[Total No. of Questions: 09]   [Total No. of Pages: 02]

Uni. Roll No. ....

Program/ Course: B.Tech. (Sem. 5)
Name of Subject: Design and Analysis of Algorithms
Subject Code: CS-14503
Paper ID: 15458

Time Allowed: 03 Hours   **Max. Marks: 60**

NOTE:
1) **Section-A** is **compulsory**
2) Attempt any **four** questions from **Section-B** and any **two** questions from **Section-C**
3) Any missing data may be assumed appropriately

Section – A   [Marks: 02 each]

Q1.
a) What do you understand by amortized analysis?
b) Differentiate between divide-and-conquer and dynamic programming approach.
c) Discuss in brief Travelling Salesman problem.
d) What are the average and worst-case time complexities of merge sort and quick sort algorithms?
e) Differentiate between 0/1 knapsack and fractional knapsack problem.
f) What is n-Queens' problem? List two methods to solve it.
g) What is Hamiltonian cycle?
h) What is meant by string matching?
i) Give an example of NP-complete problem.
j) What are approximation algorithms?

Section – B   [Marks: 05 each]

Q2. Describe greedy algorithm enlisting its advantages and disadvantages. Solve the following fractional knapsack problem using greedy strategy:
$I= <I_1, I_2, I_3, I_4, I_5>$; $w= <5, 10, 15, 20, 25>$; $V=<30, 40, 120, 100, 50>$ and capacity of Knapsack is W=35.

Q3. Discuss complexity analysis of algorithms. Explain in detail various commonly used asymptotic notations.

Q4. Discuss Backtracking. Illustrate how subset sum problem can be solved using backtracking?

Q5. What is minimum spanning tree? Discuss Prim's and Kruskal's algorithms for finding minimum spanning tree.

Q6. Write an algorithm based on divide and conquer strategy to find the maximum and minimum elements in an array. Explain with an example.

Section – C   [Marls: 10 each]

Q7. Discuss Rabin-Karp algorithm for string matching. For module q=11, how many spurious hits does the Rabin Karp matcher encounter in the text T=3141592653589793, when looking for the pattern P=26?

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Q8. What is Dynamic programming? Explain the working principle of Dynamic Programming. Show, by taking a suitable example, how dynamic programming technique can be used to solve multistage graph problem?

Q9. Show the relationship among P, NP, NP-hard and NP-complete problems mentioning an example of each. How can we deal with the NP-complete problems, explain in detail?

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