Nov - Dec - 2012

Total No. of Questions : 12]

P900

SEAT No. :

[Total No. of Pages : 3

[4263] - 358

T.E. (Information Technology)

DESIGN AND ANALYSIS OF ALGORITHMS

(2008 Pattern) (Semester - II)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) What do we mean by time and space complexity of an algorithm? How do we measure the time and space complexity of an algorithm? Explain with suitable example. **[8]**

b) Discuss the recursive and non-recursive version of Quick sort algorithm and compare the time space complexity requirement in the same. **[10]**

OR

Q2) a) What do we mean by Worst case, Average case and Best case complexity of an algorithm? Explain with suitable example. **[8]**

b) Suppose you have an array of 1000 records in which only a few are of order and they are not very far from their positions which sorting algorithm would you use to put the whole array in order? Justify your answer with time complexity of your algorithm. **[10]**

Q3) a) Design and analyze a divide and conquer algorithm for finding minimum and maximum number in the array of n-numbers that uses (3n/2)-2 comparison for any n. **[10]**

b) Write Dijkstra's algorithm for a directed graph and determine the time complexity of the algorithm. **[6]**

P.T.O.

OR

Q4) a) Given a sequence of n-elements A[1].......A[n], assume that they are split into 2 sets A[1].......A[n/2] and A[n/2 + 1].....A[n], each set is individually sorted and the resulting sequence is merged to produce a single sorted sequence of n elements. Using the divide and conquer strategy, write a Merge sort algorithm to sort the sequence in non-decreasing order. **[10]**

b) Compare Prim's algorithm and Kruskals's algorithm for finding the minimum spanning tree. Analyze the time complexity of these algorithms. **[6]**

Q5) a) Compute and Construct the OBST for the given values using dynamic programming. **[10]**

n = 4.and (a1, a2, a3, a4) = (do, if, int, while)
Let p(1:4) = (3, 3, 1, 1)
and q(0:4) = (2, 3, 1, 1, 1)

b) Distinguish between multistage graphs and Dijktra's algorithm in terms of algorithm, strategy used, time complexity and application. **[6]**

OR

Q6) a) Consider 0/1 knapsack problem N = 3, W = (4, 6, 8), P = (10, 12, 15) using dynamic programming devise the recurrence relations for the problem and solve the same. Determine the optimal profit for the knapsack of capacity 10. **[10]**

b) What is principle of optimality? Give suitable example. What is the significance of the same in dynamic programming? **[6]**

SECTION - II

Q7) In the backtracking strategy for 8-queen problem, what is the state space tree and with respect to state space tree explain the following terms. **[18]**

a) Solution space.
b) State space.
c) Answer state.
d) Static trees.
e) Dynamic trees.
f) Live nodes.
g) Bounding function.

OR

Q8) a) What is backtracking method for algorithmic design? Solve the sum of subset problem using backtracking algorithmic strategy for the following data N = 4 (w1, w2, w3, w4) = (11, 13, 24, 7) and M = 31 **[12]**

b) Discuss and analyze the problem of Graph Coloring using backtracking. **[6]**

Q9) a) Explain the branch and bound algorithmic strategy for solving the problem, take an example of traveling salesman problem using branch and bound. **[10]**

b) Differentiate between backtracking and branch and bound. Illustrate with example of Knapsack problem. **[6]**

OR

*Q10)*Explain the term : **[16]**

a) Branch and bound

b) Bounding function.

c) Various searching techniques in branch and bound.

d) Heuristic function.

e) How 0/1 Knapsack problem can be solved using branch and bound?

*Q11)*a) Show that both P and NP are closed under the operation union, intersection, concatenation and Kleen closure (*). **[10]**

b) Show that an infinite recursively enumerable set has an infinite recursive subset. **[6]**

OR

*Q12)*a) Explain the following : **[8]**

i) computational complexity.

ii) decision problems.

iii) deterministic and non-deterministic algorithms.

iv) complexity classes.

b) What is cook theorem? How can it be used to establish whether P = NP or P ≠ NP. **[8]**

❖ ❖ ❖ ❖