UNIVERSITY OF PUNE
[4364]-761
B.E. (Computer Engineering)
(Semester - I) Examination - 2013
DESIGN ANALYSIS OF ALGORITHMS
(2008 Pattern)

Total No. of Questions : 12 **[Total No. of Printed Pages :4]**

[Time : 3 Hours] **[Max. Marks : 100]**

Instructions :

*(1) Answer **any three** questions from section 1 and questions from section 2.*
*(2) Answers to the **two sections** should be written in **separate answer-books**.*
(3) Black figures to the right indicate full marks.
(4) Neat diagrams must be drawn wherever necessary.
(5) Assume suitable data, if necessary.

SECTION -1

Q. 1. a) Prove if $f(n) = a_m n^m + \ldots\ldots\ldots\ldots\ldots\ldots + a_1 + a_0$ Then f(n)=O(n^m) (8)

b) Write control abstraction for divide and conquer strategy. Give the reason why the quick sort is faster than merge sort. (6)

c) Explain the Greedy Kruskal's minimum spanning tree. (4)

OR

Q. 2. a) Prove by contradiction that "there are infinitely many prime numbers". (6)

b)Write and explain Dijkstra's algorithm for a directed graph. (6)

c) Write an algorithm for merge sort. State its time complexity. (6)

Q. 3. a) Solve the instance of 0/1 knapsack problem using dynamic Programming: $n = 4, m = 25$ (8)

$(P_1, P_2, P_3 P_4) = (10,12,14,16)$

$(W_1, W_2, W_3, W_4) = (9,8,12,14,)$

B) State multistage graphs problem and explain how it can be solved using forward approach. (8)

OR

Q. 4. a) For a directed graph the edge length matrix is given below. Solve the Travelling Salesperson problem using dynamic programming method. Specify its complexity. (8)

0	10	15	20
5	0	9	10
6	13	0	12
8	8	9	0

b) What is the optimal binary search tree problem? Explain how it is solved using dynamic programming. (8)

Q. 5. a) Explain backtracking strategy and write general recursive and iterative backtracking algorithms. (8)

b) Write the control abstractions for LC-search. (6)

c) Differentiate between "backtracking" and "branch and bound" strategies. (2)

OR

Q. 6. a) Write recursive backtracking schema for m coloring of the graph. Determine the time complexity of the same. (8)

b) Write an upper bound function for 0/1 knapsack problem. (6)

c) What are implicit and explicit constrains with respect to backtracking. (2)

SECTION-2

Q. 7.a) Explain how directed Hamiltonian Cycle (DHC) reduces to travelling salesperson decision problems (TSP). (6)

b) Prove that vertex cover problem is NP-complete. (8)

c) Differentiate between deterministic and non deterministic algorithms. (4)

OR

Q. 8. a) Prove that CNF- satisfiability reduces to clique decision problem. (6)

b) Explain AND/OR graph decision problem. (6)

c) State and Explain Cook's Theorem. (6)

Q. 9. a) Write an algorithm for prefix computation. Determine its time complexity (8)

b) Prove that "the maximum of n keys can be found in O (log log n) time using n common CRCW PRAM processors". (8)

OR

Q. 10. a) Explain parallel computational models. (8)

b) Write the odd-even merge sort algorithm and explain it with an example. (8)

Q. 11. a) What is convex Hull? Explain Quick Hull and Graham's Scan algorithm. (8)

b) What is deadlock? What are the necessary condition for deadlock to occur? Explain how resource allocation can be done to avoid deadlock. (8)

OR

Q. 12. a) What is meant by heuristic algorithms? Discuss any one heuristic search algorithm. (8)

b) Explain in brief any two image edge detection algorithm. (8)