Printed Page:-04 Subject Code:- BMICA0302

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. What is the best case complexity of Linear Search? (CO1, K1) 1

(a) O(n)

(b) O(1)

(c) O(log n)

(d) O(n*n)

1-b. What are the disadvantages of arrays? (CO1,K1) 1

(a) Index value of an array can be negative

(b) Elements are sequentially accessed

(c) Data structure like queue or stack cannot be implemented

(d) There are chances of wastage of memory space if elements inserted in an array are lesser than the allocated size

1-c. Which of the following is an example for a postfix expression? (CO2, K2) 1

(a) a*b(c+d)

(b) abc*+de-+

(c) +ab

(d) none of these

1-d. What is the other name for a postfix expression? (CO2,K1) 1

(a) Normal Polish Notation

(b) Reverse Polish Notation

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(c) Infix Notation

(d) Polish Notation

1-e. What would be the asymptotic time complexity to add an element in the linked list? (CO3, K1) 1

(a) O(1)

(b) O(n)

(c) O(n2)

(d) None

1-f. In linked list each node contain minimum of two fields. One field is info field to store the information and second field is to store _____? (CO3, K1) 1

(a) address of info

(b) address of start

(c) Address of node

(d) Node

1-g. A binary search tree contains the values 1, 2, 3, 4, 5, 6, 7, 8. The tree is traversed in pre-order and the values are printed out. Which of the following sequences is a valid output? (CO4, K2) 1

(a) 53124786

(b) 53126487

(c) 53241678

(d) 53124768

1-h. A complete binary tree with n non-leaf nodes contains (CO4, K1) 1

(a) log2 n nodes

(b) n+1 nodes

(c) 2n nodes

(d) 2n+1 nodes

1-i. In a simple graph, the number of edges is equal to twice the sum of the degrees of the vertices. (CO5, K1) 1

(a) TRUE

(b) FALSE

(c) No relation between edge and degree

(d) None of these

1-j. Which of the following statements for a simple graph is correct? (CO5, K1) 1

(a) Every path is a trail

(b) Every trail is a path

(c) Every trail is a path as well as every path is a trail

(d) Path and trail have no relation

2. Attempt all parts:-

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2.a.	What do you understand by Best case time complexity of an algorithm. (CO1, K2)	2
2.b.	Convert (a+b)*(c-d) to Postfix and Prefix Notation. (CO2, K2)	2
2.c.	Express the following polynomials in Linked List representation: (CO3, K3) a) p1(x) = 23x^9 + 18x^7 + 41x^6 + 163x^4 + 3 b) p2(x) = 4x^6 + 10x^4 + 12x + 8	2
2.d.	What is the Depth of root node in a tree? (CO4, K2)	2
2.e.	What is the basic difference between Dijkstra and Warshal algorithm. (CO5, K2)	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	Explain Row Major order Representation with example. (CO1, K2)	6
3-b.	Differentiate between Big-O and Theta-notation with example. (CO1, K4)	6
3-c.	How is Direct recursion different from indirect recursion. (CO2, K4)	6
3-d.	Explain Infix to prefix conversion with a suitable example. (CO2, K2)	6
3.e.	What is doubly linked list. Write the declaration of doubly linked list in python. (CO3, K2)	6
3.f.	Explain all terminologies used in Tree Data Structure. (CO4, K2)	6
3.g.	What is the diffrence between visiting a graph and traversing a graph? Explain any two algorithm to find minimum cost spanning tree. (CO5, K3)	6

SECTION-C 50

4. Answer any one of the following:-

4-a. Explain Space Complexity. Find out the Time Complexity of the following code: (CO1, K3) 10

```
def countFreq(arr, n):
freq = dict()
for i in arr:
if i not in freq:
freq[i] = 0
freq[i]+=1
for x in freq:
print(x, freq[x])
```

4-b. Write Quick Sort Algorithm and analyze the time and space complexity of Quick Sort. (CO1, K3) 10

5. Answer any one of the following:-

5-a.	Write a menu driven program in python to implement the various operations on a linear queue. (CO2, K3)	10
5-b.	Explain Tower of Hanoi problem and write its code using recursion. (CO2, K4)	10

6. Answer any one of the following:-

6-a.	Write functions in Python to insert a node (i) at beginning, (ii) at the end in a doubly linked list. Illustrate with an example. (CO3, K3)	10

6-b.	Sate advantages & disadvantages of linked list over arrays. (CO3, K2)	10
7. Answer any <u>one</u> of the following:-		
7-a.	Draw the B-tree of order 3 created by inserting the following data arriving in (CO4, K5) sequence - 92 24 6 7 11 8 22 4 5 16 19 20 78	10
7-b.	Explain threaded binary tree ADT in detail. (CO4, K2)	10
8. Answer any <u>one</u> of the following:-		
8-a.	What is minimum –cost spanning tree? Discuss Prim's algorithm with example. (CO5, K2)	10
8-b.	Give the importance of dynamic programming. (CO5, K2)	10

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