TCS-503 1135

Odd Semester Examination 2018-19

B.TECH. (CSE) (SEMESTER-V)

DESIGN & ANALYSIS OF ALGORITHM

Time: 03:00 Hours **Max Marks: 100**

Note: Attempt **all** sections.

Section A

Note: Attempt **any four**. All question carry equal marks: [4×5=20]

1. Define the following terms:
   (a) NP complete problem
   (b) Satisfiability problem
   (c) Clique Problem
   (d) Breadth First Search
   (e) Depth first Search

Section B

Note: Attempt **any four**. All question carry equal marks: [4×5=20]

1. What do you understand by these two programming paradigm i.e. Greedy approach and Dynamic programming?
2. What do you understand by minimum spanning tree? Is it possible for a graph to have multiple spanning trees? If yes, provide a suitable example.
3. Give bellman-ford algorithm for single source shortest path.

4. What do you understand by minimum spanning tree? Is it possible for a graph to have multiple spanning trees? If yes, provide a suitable example.

5. Every tree is a graph but every graph is not a tree. What do you understand by this statement? Please explain using a suitable example

Section C

Note: Attempt **any four**. All question carry equal marks: [4×5=20]

1. Differentiate between Min-Heap and Max-Heap? Apply and show stepwise implementation

2. Differentiate between sparse and dense graphs? Which representation of graph is better and inwhich case?

3. Explain how we can solve a given 0/1 Knapsack problem with the help of Branch and Bound techniques

4. Give algorithm to solve the 8-Queen problem using backtracking approach.

5. Give algorithm of Heap Sort

Section D

Note : Attempt **any two**. All question carry equal marks: [2×10=20]

1. Discuss time complexity of Insertion Sort Algorithm in its best case.

2. Apply and show stepwise implementation of Max-Heapify (A,2) on array A = {16, 4, 10, 14, 7, 9, 3, 2, 8, 1}, where array index starts at 1.

3. Briefly explain the difference between fractional and 0/1 knapsack problem. Write algorithm of fractional knapsack and apply it on following set of weights and their profits to maximize the profit where Knapsack capacity is 60. Weights = {40, 10, 20, 24} and Profits = {280, 100, 120, 120}.

Section E

Note : Attempt **any two**. All question carry equal marks: [2×10=20]

1. Write pseudocode and recurrence relation for the recursive function that prints Nth Fibonaccinumber. Solve the recurrence relation to get time complexity of the algorithm. What will be thespace complexity of this program and why?

2. Why do we use Huffman codes? A data file of 100,000 characters contains only the characters a-f,with the frequencies (in thousands) indicated as follows - {a:45, b:13, c:12, d:16, e:9, f:5}. If weassign each character a 3-bit codeword, we can encode the file in 300,000 bits. Your task is to assign variable-length code and encode the file in optimal number of characters. How much space are you able to save with variable length encoding?

3. Write a recurrence relation when quick sort repeatedly divides the array in to two parts of 90% and 10%. Derive the time complexity in this case. Show the recursion tree while deriving time complexity and find the difference in heights of both the extremes of recurrence tree. What do you understand by this analysis?

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