7-a. Define Binary Tree. Explain Array Representation of Binary tree. Also explain different operation that can be performed on Binary tree. CO4 — 10

7-b. Create the binary search tree using the following data elements: CO4 — 10
43, 10, 79, 90, 12, 54, 11, 9, 50.
Also show steps.

8. Answer any <u>one</u> of the following:-

8-a. Discuss direct access file organization. List out the advantages and disadvantages of direct access in file organization. CO5 — 10

8-b. Find Minimum Spanning Tree (MST) of the following graph using Kruskal's Algorithm. Define all internal steps. CO5 — 10

Printed Page:- 04

Subject Code:- AMICSE0301

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

M.Tech (Integrated)

SEM: III - THEORY EXAMINATION (2023 - 2024)

Subject: Data Structures

Time: 3 Hours **Max. Marks: 100**

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. *This Question paper comprises of* ***three Sections -A, B, & C.*** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*

2. *Maximum marks for each question are indicated on right -hand side of each question.*

3. *Illustrate your answers with neat sketches wherever necessary.*

4. *Assume suitable data if necessary.*

5. *Preferably, write the answers in sequential order.*

6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

SECTION-A — 20

1. Attempt all parts:-

1-a. Select the option that best describes an array. CO1 — 1

(a) A data structure that shows a hierarchical behavior
(b) Container of objects of similar types
(c) Arrays are immutable once initialised
(d) Array is not a data structure

1-b. Select the option that describe the length of the array, if first index is pointed by i and last index is pointed by j. CO1 — 1

(a) length of array is i+j
(b) length of array is j-i-1
(c) length of array is j-i
(d) length of array is j-i+1

1-c. Here is an infix expression: 4 + 3*(6*3-12). Suppose that we are using the usual stack algorithm to convert the expression from infix to postfix notation. The maximum number of symbols that will appear on the stack AT ONE TIME during the conversion of this expression. CO2 — 1

(a) 1
(b) 2
(c) 3
(d) 4

1-d. Process of inserting an element in the stack is called. CO2 1

(a) Enque
(b) Insert
(c) Push
(d) Pop

1-e. In a circular linked list. CO3 1

(a) Components are all linked together in some sequential manner
(b) There is no beginning and no end
(c) Components are arranged hierarchically
(d) Forward and backward traversal within the list is permitted

1-f. Linked lists are not suitable to for the implementation of _____. CO3 1

(a) Insertion sort
(b) Radix sort
(c) Polynomial addition
(d) Binary search

1-g. In a full binary tree if number of internal nodes is n, then total number of nodes N are. CO4 1

(a) N = 2*n
(b) N = n + 1
(c) N = n – 1
(d) N = 2*n + 1

1-h. In what tree, for every node the height of its left subtree and right subtree differ at least by one? CO4 1

(a) Binary search tree
(b) AVL tree
(c) Threaded binary tree
(d) Complete tree

1-i. A graph with all vertices having equal degree is known as a _____. CO5 1

(a) Mutli Graph
(b) Regular Graph
(c) Simple Graph
(d) Complete Graph

1-j. A vertex with degree one in a graph in called _____.. CO5 1

(a) A leaf
(b) Adjacency list
(c) Pendent vertex
(d) None of these

2. Attempt all parts:-

2.a. Differentiate between linear data structure and non-linear data structure. CO1 2

2.b. Write the overflow condition in circular queue. CO2 2

2.c. Differentiate between array and linked list. CO3 2

2.d. Write the difference between height of binary tree and depth of binary tree. CO4 2

2.e. Write the possible number of edges in a complete graph if number of nodes are 10. CO5 2

SECTION-B 30

3. Answer any five of the following:-

3-a. Given the base address of an array A[1300…..1900][-5…..5] as 1020 and the size of each element is 2 bytes in the memory, find the address of A[1700][2] in (i) Row major order and (ii) column major order. CO1 6

3-b. Define a sparse matrix. Suggest a space-efficient representation for space matrices. CO1 6

3-c. Define Recursion. Write a python program to calculate factorial of number using recursive functions. CO2 6

3-d. Define Priority queue. Write all possible applications where priority queue can be used. Also write the condition of underflow and overflow of priority queue. CO2 6

3.e. Write a function to delete a given node in a singly linked list. CO3 6

3.f. Mention differences among strictly binary tree, complete binary tree and almost complete binary tree. CO4 6

3.g. Explain the concept of minimum cost in graph data structure. What is its use? CO5 6

SECTION-C 50

4. Answer any one of the following:-

4-a. Explain non-linear data structure in detail with example. CO1 10

4-b. Write program in python to multiply two matrices. Order of matrices must be entered by user at run time. CO1 10

5. Answer any one of the following:-

5-a. Explain the advantages and disadvantages of Single Circular linked List. Write the python function to insert a number in the beginning of single circular link list. C02 10

5-b. Discuss the representation of polynomials of a single variable using a linked list. Write 'Python' functions to add two such polynomials represented by a linked list. CO2 10

6. Answer any one of the following:-

6-a. Write a program which performs insertion and deletion as per user choice in a queue. CO3 10

6-b. Use the merge sort algorithm to sort the following elements in ascending order. CO3 10
12,3,5,7,2,1,8,9,6

7. Answer any one of the following:-

8-b. Find Minimum Spanning Tree (MST) of the following graph using Kruskal's Algorithm. Define all internal steps. CO5 10