

8389

B.Tech. VIth Semester Examination, 2023

**DESIGN AND ANALYSIS OF
ALGORITHM**

Paper : CS-601

Time : 3 Hours]

[M.M. : 70

Note :- Answer any *five* questions. All questions carry equal marks.

1. (a) Write characteristics of Algorithm. Solve the following recurrence relation using Master theorem :

$$T(n) = 9T\left(\frac{n}{3}\right) + n$$

- (b) Write down the algorithm of heap sort and illustrate the Algorithm MAX HEAPIFY (A, *i*) on the array :

A = (15, 6, 4, 8, 5, 3, 1, 2, 7) 7,7

8389/ 4

(1)

KN-54 Turn Over



2. Write down the algorithm of quicksort. Sort the input A : (2, 3, 18, 17, 5, 1) using quicksort technique.
3. Write down the properties of B-tree. Insert the information F, S, Q, K, C, L, H, T, V, W, M, R, N, P, A, B, X, Y, D, Z, E, G, I into an empty B-tree with degree $t = 3$.
4. Define red-black tree and its properties. Show the red-black tree that result after successively inserting the keys 41, 38, 31, 12, 19, 8 into an initially empty red-black tree.
5. What is Dynamic programming and we are given the sequence {4, 10, 3, 12, 20, 7} ? The matrices have size 4×10 , 10×3 , 3×12 , 12×20 , 20×7 we need to compute $M[i, j]$, $0 \leq i \leq 1$, $j \leq 5$. We know $M[i, i] = 0$ for all i .
6. Discuss backtracking approach using Sum of subset problem. Apply this problem to given data set A and show complete State space representation including all backtracking steps with clear representation. $A = \{3, 4, 12, 5, 2\}$, Sum = 9.

7. Discuss Prim algorithm and write their Pseudo codes. For the graph shown below obtain the following :

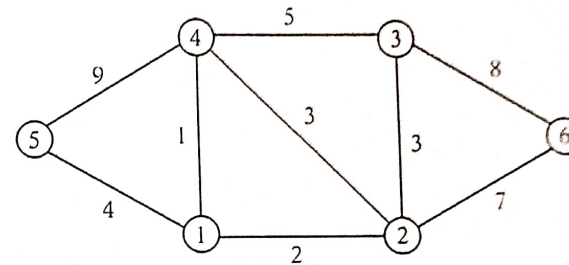


Fig.

8. Write down Floyd Warshal's Algorithms. Apply all pair sources shortest path problem and find out the minimum distance between each pair of given vertices as mentioned in the directed graph shown as below in Figure :

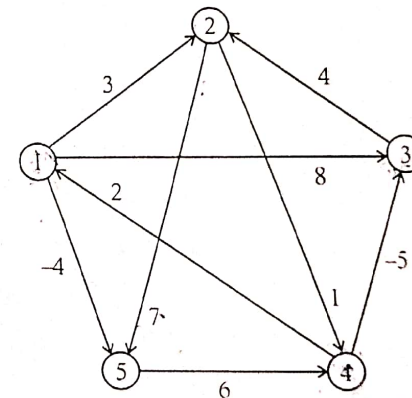


Fig.

9. Write down the Naive String-Matching Algorithm and mention its Time Complexity. Use Naive String-Matching Algorithm to the given Pattern (P) and Text (T)

T : 0000100010010

P : 10001

Find whether the given Pattern (P) is found in the Text by showing all shifts and successful matches.

10. Describe the following listed problem using one example for each of them.
- (i) P problems
 - (ii) NP Problems
 - (iii) NP Complete Problems
 - (iv) NP Hard Problems

FACULTY OF ENGINEERING, UNIVERSITY OF LUCKNOW

Mid-Term Test - I

B.TECH. SEMESTER - VI, 2022-23

Branch: CSE

Student's Roll No.....

Subject Code: CS601 Subject Title: Design and Analysis of Algorithm

Time: 1 Hrs.

Full Marks: 20

Note: Attempt questions from each section as per instructions. The symbols have their usual meaning.

SECTION A

1. Attempt all parts of this question. Each part carries 1 mark. (1 x 5 = 5)

- What do you mean by Complexity of an algorithm?
- Define different design approaches of an algorithm.
- Arrange the following growth rates in the increasing order: -
($O(n)$, $O(\log n)$, $O(n \log n)$, $O(1)$, $O(n^2)$)
- For the function $f(n) = 27n^2 + 16n$, find θ - notation.
- Consider the following recurrence: $T(n) = 4T(n/2) + n$. find its asymptotic bound using Master Method.

SECTION B

Attempt any THREE questions of the following. Each question carries 5 marks.

(5 x 3 = 15)

- Discuss Asymptotic notations in brief with Example.
- An array $A = (2, 3, 18, 17, 5, 1)$ is given. Sort using Quick Sort.
- Write down the MERGE SORT algorithm and mention complexity.
- Illustrate the operation of Insertion Sort on the array $A = (2, 13, 5, 18, 14)$.