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B TECH
(SEM V) THEORY EXAMINATION 2017-18
DESIGN AND ANALYSIS OF ALGORITHMS

Time: 3 Hours**Total Marks: 100****Notes:** Attempt all Sections. Assume any missing data.**SECTION-A****1. Define/Explain the following:****(2*10=20)**

- (a) Difference between Complete Binary Tree and Binary Tree?
- (b) Difference between Greedy Technique and Dynamic programming.
- (c) Solve the following recurrence using Master method:

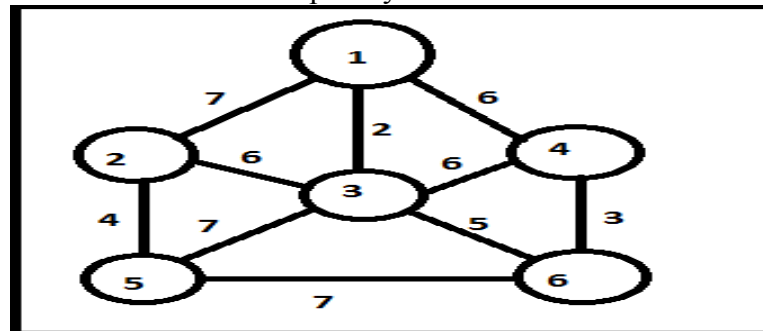
$$T(n) = 4T(n/3) + n^2$$
- (d) Name the sorting algorithm that is most practically used and also write its Time Complexity.
- (e) Find the time complexity of the recurrence relation

$$T(n) = n + T(n/10) + T(7n/5)$$
- (f) Explain Single source shortest path.
- (g) Define Graph Coloring.
- (h) Compare Time Complexity with Space Complexity.
- (i) What are the characteristics of the algorithm?
- (j) Differentiate between Backtracking and Branch and Bound Techniques.

SECTION-B**2. Attempt any three of the following:****(10*3=30)**

- (a) Solve the following By Recursion Tree Method

$$T(n) = n + T(n/5) + T(4n/5)$$
- (b) Insert the following information F, S, Q, K, C, L, H, T, V, W, M, R, N, P, A, B, X, Y, D, Z, E, G, I. Into an empty B-tree with degree $t=3$.
- (c) What is Minimum Cost Spanning Tree? Explain Kruskal's Algorithm and Find MST of the Graph. Also write its Time-Complexity



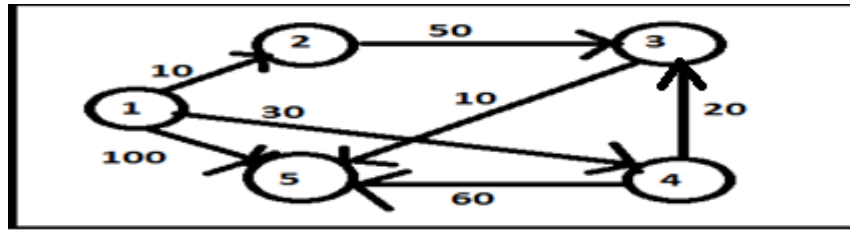
(d) What is Red-Black tree? Write an algorithm to insert a node in an empty red-black tree explain with suitable example.

(e) Explain HEAP-SORT on the array. Illustrate the operation of HEAP-SORT on the array

$$A = \{6, 14, 3, 25, 2, 10, 20, 7, 6\}$$

SECTION C**3. Attempt any one part of the following:****(10 x 1=10)**

- (a) Explain Convex –Hull problem.
- (b) Find the shortest path in the below graph from the source vertex 1 to all other vertices by using Dijkstra's algorithm.



4. Attempt any one part of the following:

(10 x 1=10)

- (a) What is backtracking? Discuss sum of subset problem with the help of an example.
- (b) Write down an algorithm to compute Longest Common Subsequence (LCS) of two given strings and analyze its time complexity.

5. Attempt any one part of the following:

(10 x 1= 10)

- (a) The recurrence $T(n) = 7T(n/2) + n^2$ describe the running time of an algorithm A. A competing algorithm A' has a running time of $T'(n) = aT'(n/4) + n^2$. What is the largest integer value for a A' is asymptotically faster than A?
- (b) Discuss the problem classes P, NP and NP –complete .with class relationship.

6. Attempt any one part of the following:

(10 x 1=10)

- (a) Explain properties of Binomial Heap in .Write an algorithm to perform uniting two Binomial Heaps. And also to find Minimum Key.
- (b) Given the six items in the table below and a Knapsack with Weight 100, what is the solution to the Knapsack problem in all concepts. I.e. explain greedy all approaches and find the optimal solution

ITEM ID	WEIGHT	VALUE	VALUE/WEIGHT
A	100	40	.4
B	50	35	.7
C	40	20	.5
D	20	4	.2
E	10	10	1
F	10	6	.6

7. Attempt any one part of the following:

(10 x 1=10)

- (a) Compute the prefix function π for the pattern $P = a b a c a b$ using KNUTH-MORRIS –PRATT Algorithm. Also explain Naïve String Matching algorithm.
- (b) Explain Approximation and Randomized algorithms.