UNIT-1

The Role of Algorithms in computing: Analyzing Algorithms, Time and Space Analysis of Algorithms, Big-Oh and Theta Notations, Average, Best and Worst case analysis. Designing Algorithms, Growth of functions. Asymptotic Notations, Divide and Conquer, Recurrences, Maximum sub-array problem, Stressan's Method, Substitution method, Recurrence tree method, The Master method, Floors and Ceilings.

UNIT-II

Trees : Binary tree traversal methods: Pre-order, In-order, Post-ordered traversal. Recursive Algorithms. Traversal methods. Representation of trees and its applications: Binary tree representation of a general tree. Conversion of forest into tree. Threaded binary trees. Binary search tree: Height balanced (AVL) tree, B-trees, Splay tree. Heap: Heap operations, Binomial heaps, Fibonacci heaps, Skew heaps, heap set.

UNIT-III

Graphs & Algorithms: Representation, Type of Graphs, Paths and Circuits: Euler Graphs, Hamiltonian Paths & Circuits; Cut-sets, Connectivity and Separability, Planar Graphs, Isomorphism, Graph Coloring, Covering and Partitioning, , Depth-and breadth-first traversals, Minimum Spanning Tree: Prim's and Kruskal's algorithms, Shortest-path Algorithms: Dijkstra's and Floyd's algorithm, Topological sort, Maxflow: Ford-Fulkerson algorithm, max flow –min cut.

UNIT-IV

Dynamic Programming: Backtracking Algorithms, Design Methodologies, Travelling salesperson problem, 0/1 Knapsack problem, multistage graphs, All Pair Shortest Path, 8-Queens problem Advanced String Matching Algorithms: Naïve string matching algorithm, Robin-Karp algorithm, string matching with finite automata, Knuth-Morris-Pratt algorithm.

P, NP and Approximation Algorithms: Basic Concepts, Non Deterministic algorithms, NP

Complete and NP-hard classes, NP complete Problems.

Total No. of Questions : 9]   [Total No. of Pages : 3

67008-N

MCA 1st Semester (Regular) Examination,
March–2022
(MCA 2 Year Programme)
(w.e.f. 2020-21)
Paper–20MCA21C5

ADVANCE DATA STRUCTURES USING C++/JAVA

Time : Three Hours]   *[Maximum Marks : 80*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note :– Attempt *five* questions in all, selecting *one* question from each Unit. Q. No. 1 is compulsory. All questions carry equal marks.

1. (a) What is Divide and Conquer method ?
   (b) What are minimal spanning tree ?
   (c) What do you mean by Recurrences ?
   (d) What is threaded binary tree ?

   (e) What are Euler graphs ?
   (f) What do you mean by non-deterministic algorithms ?
   (g) What is Prim's algorithm ?
   (h) What is topological sort ? $2 \times 8 = 16$

Unit–I

2. (a) What do you mean by complexity of algorithms ? What is the importance of algorithm and data structure in computer science ? Explain.
   (b) What is Strassen's method ? How is it significant ? Illustrate.   8,8

3. Explain the following :
   (a) Recurrence Tree Method
   (b) Substitution Method   8,8

Unit–II

4. (a) What is binary search ? Determine its complexity and write down an algorithm for binary search technique.
   (b) What are AVL trees ? What are their applications ? How are these implemented ? Illustrate.   8,8

5. Explain the following :
   (a) B-tree and their implementation using C++/Java
   (b) Concept of heap and heap operations   8,8

Unit–III

6. (a) What is a spanning tree ? How Kruskal's algorithm results in a minimum-cost spanning tree ? Illustrate.
   (b) How is DFS traversal different from BFS traversal ? Discuss their pros and cons.   8,8

7. Explain the following :
   (a) Ford-Fulkerson algorithm
   (b) Max flow-Min cut theorem   8,8

Unit–IV

8. (a) What is 0/1 Knapsack problem ? How Greedy method can be applied to solve the Knapsack problem ? Justify.
   (b) What is Knuth-Morris-Pratt algorithm ? How is it significant ? Explain.   8,8

9. Explain the following :
   (a) NP Complete problems
   (b) 8-Queens problem   8,8

MCA 1st Semester (MCA 2 Year Programme)
w.e.f. 2020-21 Examination,
December-2022

ADVANCE DATA STRUCTURES USING C++ / JAWA

Paper-20MCA21C5

Time allowed : 3 hours]   *[Maximum marks : 80*

Note :   *Question No. 1 is compulsory. Attempt four more questions, selecting one question from each unit.*

1.   Answer the following questions briefly :   8×2=16

    (a)   What is Big-Oh notation ?

    (b)   Describe pre-order traversal of a binary tree.

    (c)   What do you mean by spanning tree ?

    (d)   What is travelling salesperson problem ?

    (e)   Explain NP complete class and problem.

    (f)   Describe Euler graph and its one use.

    (g)   What is topological sort ?

    (h)   Explain splay tree with an example.

Unit—I

2.   (a)   What is Recurrence tree method ? How is it useful and used ? Discuss its advantages with suitable examples.   10

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    (b)   Explain best and worst case analysis of an algorithm and its uses with examples briefly.   6

3.   Explain the following briefly with suitable examples :   8,8

    (i)   Theta notations and asymptotic notations and their uses

    (i)   Substitution method and its advantages.

Unit—II

4.   (a)   What is threaded binary tree ? How is it useful and used ? Explain its applications with examples.   6

    (b)   How many rotations are required during construction of an AVL tree if the following elements are added in the given order ?

    35, 50, 40, 25, 30, 60, 78, 20, 28   10

5.   (a)   What is binary search tree ? How is it useful and used ? Explain its applications and drawbacks with examples.   6

    (b)   Create B-tree of order 3 of the following list of elements :

    1, 2, 3, 4, 5, 6, 7, 8, 9, 10   10

Unit—III

6.   (a)   What is graph coloring ? How is it used and useful ? Explain its applications with suitable examples.

    (b)   Explain Kruskal's algorithm and its advantages and applications with examples.   6,10

7.   Explain the following with suitable examples :   8,8

    (i)   Depth and Breadth-first traversals and their applications.

    (ii)   Floyd-Warshall algorithm and its applications.

Unit—IV

8.   (a)   What is 0/1 Knapsack problem ? How is it used ? Explain its applications and advantages with an example.

    (b)   Explain Rabin-Karp algorithm and its applications with an example.   9,7

9.   Explain the following briefly with examples :   7,9

    (i)   Backtracking algorithm and its uses and advantages

    (ii)   Knuth-Morris-Pratt algorithm and its uses and applications.