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06CS43

Fourth Semester B.E. Degree Examination, December 2010
Analysis and Design of Algorithms

Time: 3 hrs. Max. Marks:100

Note: *Answer any FIVE full questions, selecting at least TWO questions from each part*

PART – A

1 a. What is an algorithm? With a neat diagram, explain the algorithm design and analysis process. **(10 Marks)**

b. Define the asymptotic notations for worst case, best case and average case time complexities. Give example. **(10 Marks)**

2 a. With a suitable example, explain the significance of the order of growth in analyzing the algorithm efficiency. **(10 Marks)**

b. Prove that : i) $\frac{1}{2}n(n-1) \in \theta(n^2)$ ii) $n! \in \Omega(2^n)$. **(04 Marks)**

c. Distinguish between the two common ways to represent a graph – given the representation of undirected graph. Explain how the following can be ascertained by the representation
i) The graph is completed ii) The graph has a loop iii) The graph has an isolated vertex
Answer for each of the representation separately. **(06 Marks)**

3 a. What is a "Bruteforce" method? Under what condition does the method become desirable? **(06 Marks)**

b. State the merge sort algorithm and analyze its complexity. **(08 Marks)**

c. Outline an exhaustive search algorithm to solve the traveling salesman problem. **(06 Marks)**

4 a. Briefly explain the strassen's matrix multiplication. How it uses divide and conquer method? Obtain its time complexity. **(06 Marks)**

b. Write an algorithm to topologically sort a diagrph using DFS. Prove the correctness of the algorithm, with examples. **(08 Marks)**

c. With the suitable example, explain the Johnson trotter algorithm, to generate the permutation of given objects. **(06 Marks)**

PART - B

5 a. What is an AVL tree? Explain the four types of rotations used to construct the AVL tree. Insert 1, 25, 28, and 12 in the following tree.

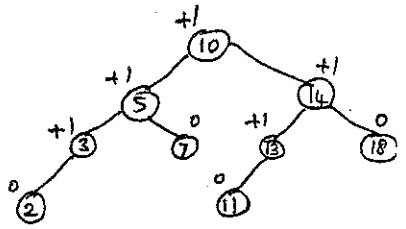

Fig. Q5(a) **(10 Marks)**

b. When does collision occur in hashing? Arrange the following keys in the hash table of size 10, using open hashing technique. A, GOOD, STUDENT, WORKS, HARD. **(04 Marks)**

c. Construct a Huffman code for the following data :

Char	A	B	C	D	E
Probability	0.4	0.1	0.25	0.2	0.15

i) Encode the text A B A C A B A D using generated code
ii) Decode the text whose encoding is 10001011100101. **(06 Marks)**

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

6 a. With the help of pseudocode, explain Marshall's algorithm to find the transitive closure of a directed graph. Apply it to the graph shown below : **(10 Marks)**

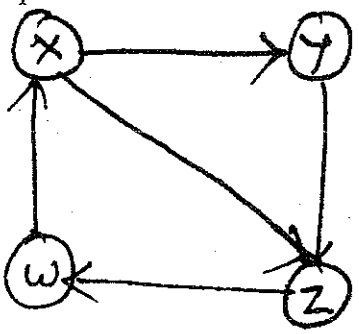

Fig. Q6(a)

b. Find the minimum spanning tree, using Prim's method for the graph shown below:

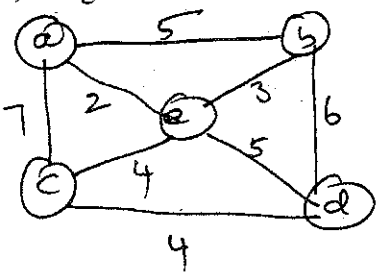

Fig. Q6(b) **(10 Marks)**

7 a. Find the single source shortest paths. Apply the Dijkstra's algorithm to Fig. Q7(a), to get the shortest path form the vertex to all the other vertices.

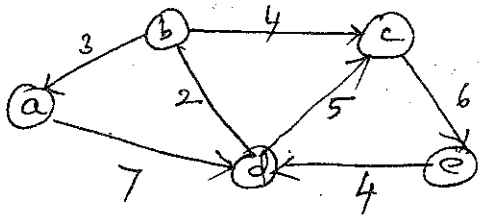

Fig. Q7(a) **(10 Marks)**

b. Write a bottom-up dynamic algorithm for the knapsack problem. Apply it on the following instance of the knapsack problem. **(10 Marks)**

Item	Weight	Value
1	2	3
2	3	4
3	4	5
4	5	6

Table Q7(b)

8 a. Define P, NP and NP complete problem. **(04 Marks)**

b. Explain how the TSP problem can be solved using branch and bound methods. **(06 Marks)**

c. Explain the back – traching algorithm. Apply the same to solve the following instance of the subset sum problem
s = {5, 10, 12, 13, 15, 18} and d = 30. **(10 Marks)**

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