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Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

MCA (Integrated)

SEM: III - THEORY EXAMINATION (2024 - 2025)

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. The order of an algorithm that finds whether a given Boolean function of n variables 'n' produces a 1 is CO1, K1 1

(a) linear

(b) constant

(c) exponential

(d) logarithmic

1-b. _____algorithm is one which utilizes minimum processor time and requires minimum memory space during its execution. CO1, K1 1

(a) Best

(b) Efficient

(c) Both (a) and (b)

(d) None of the above

1-c. Any arithmetic expression can be represented in any of the notation. CO2, K1 1

(a) Infix expression

(b) Postfix expression

(c) Prefix expression

(d) all the above

1-d. In a circular queue implementation using array of size 5, the array index starts with 0 where front and rear values are 3 and 4 respectively. Determine the array 1

index at which the insertion of the next element will take place. CO2, K1

(a) 5

(b) 4

(c) 0

(d) None of the above

1-e. A linear collection of data elements where the linear node is given by means of pointer is called? CO3, K1 1

(a) linked list

(b) node list

(c) primitive list

(d) None of these

1-f. In doubly linked lists, traversal can be performed? CO3, K1 1

(a) Only in forward direction

(b) Only in reverse direction

(c) In both directions

(d) None

1-g. Height of a binary tree is CO4, K1 1

(a) MAX(Height of left Subtree, Height of right subtree)+1

(b) MAX(Height of left Subtree, Height of right subtree)

(c) MAX(Height of left Subtree, Height of right subtree)-1

(d) None of the above

1-h. In heap sort, after deleting the last minimum element, the array will contain elements in? CO4, K1 1

(a) increasing sorting order

(b) decreasing sorting order

(c) tree inorder

(d) tree preorder

1-i. Which of the following is false? CO5, K2 1

(a) The spanning trees do not have any cycles

(b) MST have n – 1 edges if the graph has n edges

(c) Edge e belonging to a cut of the graph if has the weight smaller than any other edge in the same cut, then the edge e is present in all the MSTs of the graph

(d) Removing one edge from the spanning tree will not make the graph disconnected

1-j. Every graph has only one minimum spanning tree. CO5, K2 1

(a) TRUE

(b) FALSE

(c) Depends upon Algorithm used to find minimum spanning tree

(d) depends upon edge length

2. Attempt all parts:-

2.a.	Discuss the advantages and disadvantages of hashing over other searching technique. CO1, K2	2
2.b.	Define Underflow condition of Stack. CO2, K2	2
2.c.	Implement a function that counts the number of nodes in a circularly linked list. CO3, K4	2
2.d.	Explain Threaded Binary Tree. CO4, K2	2
2.e.	Define minimum spanning tree. CO5, K2	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	Explain Bubble Sort with example by showing all steps. CO1, K2	6
3-b.	Define Array and briefly explain array operations. CO1, K2	6
3-c.	Explain different types queues in details. CO2, K2	6
3-d.	Differentiate between Recursion and Iteration. CO2, K4	6
3.e.	Explain Singly Linked List in short. CO3, K2	6
3.f.	Explain post-order traversal of a binary tree with an example. CO4, K2	6
3.g.	Define adjecency list with an example. CO5, K2	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Explain linear data structure in detail with example. CO1, K2	10
4-b.	Using the hash function 'key mod 7', insert the following sequence of keys in the hash table- 50, 700, 76, 85, 92, 73 and 101. Use Quadratic probing technique for collision resolution. CO1, K4	10

5. Answer any one of the following:-

5-a.	Write a python program to implement quick sort using recursion. CO2, K4	10
5-b.	Explain circular queue. Also explain implementation of circular queue . CO2, K4	10

6. Answer any one of the following:-

6-a.	What are different ways of implementing linked list? Write a function to reverse the nodes of a linked list. CO3, K4	10
6-b.	Write functions in Python to delete a node (i) from the beginning, (ii) from the end in a singly linked list. Illustrate with an example. CO3, K4	10

7. Answer any one of the following:-

7-a.	Construct a tree for the given inorder and postorder traversals. CO4, K5 Inorder : DGBAHEICF Postorder : GDBHIEFCA	10
7-b.	Construct an AVL tree having the following elements: H, I, J, B, A, E, C, F, D, G, K, L. Also show steps. CO4, K4	10

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

8-a.	Differentiate BFS and DFS. CO5, K4		10
8-b.	Explain Divide and conquer algorithm with an example.	CO5, K2	10