[Paper : CS-601]

Time : Three Hours] **[Maximum Marks : 70**

Note : Attempt all sections as instructed in each section.

SECTION - A **[Total Marks 9]**

1. *Attempt **any nine** parts of the following :* [1x9=9]

(a) Write the time complexity of Merge Sort in all the 3 cases (worst, average and best).

(b) What do you mean by stable sort algorithms?

(c) Write the time complexity of n node Red-Black Tree for search, insert and delete operation.

(d) Consider a B-tree in which the maximum number of keys in a node is 5. What is the minimum number of keys in any non-root node?

(e) List three example of divide and conquer algorithm.

(f) Dijkstra does not work for graphs with negative weights, Bellman-Ford works for such graphs. True or False.

(g) List three applications of backtracking algorithm.

(h) When dynamic programming approach is applicable?

(i) Define NP problems.

(j) What is the difference between approximation and deterministic algorithm?

SECTION - B **[Total Marks 40]**

Note : Attempt **all** the questions form this section.

2. Attempt **any two** parts of the following : [2×4=8]

(a) Differentiate between the Big-O and Little-o notation with suitable example.

(b) Find the time complexity of following recurrence relation.

$T(n)=T(n/4)+T(n/2)+cn^2$

(c) Sort the following list in increasing order using Heap sort technique and argue its running time : 37, 56, 61, 2, 38, 66, 69, 4, 30, 71.

3. Attempt **any two** parts of the following : [2×4=8]

(a) Describe the properties of binomial tree. Construct the binomial heap for the following sequence : 8, 2, 4, 17, 1, 11, 6, 9, 15, 10, 20.

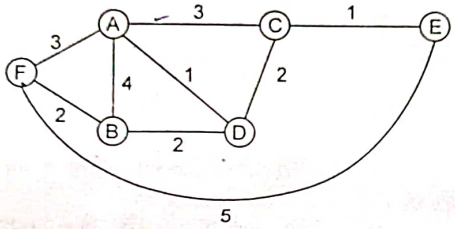
(b) List the advantages of Red Black Tree over Binary Search Tree. Insert the following sequence of keys in an empty Red Black Tree : 1, 2, 3, 4, 5, 6.

(c) Write short note on Fibonacci heap.

4. Attempt **any two** parts of the following : [2×4=8]

(a) Define minimum spanning tree, Find the minimum

cost spanning tree by Prim's algorithm of following graph :



(b) What is 0/1 Knapsack problem? Explain with a suitable example.

(c) Discuss the Dijkstra's algorithm for single source shortest path with a suitable example.

5. Attempt **any two** parts of the following : [2×4=8]

(a) Write a short note on n-queen problem.

(b) Explain Floyd-Warshall algorithm with a suitable example.

(c) Discuss travelling salesman problem with a suitable example.

6. Attempt **any two** parts of the following : [2×4=8]

(a) Explain NP-Hard and NP-Complete problems with suitable examples.

(b) Describe approximation algorithm. What is the approximation ratio?

(c) Write short note on randomized algorithm.

SECTION - C [Total Marks 21]

Note : Attempt **any three** questions from this section. [3×7=21]

7. Discuss the best case, average case and worst case complexities of quick sort algorithm in detail.

8. Discuss How B-Tree differ with binary search tree? Insert the following keys into an empty B-Tree with degree 2 : S, O, K, C, L, V, W, M, R, N, P, A, D, Y, Z, E.

9. Write an algorithm for chain matrix multiplication. Calculate the minimum number of multiplication required to compute the chain A1A2A3A4A5 of matrix where A1=2×3, A2=3×4, A3=4×5, A4=5×3, A5=3×4.

10 Compare Backtracking and Branch and Bound techniques with an example

11 Using Knuth-Morris Pratt algorithm to find whether the pattern P=<0010> is in text T=<1000110100010100> or not?

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