Question Paper

Exam Date & Time: 14-Jan-2021 (02:00 PM - 05:00 PM)

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

FOURTH SEMESTER B.TECH (IT/CCE) GRADE IMPROVEMENT EXAMINATIONS, JAN 2021

DESIGN AND ANALYSIS OF ALGORITHMS [ICT 2257]

Marks: 50 **Duration: 180 mins.**

A

Answer all the questions.

1) Write an algorithm for insertion sort and find its asymptotic space and time complexity using step count method. (5)

A)

B) Write an approximation algorithm for travelling salesperson problem and mention it's time complexity. (3)

C) Explain class NP and NP-hard problem. Give one example for each. (2)

2) Using double Hashing store the following values in hash table. Make use of hash function (5)

A) f(x)=x mod 31.

101, 589, 2455, 1044, 910, 2088, 1820, 91, 455, 1178, 522, 650, 444, 121, 182, 273, 364, 546, 637, 728, 819

B) Show that (3)

i. $n^2 2^n + n^2 \log n + n^2 3^n = O(3^{2n})$

ii. $\sum_{i=1}^{n} i^2 \neq O(n^2)$

C) Find the asymptotic time complexity of the following code snippet? Assume that n and k are integers and $n = 2^k$ and $k=2^m$. (2)

while (n > 1)

n= √n; \\ where √n denote square root of n

3) Compute 0/1 knapsack for the below given data using dynamic programming. Number of objects, n = 4; Weights w = [5, 3, 1, 4]; Profits p = [8, 16, 25, 40] and Capacity c = 8. (5)

A)

B) Write an algorithm for finding a path between two nodes in a graph. Also, analyse it's complexity. (3)

C) Write a pseudocode to find the sum of the elements of an array using divide and conquer technique. Write the recurrence relation and compute the time complexity. (2)

4) Compute the max clique for the graph shown in Figure Q.10 using backtracking technique. (5)

A)

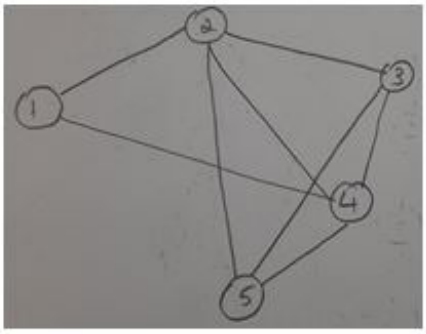

Figure Q.10

B) Construct an AVL tree for the list 5, 6, 8, 3, 2, 4, 7 by successive insertions. (3)

C) Solve the container loading problem using FIFO method of Branch and bound without using bounding function where, number of objects = 3, capacity = 50 and weights = [15, 35, 35] (2)

5) Write an algorithm to find the topological sequence of the graph using Greedy technique, specify the criteria. Also find the topological sequence for the graph shown in the Figure Q.13 using the same. (5)

A)

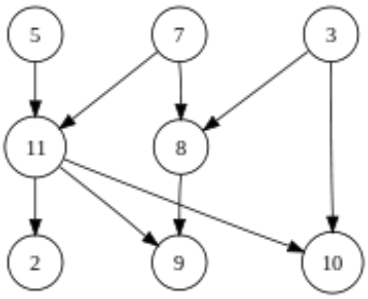

Figure Q.13

B) Analyse the time complexity of Strassen's matrix multiplication (3)

C) Differentiate between B trees and B+ Trees. Construct the B-Tree by considering the following elements (2)

18, 56, 23, 120, 17, 5, 2, 6, 66, 22

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