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13MCA41

Fourth Semester MCA Degree Examination, Dec.2017/Jan.2018

Analysis and Design of Algorithms

Time: 3 hrs. Max. Marks:100

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

2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

1 a. Mention the general plan for analyzing the efficiency of recursive algorithm. Apply this plan to analyze the algorithm to solve tower of Hanoi problem. **(10 Marks)**

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

2 a. Compare the orders of growth of $\frac{1}{2}n(n-1)$ and n^2 using limits. **(04 Marks)**

b. Write the algorithm for selection sort and analyze the time complexity of the algorithm. **(06 Marks)**

c. Explain the general divide and conquer technique. Discuss merge sort algorithm and analyze the same. **(10 Marks)**

3 a. Write the algorithm for Quick Sort and trace the algorithm on the following data: 5, 3, 1, 9, 8, 2, 4, 7. **(10 Marks)**

b. Write the recursive binary search algorithm and apply it for searching 70 in the following list: 3, 14, 27, 31, 39, 42, 55, 70, 74, 81, 85, 93, 98. **(10 Marks)**

4 a. Explain the methods used for topological ordering of vertices of a Directed Acyclic Graph. Apply any one of the methods on the graph given in Fig.Q4(a) and write the sorted list of vertices.

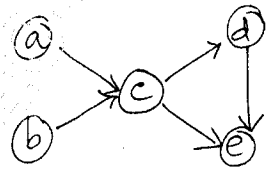

Fig.Q4(a) **(10 Marks)**

b. Explain decrease and conquer technique and its major variants. Traverse the graph given in Fig.Q4(b) using BFS method.

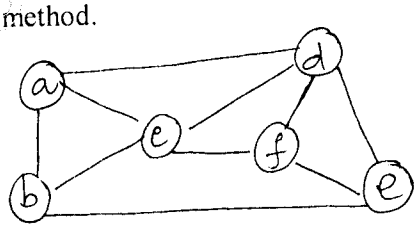

Fig.Q4(b) **(10 Marks)**

5 a. Explain Horspool's algorithm to find the pattern in the given text and search for the pattern BARBER. Text : JIMSAWMEINA$BARBER$SHOP **(10 Marks)**

b. Apply Dynamic Programming technique to the following instance of KnapSack problem, capacity, W = 5.

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

(10 Marks)

6 a. Explain Dynamic Programming. Explain Warshall's algorithm and find the transitive closure of the following graph in the Fig.Q6(a).

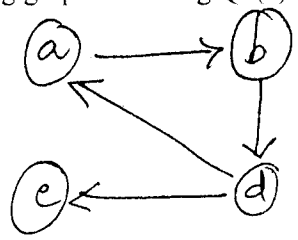

Fig.Q6(a) **(10 Marks)**

b. Write Prim's algorithm. Apply this algorithm to find minimum cost spanning tree of the graph shown in Fig.Q6(b).

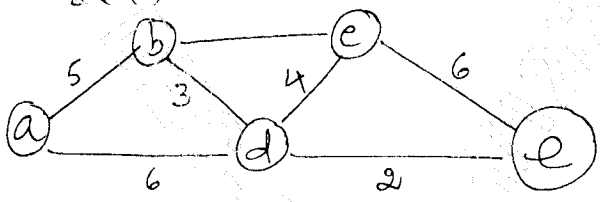

Fig.Q6(b) **(10 Marks)**

7 a. Explain Huffman's algorithm and construct Huffman tree for the following data and obtain the Huffman codes.

Character	A	B	C	D	-
Probability	0.35	0.1	0.2	0.2	0.15

(10 Marks)

b. Write short notes on the following:
i) Decision tree
ii) P. NP and NP complete problems **(10 Marks)**

8 a. Explain backtracking. Draw the state space tree and solve the subset sum problem for the following instance. S = {3, 5, 6, 7} and d = 15. **(10 Marks)**

b. Explain branch and bound technique and apply it to assignment problem specified in the following cost matrix, C.

$$C = \begin{array}{c} \begin{matrix} job1 & job2 & job3 & job4 \end{matrix} \\ \begin{bmatrix} 9 & 2 & 7 & 8 \\ 6 & 4 & 3 & 7 \\ 5 & 8 & 1 & 8 \\ 7 & 6 & 9 & 4 \end{bmatrix} \end{array} \begin{matrix} \text{person a} \\ \text{person b} \\ \text{person c} \\ \text{person d} \end{matrix}$$

(10 Marks)

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