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07MCA44

Fourth Semester MCA Degree Examination, June/July 2011
Design and Analysis of Algorithms

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. Mention the characteristics of a good algorithm. Explain the algorithm design and analysis process, with a neat flow chart. **(10 Marks)**

b. In how many ways a graph can be represented in computer? Explain with examples. **(05 Marks)**

c. Write an algorithm to select second largest element in a given set of N numbers. **(05 Marks)**

2 a. Define space and time complexities. Explain the commonly used asymptotic notations, with an example each. **(10 Marks)**

b. Suggest a general plan for analyzing the efficiency of recursive algorithms. Apply the plan to analyze the efficiency of the Tower of Hanoi algorithm. **(10 Marks)**

3 a. Solve the following recurrence relations:

i) $T(n) = 2.T(n/2) + 1$, for $n > 1$, $T(1) = 1$, $n = 2^k$.

ii) $T(n) = 2.T(n-2) + 1$, for $T(1) = 1$, $n > 1$. **(06 Marks)**

b. Write the Brute force string matching algorithm and determine the number of character comparisons required in searching for the pattern ABABC using the above algorithm in the text: BAABABABCCA **(06 Marks)**

c. Explain a method to multiply two large integers based on divide and conquer strategy. Analyze the algorithm to multiply the integers 121 and 234. **(08 Marks)**

4 a. Write the DFS traversal algorithm of a graph and calculate its worst case efficiency. **(10 Marks)**

b. What is a heap? Outline an algorithm to construct a bottom-up heap. Sort the following elements using heap sort technique: 2, 7, 3, 6, 4, 8, 9. **(10 Marks)**

5 a. What is AVL tree? Explain various rotations associated with AVL trees. Also, explain how AVL trees are used as search trees. **(10 Marks)**

b. Write an algorithm to sort a given list using comparison counting. Trace the algorithm for the following list: 18, 35, 15, 50, 25. **(10 Marks)**

6 a. Outline the Floyd's algorithm. Find all pair shortest path for the following graph using the Floyd's algorithm [Refer Fig.Q6(a)]. **(10 Marks)**

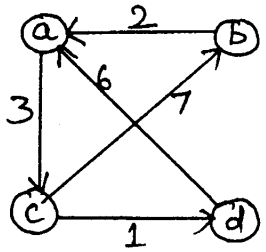

Fig.Q6(a)

b. Solve the following knapsack problem using the dynamic programming: Capacity , W = 5.

Item :	1	2	3	4
Weight :	2	1	3	2
Value :	12	10	20	15

(10 Marks)

7 a. Write Prim's algorithm to find the minimum cost spanning tree. Apply it to find the minimum spanning tree for the graph shown in Fig.Q7(a). **(10 Marks)**

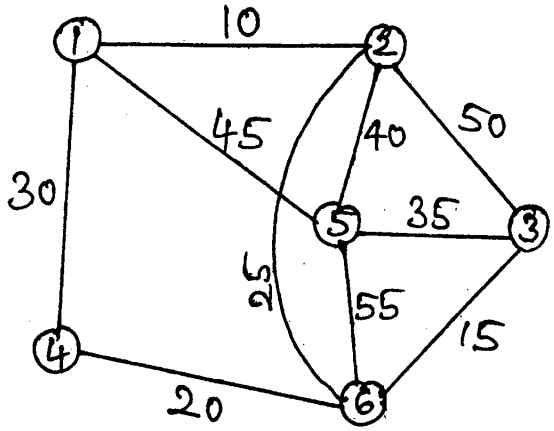

Fig.Q7(a)

b. Explain how branch and bound technique can be used to solve i) Knapsack problem and ii) Traveling salesman problem. **(07 Marks)**

(10 Marks)

8 Write short notes on the following :

a. N-Queens problem

b. NP and NP complete problems

c. Huffman trees

d. Exhaustive search **(20 Marks)**

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