Printed page: 02 **Subject Code: AMTCSE0101**

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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

M. Tech

(SEM: -I, THEORY EXAMINATION (2020-2021)

Subject Name: Advanced Data Structures and Algorithms

Time: 3 Hours **Max. Marks:70**

General Instructions:

- All questions are compulsory. Answers should be brief and to the point.
- This Question paper consists of 02 pages & 08questions.
- It comprises of three Sections, A, B, and C. You are to attempt all the sections.
- **Section A** -Question No- 1 is objective type questions carrying 1 mark each, Question No- 2 is very short answer type carrying 2 mark each. You are expected to answer them as directed.
- **Section B** - Question No-3 is Long answer type -I question with external choice carrying 4 marks each. You need to attempt any five out of seven questions given.
- **Section C** - Question No. 4-8 are Long answer type –II (within unit choice) questions carrying 7 marks each. You need to attempt any one part *a* or *b*.
- Students are instructed to cross the blank sheets before handing over the answer sheet to the invigilator.
- No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION – A

1.	**Answer all the parts-**		**[5x1=5]**	**CO**
	a.	Links between two nodes is termed as _____.	**(1)**	**CO1**
	b.	Root, left, right traversal of a tree is known as _____ traversal.	**(1)**	**CO4**
	c.	A doubly linked list may or may not have _____ node.	**(1)**	**CO3**
	d.	Define the Θ-notation.	**(1)**	**CO1**
	e.	A _____ is a queue structure in which elements are inserted or deleted based on priority.	**(1)**	**CO4**
2.	**Answer all the parts-**		**[5×2=10]**	**CO**
	a.	Explain the role of space complexity in analysis of algorithm.	**(2)**	**CO1**
	b.	Enlist the operations of stack data structure using array.	**(2)**	**CO2**
	c.	Enumerate the various applications of tree data structure?	**(2)**	**CO4**
	d.	Define the self-referential structure to implement the polynomial representation using linked list.	**(2)**	**CO3**
	e.	List out limitation of linear queue when implemented using array.	**(2)**	**CO5**

SECTION – B

3.	**Answer any five of the following-**		**[5x4=20]**	**CO**
	a.	How are graphs represented in memory of a computer? Give relative merits and demerits of these representation schemes.	**(4)**	**CO5**

b.	Explain the Warshall's algorithm for finding the transitive closure using a suitable example.	**(4)**	**CO2**
c.	Write an algorithm to determine number of elements in a tree.	**(4)**	**CO4**
d.	Discuss the array representation of stacks.	**(4)**	**CO2**
e.	Write a short note on approximation algorithms.	**(4)**	**CO5**
f.	What is the relationship among P, NP and NP complete problems? Show with the help of a diagram	**(4)**	**CO5**
g.	Differentiate between the singly linked list and doubly linked list. Write the algorithm to implement following operation in doubly linked list (DLL): i. create a DLL. ii. insert in the beginning of DLL.	**(4)**	**CO3**

SECTION – C

4	**Answer any <u>one</u> of the following-**	**[5×7=35]**	**CO**
a.	Define spanning tree. Describe Kruskal's algorithm for finding minimum cost spanning tree with a suitable example.	**(7)**	**CO4**
b.	Write down the Merge sort algorithm. Explain how analysis of Merge sort is done with suitable illustration.	**(7)**	**CO2**
5.	**Answer any <u>one</u> of the following-**		
a.	Compare the various programming paradigms such as divide-and-conquer, dynamic programming and greedy approach. Explain the greedy algorithm to solve the fractional knapsack problem.	**(7)**	**CO2**
b.	Define binomial heap. Compare and contrast the binomial and Fibonacci heap. Also, Describe the union operation of two binomial heaps.	**(7)**	**CO4**
6.	**Answer any <u>one</u> of the following-**		
a.	Explain in detail backtracking strategy and give control abstraction for the same. Also differentiate between the backtracking and branch and bound technique.	**(7)**	**CO5**
b.	Write an algorithm for quicksort. Also , apply the quicksort algorithm on following sequence: 25, 10, 30, 15, 20, 28, 18, 12	**(7)**	**CO2**
7.	**Answer any <u>one</u> of the following-**		
a.	What is an ascending priority queue? Explain how to implement this using binary heap.	**(7)**	**CO4**
b.	Write the advantages and disadvantages of linked list over array. Implement circular queue data structure using circularly doubly linked list.	**(7)**	**CO3**
8.	**Answer any <u>one</u> of the following-**		
a.	What is hashing? Explain how it helps in faster accessing of the information?	**(7)**	**CO5**
b.	Write the binary search algorithm. Calculate the time complexity of the above algorithm.	**(7)**	**CO5**