

Name :

Roll No. :

Invigilator's Signature :

CS/M.Tech (CSE)/SEM-1/PGCS-102/2010-11

2010-11

DESIGN AND ANALYSIS OF ALGORITHM

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer any *five* questions.

5 × 14 = 70

1. a) P_1, P_2, P_3, P_4 are four sets of problems, the relationship between them is as follows

i) $P_1 \cap P_2 = P_1$

ii) $P_1 \cap P_3 = \phi$

iii) $P_1 \cap P_4 = \phi$

iv) $P_2 \cap P_3 \neq \phi$ or $(P_2 \cap P_3 = P_3)$

v) $P_2 \cap P_4 = \phi$

vi) $P_3 \cap P_4 = \phi$.

What are the classical names of sets P_1, P_2, P_3, P_4 ?

Explain in brief.

6



b) If in a particular time $0 \leq f(n) \leq c_1 g(n)$ where $n \geq n_0$ and c_1 is a positive constant then what is the correct procedure to represent the following relations ?

i) $f(n) \in O(g(n))$ or

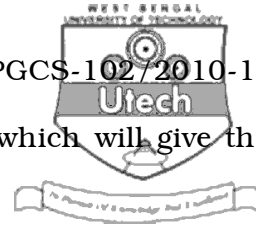
ii) $f(n) = O(g(n))$

Explain your answer. 4

c) For every algorithm if their exist tightly upper bound and tightly lower bound then why do we use loosely upper bound and loosely lower bound for complexity of an algorithm ? 4

2. a) Branch and bound procedure always take the less time complexity than the Brute force procedure. Justify or falsify the statement. 7

b) Write the algorithm to solve n -queens problem using Brute force approach. 7



3. a) For searching an element for a tree which will give the better average time complexity,

i) If the tree is BST

ii) If the tree is AVL

Explain properly.

Find the time complexity in both cases. 7

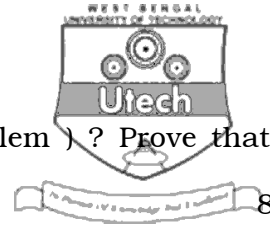
b) Find out the time complexity for constructing an AVL tree with n no. of nodes. 7

4. a) We know that fractional Knapsack problem can be solve by Greedy methods and O/I Knapsack can be solved by Dynamic programming. Is it possible to solve fractional Knapsack in Dynamic procedure and O/I Knapsacking Greedy methods ? Explain with proper algorithm. 10

b) Why do we use RAM (Random Access Machine) for computing the complexity of an algorithm ? 4

5. a) Find out the time complexity to calculate the shortest distance between two points in a plane in divide & conquer procedure. 7

b) When will quick sort algorithm give you the best case ? Write the recurrence relation to find the median of medians of n numbers. 7



6. a) What is CDP (Clique Decision Problem) ? Prove that the problem is NP-complete. 8
- b) If P_1 is circuit SAT problem and P_2 is the equivalent formula SAT problem, then prove that P_1 can be reduced to P_2 and P_2 can be reduced to P_1 . 6
7. a) What do you mean by triangulation of a polygon ? 3
- b) Define the art gallery problem. 4
- c) Construct a Kd tree with n no. of nodes, where every nodes are the points of a 2d plane, $n = 8$ and the points are ((5, 11) , (6, 4) , (8, 6) , (7, 13) , (18, 10) , (16, 5) , (11, 6) , (12, 9)). 7
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