Printed Pages : 4

ECS-502

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

PAPER ID : 110502

Roll No.

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 2lg(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 : 10×2=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.

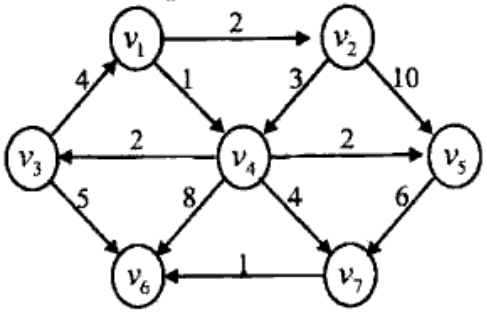
(c) How B-Tree differs with other tree structures. Insert the following information *F, S, Q, K, C, L, V, W, M, R, N, P, A, D, Z, E* into an empty B-Tree with degree $t = 2$.

3 Attempt any two parts of the following : 10×2=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.

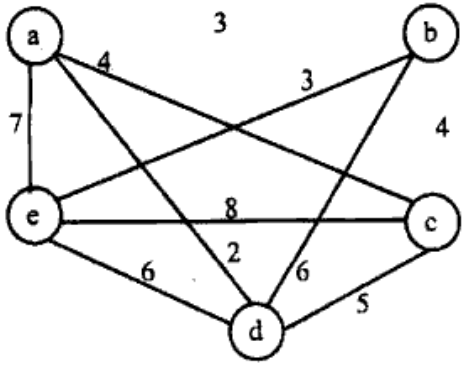


4 Attempt any two parts of the following : **10×2=20**

(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=<1,6,18,22,28> and w=<1,2,5,6,7>.

(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=< 1,2,5,7,8,10,15,20,25 >.

(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 : **10×2=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=abababaca.