Even Semester Back/Debarred/Special Examination Jan 2025

Roll no. 2261514

Name of the Course and semester: BTech CSE 4th Semester
Name of the Paper: Design and Analysis of Algorithms
Paper Code: TCS 409

Time: 3 hour

Maximum Marks: 100

Note:

(i) All the questions are compulsory.
(ii) Answer any two sub questions from a, b and c in each main question.
(iii) Total marks for each question is 20 (twenty).
(iv) Each sub-question carries 10 marks.
(v) Please specify COs against each question.

Q1.(CO1) (2X10=20 Marks)

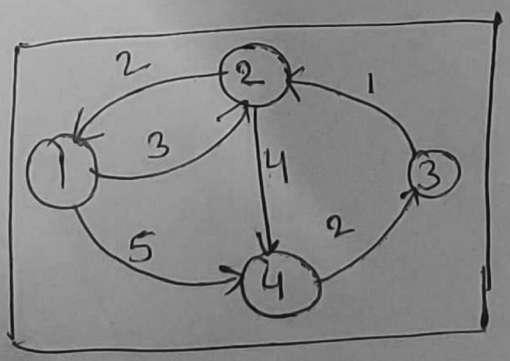
a. Explain in detail the concept of asymptotic notations in algorithm analysis and provide examples of commonly used notations.
b. Discuss the drawbacks of the recursive Fibonacci algorithm and propose an alternative approach to compute Fibonacci numbers. Compare the time complexity of the recursive and alternative solutions.
c. What is a tower of Hanoi problem? Write a recursive algorithm to solve the tower of Hanoi problem. Also analyze the algorithm and find it complexity.

Q2. (CO2) (2X10=20 Marks)

a. Write an algorithm to implement quick sort using recursion and compute the complexity of the algorithm.
b. Compare and contrast the selection sort and insertion sort algorithms in detail. Provide a thorough explanation of the differences between these two sorting techniques
c. Write the algorithm of heap sort. With the help of diagrams explain different steps involved to sort the following list of integers using heap sort.
List: {8,3,5,1,2,6,9,7,4}

Q3.(CO3) (2X10=20 Marks)

a. What is a graph? How is it represented? Write an algorithm to find a cycle in graph.
b. What is a minimum spanning tree? Explain the working of Prim's and Kruskal's algorithm.
c. Find the shortest path between all the pair of vertices of the given graph using Floyd-Warshall algorithm. Also write an algorithm for the same.



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a. What is the significance of Huffman code? Explain with the help of an example.
b.For the following items available in the departmental store. Find the solution considering Fractional Knapsack and 0/1 Knapsack Problem. Capacity of bag is 9 kg.

Item	Weight	Price
A	2	2
B	4	6
C	6	3
D	5	4
E	3	6

c. Find the longest common subsequence between the given strings using dynamic programming.
String1: LONGEST
String2: HONEST

Q5. (CO5) (2X10=20 Marks)

a. Define NP-completeness and its significance in the field of computational complexity. Explain the difference between P, NP, NP-Complete, and NP-hard problems.
b. Define hashing. What are different collision handling techniques used in hashing?
c. Compare and contrast the Naive string-matching algorithm and Rabin Karp string matching algorithms. Additionally, present the step-by-step algorithms for both.