322512 (22)

BE (5th Semester)

Examination, April - May, 2014

Branch : CSE

ANALYSIS AND DESIGN OF ALGORITHMS

Time Allowed : Three Hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : Answer all the questions. Part (a) of all the

questions is compulsory and which carry 2 marks. Answer any two parts out of the remaining (b), (c) & (d) parts of each question which carry 7 marks.

Q. 1. (a) Define the term Floors and Ceils.

(b) Consider the following recurrence, $t_n = 3t_{n-1} - 4t_{n-3}$ having initial condition $t_0 = -4, t_1 = 2, t_2 = 6$. Obtain solution for the recurrence.

(c) What do you mean by Asymptotic Notation. Explain different types of asymptotic notation with example.

(d) Analyse the insertion sort algorithm. Argue on its best case, average case, and worst case time complexity.

Q. 2. (a) Define 0–1 Knapsack problem.

(b) Determine an LCS of <1, 0, 0, 1, 0, 1, 0, 1> and <0, 1, 0, 1, 1, 0, 1, 1, 0>

(c) Waht is an optimal Huffman code for the following set of frequencies, based on the first 7 Fibonacci numbers ?

a : 1, b : 1, c : 2, d : 3, e : 5, f : 8, g : 13

Can you generalize your answer to find the optimal code when the frequencies are the first n Fibonacci numbers ?

(d) Suppose that the graph G = (V, E) is represented as an adjacency matrix. Give a simple implementation of Prim's algorithm for this case that runs in $O(V^2)$ time.

Q. 3. (a) Difine the term divide and conquer paradigm.

(b) Illustrate the operation of heap-sort on the Array and also write the algorithm :

A = <5, 13, 2, 25, 7, 17, 20, 8, 4>

(c) What do you mean by 2-3 tree. Write an algorithm for insertion and deletion of 2-3 tree with example ?

(d) Banks often record transactions on an account in order of the times of the transactions, but many people like to receive their bank statements with checks listed in order by check number. People usually write checks in order by check

number, and merchants usually cash them with reasonable dispatch. The problem of converting time-of-transaction ordering to check-number ordering is therefore the problem of sorting almost-sorted input. Argue that the procedure insertion-sort would tend to beat the procedure quick-sort on this problem.

Q. 4. (a) Write the preprocessing time and matching time of KMP algorithm.

(b) Construct the string-matching automaton for the pattern P = aabab and illustrate its operation on the text string T = aaababaabaababaab. 7

(c) Show how to modify the Bellman-Ford algorithm slightly so that when it is used to solve a system of difference constraints with m inequalities on n unknowns, the running time is O(nm). 7

(d) Write down the algorithm of DFS and BFS with example ?

Q. 5. (a) Define the technical term solvable problems.

(b) Define the term P class, NP class, NP-hardness and NP-completeness with example.

(c) Solve travelling salesperson problem by using branch and bound technique.

(d) Write a short note on (any two) :

(i) Non-deterministic algorithm

(ii) Clique problem

(iii) Hamiltonian path problem

(iv) Vertex cover.