NEW

2016

BCA

3rd Semester Examination

DESIGN AND ANALYSIS OF ALGORITHMS

PAPER—2101

Full Marks : 70

Time : 3 Hours

The figures in the right-hand margin indicate full marks.

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

Illustrate the answers wherever necessary.

Answer *Question no. 1* and any *four* from the rest.

1. Answer any *five* questions : 5×2

(a) Write a procedure for pre-order traversal of a binary tree.

(b) What is time and space complexity of an algorithm ?

(c) What is the notion behind divide and conquer method ?

(d) What are the basic characteristics of an algorithm ?

(e) What do you mean by Branch and Bound technique ?

(f) Define Omega (Ω) notation in complexity of algorithm.

(g) Define NP-hard and NP-Complete.

2. (a) What is minimum spanning tree ? Write down Kruskal's algorithm to find MST of a graph. 1+5

(b) Explain how an Eight queens problem is solved using backtracking method. 4

(c) Show the complexity of the following recurrance relation : 5

$T(n) = 3T(n/3) + n.$

3. (a) How dynamic programming is different from greedy approach ? 3

(b) Explain matrix-chain multiplication problem using dynamic programming. 6

(c) What are the properties of an optimization problem for which it can be implemented using dynamic programming ? 2

(d) Explain Mergesort using divide and conquer strategy. 4

4. (a) What are BFS and DFS algorithms in graph traversal ? Explain each of them. 2+4

(b) Write binary search algorithm using divide and conquer approach. Find its best case, average case and worst case time complexities. 4+3

(c) What is graph coloring problem and hamiltonian problem ? 2

5. (a) Define these terms, Big–O, small–O, Θ in connection with analysis of algorithm. 3

(b) If $C(n) = \begin{cases} 2C\left(\frac{n}{2}\right)+3, & \text{for } n>2 \\ 2, & \text{for } n=2 \end{cases}$

then prove that $C(n) = 0(n)$, where $n = 2^k$ for some positive integer K. 7

(c) Write down differences between : 5

(i) greedy method and divide and conquer method ?

(ii) Linear search and Binary search.

6. (a) Define divide and conquer technique. Write merge sort algorithm using divide and conquer technique. Discuss its time complexity. 2+5+4

(b) Write down Tower of Hanoi algorithm using recursion. 4

7. (a) Write an algorithm of job sequencing with dead lines. 5

(b) What is Knapsack problem ? Write an algorithm for Knapsack problem. Consider the following instance of the Knapsack problem :

$n = 3$, $m = 20$, $(p_1, p_2, p_3) = (25, 24, 15)$
and $(w_1, w_2, w_3) = (18, 15, 10)$.
Solve it by Knapsack algorithm.

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