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10MCA44

Fourth Semester MCA Degree Examination, June/July 2014

Design and Analysis of Algorithms

Time: 3 hrs. Max. Marks:100

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

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.

1 a. With a neat graph, explain O, Θ and Ω notations. **(06 Marks)**

b. Find the order of growth of the following recurrences:

i) $T(n) = 4T\left(\frac{n}{2}\right) + n$

ii) $T(n) = 2T\left(\frac{n}{2}\right) + n \log n$ **(04 Marks)**

c. Suggest a general plan for the non-recursive algorithm and suggest an algorithm to find whether the elements in an array are unique. Analyze its efficiency. **(10 Marks)**

2 a. Explain the general method of divide and conquer technique. Discuss defective chessboard problem and analyze the same. **(10 Marks)**

b. Write the algorithm for Quick sort and apply it to sort the list "C, O, M, P, U T, E, R" in alphabetical order and analyze the time complexity of the algorithm. **(10 Marks)**

3 a. What are the requirements to be satisfied to apply greedy technique? Explain Prim's algorithm and solve the following graph Fig.Q3(a).

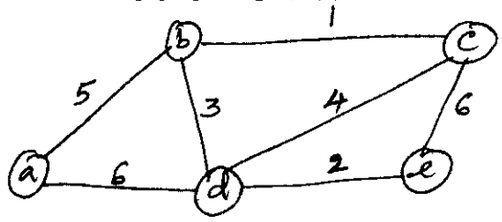

Fig.Q3(a) **(10 Marks)**

b. Explain job sequencing with deadlines and apply it for n = 4, $(p_1, p_2, p_3, p_4) = (100, 10, 15, 27)$ and $(d_1, d_2, d_3, d_4) = (2, 1, 2, 1)$ and obtain the feasible solution. **(10 Marks)**

4 a. Apply Warshall's algorithm to find the transitive closure of the graph defined by the following adjacency matrix.

$$\begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$ **(10 Marks)**

b. For the given instance of problem, obtain the optimal solution for the 0/1 Knapsack problem.

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

The capacity of Knapsack is W = 5. **(10 Marks)**

5 a. Explain Boyer-Moore algorithm to find the pattern in the given text and search for the pattern BARBER in the text:

TOM $ SAW $ ME $ IN $ BARBER $ SHOP **(10 Marks)**

b. Apply DFS based and source removal method to obtain the topological sorting of the following graph Fig.Q5(b):

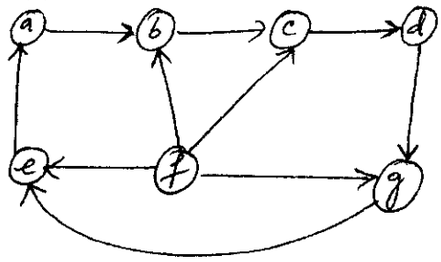

Fig.Q5(b) **(10 Marks)**

6 a. Describe in brief, different methods for obtaining lower bounds. **(08 Marks)**

b. Explain P, NP and NP complete problems. **(06 Marks)**

c. Write short notes on decision trees. **(06 Marks)**

7 a. Explain the principle of backtracking and apply the same to n-queens problem. Also indicate the solution for state space representation of 4-queens problem. **(10 Marks)**

b. Solve the knapsack using branch and bound technique.

Item	Weight	Value
1	4	$40
2	7	$42
3	5	$20
4	3	$12

Capacity of knapsack, W = 10. **(10 Marks)**

8 a. What is prefix computation problem? Explain in brief. **(10 Marks)**

b. Explain how graph problems can be solved using parallel algorithms. **(10 Marks)**

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