

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : **110502**

Roll No.

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B. Tech.

(SEM. V) (ODD SEM.) THEORY

EXAMINATION, 2014-15

DESIGN AND ANALYSIS OF ALGORITHMS

Time : 3 Hours]

[Total Marks : 100

1 Attempt any four parts of the following : **5×4=20**

(a) Solve the following recurrences:

i) $T(n) = T(n/2) + T(n/4) + T(n/8) + n$

ii) $T(n) = T(\sqrt{n}) + O(\lg n)$

(b) What is the time complexity of counting sort?

Illustrate the operation of counting sort on array

$A = \{1, 6, 3, 3, 4, 5, 6, 3, 4, 5\}$

(c) Describe the properties of red Black tree. Show that Red Black Tree with n internal nodes has height at most $2\lg(n+1)$.

(d) Discuss the complexity of Max-Heapify and Build-Max Heap procedures.

(e) Discuss asymptotic notations in brief.

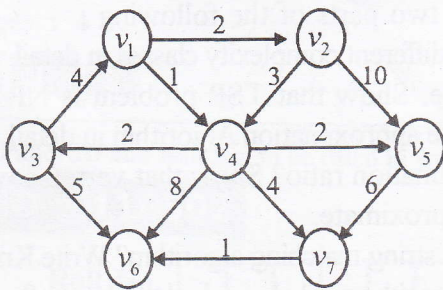
(f) Discuss the best case and worst case complexities of quick sort algorithm in detail.

2 Attempt any two parts of the following : $10 \times 2 = 20$

- (a) What are the advantages of Red Black Tree over Binary Search Tree? Write algorithms to insert a key in a red black tree. Insert the following sequence of information in an empty red black tree 1, 2, 3, 4, 5, 5.
- (b) Define the binomial heap in detail. Write an algorithm for performing the union operation of two binomial heaps and also explain with suitable example.
- (c) How B-Tree differs with other tree structures. Insert the following information $F, S, Q, K, C, L, V, W, M, R, N, P, A, D, Z, E$ into an empty B-Tree with degree $t = 2$.

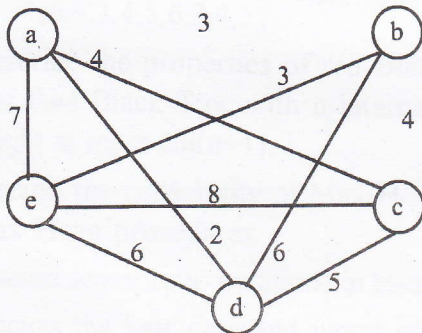
3 Attempt any two parts of the following : $10 \times 2 = 20$

- (a) What do you mean by minimum spanning tree? Write an algorithm for minimum spanning tree that may generate multiple forest trees and also explain with suitable example.
- (b) Describe in detail the Strassen's Matrix Multiplication algorithms based on divide and conquer strategies with suitable example.
- (c) Given a weighted directed graph $G = (V, E)$ with source s and weight function $W : E \rightarrow R$, then write an algorithm to solve a single source shortest path problem whose complexity is $O(VE)$. Apply the same on the following graph.



4 Attempt any two parts of the following : $10 \times 2 = 20$

- (a) Differentiate between Dynamic programming and Greedy approach. What is 0/1 knapsack problem? Solve the following instance using Dynamic programming, write the algorithm also. Knapsack Capacity=10 $P = \langle 1, 6, 18, 22, 28 \rangle$ and $w = \langle 1, 2, 5, 6, 7 \rangle$.
- (b) Differentiate between Backtracking and Branch and Bound approach. Write an algorithms for sum subset problem using back tracking approach. Find all possible solution for following instance using same if $m=30$, $S = \langle 1, 2, 5, 7, 8, 10, 15, 20, 25 \rangle$.
- (c) Define TSP problem in detail. Find the solution for the following instance of TSP problem using branch and bound.



5 Attempt any two parts of the following : $10 \times 2 = 20$

- (a) Define different complexity classes in detail with suitable example. Show that TSP problem is NP Complete.
- (b) Describe approximation Algorithm in detail. What is the approximation ratio? Show that vertex cover problem is 2 approximate.
- (c) What is string matching algorithm? Write Knuth-Morris-Pratt algorithm and also calculate the prefix function for the pattern $P = ababaaca$.