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10CS43

Fourth Semester B.E. Degree Examination, June/July 2013
Design and Analysis of Algorithms

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. What is an algorithm? What are the properties of an algorithm? Explain with an example. **(08 Marks)**

b. Explain brute force method for algorithm design and analysis. Explain the brute force string matching algorithm with its efficiency. **(08 Marks)**

c. Express using asymptotic notation i) n! ii) $6 * 2^n + n^2$. **(04 Marks)**

2 a. Explain divide and conquer technique. Write the algorithm for binary search and find average case efficiency. **(10 Marks)**

b. What is stable algorithm? Is quick sort stable? Explain with example. **(06 Marks)**

c. Give an algorithm for merge sort. **(04 Marks)**

3 a. Explain the concept of greedy technique for Prim's algorithm. Obtain minimum cost spanning tree for the graph below Prim's algorithm. **(09 Marks)**

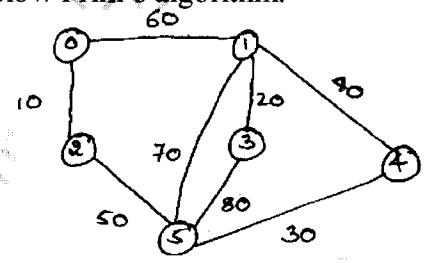

Fig.Q.3(a)

b. Solve the following single source shortest path problem assuming vertex 5 as the source. **(09 Marks)**

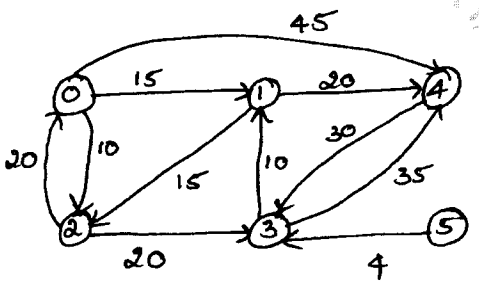

Fig.Q.3(b)

c. Define the following: i) Optimal solution; ii) Feasible solution. **(02 Marks)**

4 a. Using Floyd's algorithm solve the all pair shortest problem for the graph whose weight matrix is given below:

$$\begin{bmatrix} 0 & \infty & 3 & \infty \\ 2 & 0 & \infty & \infty \\ \infty & 7 & 0 & 1 \\ 6 & \infty & \infty & 0 \end{bmatrix}$$

(07 Marks)

b. Using dynamic programming, solve the following knapsack instance.
$N = 4 \quad M = 5$
$(W_1, W_2, W_3, W_4) = (2, 1, 3, 2)$
$(P_1, P_2, P_3, P_4) = (12, 10, 20, 15)$. **(05 Marks)**

c. Outline an exhaustic search algorithm to solve traveling salesman problem. **(08 Marks)**

PART – B

5 a. Write and explain DFS and BFS algorithm with example. **(08 Marks)**

b. Obtain topologies sorting for the given diagraph using source removal method. **(05 Marks)**

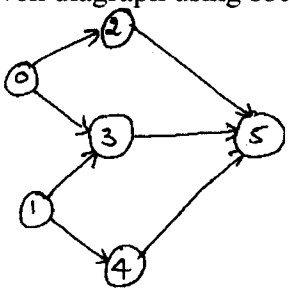

Fig.Q.5(b)

c. Explain Horspool's string matching algorithm for a text that comprises letters and space (denoted by hyphen) i.e "JIM-SAW-ME-IN-BARBER-SHOP" with pattern "BARBER". Explain its working along with a neat table and algorithm to find shift table. **(07 Marks)**

6 a. Define the following:
i) Class P
ii) Class NP
iii) NP complete problem
iv) NP hard problem. **(08 Marks)**

b. Write the decision tree to sort the elements using selection sort and find the lower bound. **(08 Marks)**

c. What is numeric analysis? **(02 Marks)**

d. Brief overflow and underflow in numeric analysis algorithms. **(02 Marks)**

7 a. What is back tracking? Apply back tracking problem to solve the instance of the sum of subset problem: $S = \{3, 5, 6, 7\}$ and $d = 15$. **(07 Marks)**

b. With the help of a state space tree, solve the following instance of the knapsack problem by the branch-and-bound algorithm. **(06 Marks)**

Item	Weight	Value
1	4	40
2	7	42
3	5	25
4	3	12
Knapsack	Capacity	W = 10

c. Explain how backtracking is used for solving 4-queen's problem. Show the state space table. **(07 Marks)**

8 a. What is prefix computation problem? Give the algorithms for prefix computation which uses: i) n processors; ii) n/logn processors.
Obtain the time complexities of these algorithms. **(10 Marks)**

b. What is super linear speed up? Obtain the maximum speed up when P = 10 and various values of f = 0.5, 0.1, 0.01. **(05 Marks)**

c. What are the different ways of resolving read and write conflicts? **(05 Marks)**

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