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
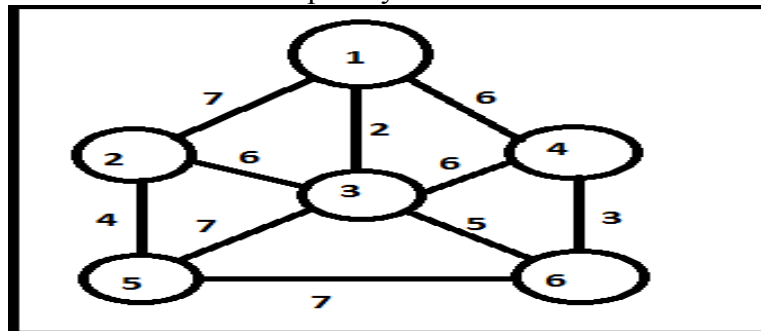
   (d) What is Red-Black tree? Write an algorithm to insert a node in an empty red-black tree explain with suitable example.
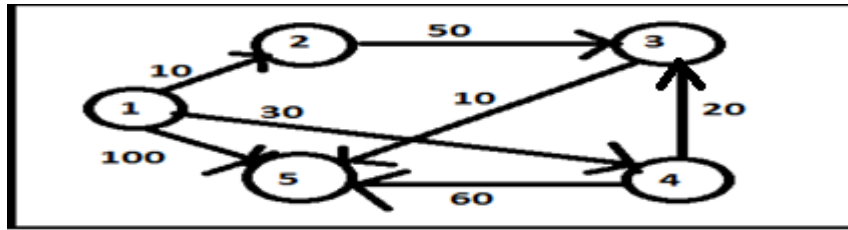
   (e) Explain HEAP-SORT on the array. Illustrate the operation of HEAP-SORT on the array
         A= {6, 14, 3, 25, 2, 10, 20, 7, 6}

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.