[4458]-761

B.E. (Computer Engineering) (Semester - I)
DESIGN & ANALYSIS OF ALGORITHMS
(2008 Course)

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

Instructions to the candidates:

    1)   *Answer 3 questions from Section - I and 3 questions from Section - II.*

    2)   *Answers to the two sections should be written in separate 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) Prove by generalized mathematical induction that "every positive integer can be expressed as a product of prime numbers". **[8]**

b) Consider the following instances of the knapsack problem: n=3, m=20, (P1, P2, P3) = (24, 25, 15) and (W1, W2, W3) = (18, 15, 20) find the feasible solutions. **[8]**

c) Define amortized analysis. **[2]**

OR

Q2) a) Define Asymptotic notations. **[2]**

b) Explain merge sort using divide & conquer strategy. State its time complexity. **[8]**

c) Solve following Recurrences. **[8]**

    i) $f(n) = n$ if n = 0 or n = 1

                   $= fn - 1 + fn - 2$ otherwise

    ii) $T(n) = 1$ if n = 1

                  $= 3T(n/2) + n$ if n is a power of 2, n > 1

Q3) a) What is Optimal Binary Search Tree problem? Explain how principle of optimality holds for this problem. Also explain how it is solved using dynamic programing. **[8]**

b) Two jobs have to be scheduled on three processors. The task time are given by matrix J. Show all possible schedules for the jobs and prove there exist an optimal schedule. **[8]**

OR

Q4) a) Explain Travelling Salesperson problem by using dynamic programing with example. **[8]**

b) Two jobs have to be scheduled on three processors. The task times are given by matrix. $J = \begin{vmatrix} 2 & 2 \\ 3 & 3 \\ 5 & 2 \end{vmatrix}$ show all possible schedules for the jobs.

Prove that there exists an optimal schedule. **[8]**

Q5) a) Explain how branch & bound method can used to solve knapsack problem? **[8]**

b) Explain in detail Control Abstraction for LC-Search. **[8]**

OR

Q6) a) Explain Backtracking solution to the 0|1 knapsack problem. **[8]**

b) Analyze 8 queens problem using Backtracking. Discuss the time complexity of the same. **[8]**

SECTION - II

Q7) a) What is satisfiability problem? Explain in detail. **[8]**

b) Prove that vertex cover problem is NP complete. **[6]**

c) What are non - deterministic algorithms? Explain classes NP Hard & NP-complete. **[4]**

OR

Q8) a) Prove that directed Hamiltonian cycle α Traveling Salesperson problem. **[8]**

b) Write a short note on Cook's Theorem. **[6]**

c) Show that the partition problem reduces to minimum finish time nonpreemptive schedule. **[4]**

Q9) a) Write a function to compute length of shortest path of a given graph by using parallel algorithm. **[6]**

b) Explain performance matrics for parallel algorithms. **[6]**

c) Explain pointer doubling problem. **[4]**

OR

Q10) a) Explain parallel sort strategy. **[6]**

b) Write an algorithm for prefix computation. Determine its time complexity. **[6]**

c) Explain parallel computational model. **[4]**

Q11) a) Explain Huffman coding theory algorithm. **[8]**

b) Explain deadlock detection & avoidance problem. **[8]**

OR

Q12) a) Explain convex Hulls algorithm. **[8]**

b) Explain heuristic search algorithms. Give any one in detail. **[8]**

❦ ❦ ❦