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10CS43

Fourth Semester B.E. Degree Examination, Dec.2016/Jan.2017
Design & 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. Define three asymptotic notations and express the following assertions using three asymptotic notations with proof from its definition
i) $n(n-1)/2$ ii) $6*2^n + n^2$ iii) $100n + 5$. **(06 Marks)**

b. Give general plan of analyzing recursive algorithm. Mathematically analyze the tower of Hanoi problem and find its complexity. **(08 Marks)**

c. Give any two brute force sorting algorithms to sort the given set of integer and find its complexities. **(06 Marks)**

2 a. Give the general form of divide and conquer recurence relation and explain how you can solve it using Master's theorem. **(06 Marks)**

b. Give a suitable sorting algorithm that uses divide and conquer techniques which divides problem size by considering values in the list. Analyze it for best and worst case efficiencies. **(08 Marks)**

c. Give recursive binary search algorithm and write binary decision tree for the following n = 14 elements (–15, –6, 0, 7, 9, 23, 54, 82, 101, 112, 125, 131, 142, 151). **(06 Marks)**

3 a. Give the control abstraction for subset paradigm using greedy method. Solve the job sequencing with deadline problem using greedy method for the given data
N = 7, P = {3, 5, 20, 18, 1, 6, 30} are profits and
D= {1, 3, 4, 3, 5, 1, 2} are deadline respectively. **(06 Marks)**

b. Find minimum cost spanning tree for a graph G(6, 10) with vertices named as a, b, c, d, e, f and edges ab = 3, bc = 1, af = 5, ae = 6, ed = 8, fe = 2, fd = 5, cd = 6, cf = 4 and bf = 4 using prim's algorithm and justify your answer by solving the problem using Kruskal's algorithm showing results in each stages. **(08 Marks)**

c. Find the shortest path from source a to all other vertices in the graph shown in Fig Q3(c). Using greedy method. Give the greedy criterion used. **(06 Marks)**

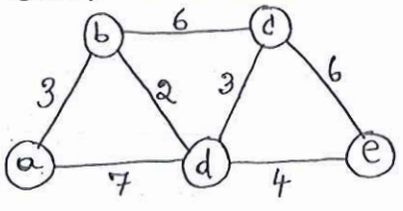


Fig Q3 (c)

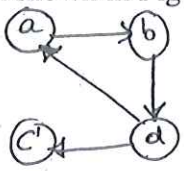
4 a. Design the recurrence to solve all pairs shortest path algorithm and give the all pairs shortest path algorithm. **(08 Marks)**

b. Give the recurrence used to solve knapsack problem using dynamic programming and explain in brief the same. Solve the following Knapsack problem using dynamic programming. Capacity W = 5 **(08 Marks)**

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

c. Find the transitive closure for the graph shown in Fig 4 (c) using dynamic programming

Fig Q4(c)



(04 Marks)

PART – B

5 a. Sort the list 75, 65, 55, 45, 35, 25 to arrange in ascending order using decrease and conquer technique showing traces of its working and find its complexity. Also write the algorithm used. **(06 Marks)**

b. Give a suitable algorithm for finding a minimum edge – path between two given vertices in any given graph. Apply that algorithm to the graph shown in Fig Q5(b) showing the tree that identifies the minimum edge path from a to g. **(06 Marks)**

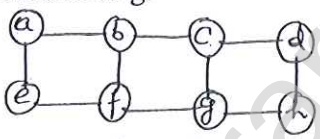


Fig Q5(b)

c. Show the steps of searching for a pattern BAOBAB in a Text: BESS – KNEW – ABOUT – BAOBAB using input enhancement technique that uses single shift table. Give the pseudo code of the algorithm and find its worst case complexity. **(08 Marks)**

6 a. What do you mean by lower bound arguments? Listout four methods of obtaining lower bounds and explain them in brief. **(08 Marks)**

b. What is a decision tree? Write a 3 – element insertion sort decision tree and find the average number of comparison. **(06 Marks)**

c. Apply four iterations of Newton method to compute $\sqrt{2}$ and estimate the absolute and relative errors of the computations. **(06 Marks)**

7 a. Explain backtracking concept and apply it to solve subset sum problem for S = {6, 5, 3, 7} and d = 15. **(06 Marks)**

b. How the branch and bound algorithm is different from backtracking? Solve the following instance of Knapsack problem by the branch and bound method.
Given Knapsack capacity = 10. **(08 Marks)**

Item	1	2	3	4
Weight	4	7	5	3
Value	40	42	25	12

c. Give the nearest neighbor algorithm to solve TSP and apply that algorithm for the graph shown in Fig Q7(c), with starting vertex a and also calculate accuracy ratio of approximation. **(06 Marks)**

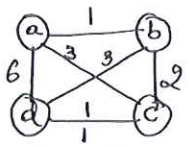


Fig Q7(c)

8 a. What is super linear speed up? Obtain maximum speed up when P = 10 and for f = 0.5, 0.1, 0.01. **(04 Marks)**

b. What are the different ways of solving read and write conflict? Define all that conflicts. **(06 Marks)**

c. Let input to the prefix computation problem be 5, 12, 8, 6, 3, 9, 11, 12, 1, 5, 6, 7, 10, 4, 3, 5 and let ⊕ stand for addition. Solve problem using work optimal algorithm. **(10 Marks)**

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