



National Institute of Technology Tiruchirappalli

BRANCH: Computer Science and Engineering

B.Tech., End Semester Examination

SUB. CODE & TITLE: CSPC42 & Design and Analysis of Algorithms

DATE: 11.05.2021, **Max. Marks:** 30, **No. of Pages:** 02

Instructions: Answer all the questions.

1. **A.** What is the value of following recurrence?

$$T(n) = T(n/4) + T(n/2) + cn^2$$

$$T(1) = c$$

$$T(0) = 0$$

Where c is a positive constant. Use Recurrence tree method to solve the above. (3)

- B.** The running time of an algorithm is represented by the following recurrence relation:

$$\text{if } n \leq 3 \text{ then } T(n) = n$$

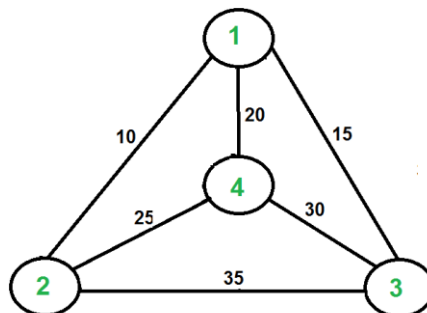
$$\text{else } T(n) = T(n/3) + cn$$

Find the time complexity of the algorithm. (3)

2. **A.** Let $X = \{a/20; b/15; c/5; d/15; e/45\}$ be the alphabet and its frequency distribution. Calculate the Optimum prefix code for the distribution using Huffman Coding along with its algorithm. (3)

- B.** Write short note on greedy design technique and state its advantages, disadvantages, and suitable applications. (3)

3. **A.** Which algorithm design paradigm is used to solve Travelling Salesman Problem? Explain the suitable algorithm for solving Travelling salesman problem for the below figure that consists of 4 cities. (3)



- B.** Suppose there are three items and Knapsack has capacity 5. Item 1 has weight 1, benefit 6. Item 2 has weight 2, benefit 10. Item 3 has weight 3, benefit 12. Using Dynamic Programming algorithm, find the maximum amount the knapsack can contain. (3)

4. **A.** What is randomized binary search? Write the randomized binary search algorithm with example. (3)

B. Write the Pseudocode for Randomized Quicksort. Show that Randomized Quicksort expected running time is $\Omega(n \log n)$. (3)

5. Explain P, NP, NPC, and NPH problems with suitable diagram. (6)
