



Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
B.Tech Degree S4 (R) Examinations April 2026 (2024 Scheme)

Course Code: PECST495
Course Name: Advanced Data Structures

Max. Marks: 60

Duration: 2 hours 30 minutes

PART A

(Answer all questions. Each question carries 3 marks)

		CO	Marks
1	Differentiate between Cuckoo Hashing and traditional chaining in resolving collisions.	CO1	(3)
2	Identify how a Count-Min Sketch handles frequency estimations for Heavy Hitters in data streams.	CO1	(3)
3	Evaluate the structural properties that guarantee balancing in a Red-Black Tree.	CO2	(3)
4	Analyze the core mechanism of a Merkle Tree in ensuring data integrity.	CO2	(3)
5	Distinguish between the spatial partitioning strategies of Quadrees and K-D Trees.	CO3	(3)
6	Define retroactivity in Temporal Data Structures and state its primary use case.	CO3	(3)
7	Detail the function of consistent hashing within Distributed Hash Tables (DHTs).	CO4	(3)
8	Summarize the objective of the Burrows-Wheeler Transform in data compression.	CO4	(3)

PART B

(Answer any one full question from each module, each question carries 9 marks)

Module -1

9	a) Design a click stream processing system using Bloom Filters for a high-traffic network.	CO1	(5)
	b) Analyze the time complexity and memory overhead of representing rooted trees using objects and pointers versus arrays.	CO1	(4)

- 10 a) Illustrate the process of identifying Heavy Hitters using a Count-Min structure in data science applications. CO1 (4)
- b) Demonstrate the insertion of elements into a Hash Table employing Cuckoo Hashing, detailing the eviction process. CO1 (5)

Module -2

- 11 a) Construct a Suffix Tree for a given short string - "banana" and formulate its usage in substring searches. CO2 (5)
- b) Describe the structural properties of a Fibonacci Heap and outline its performance advantages over a Binomial Heap. CO2 (4)
- 12 a) Develop an AutoComplete feature utilizing Tries, outlining the exact search and retrieval algorithms. CO2 (5)
- b) Formulate a scenario where a Segment Tree is the optimal choice for range queries over a standard balanced BST. CO2 (4)

Module -3

- 13 a) Construct an R-tree for spatial data representation and detail the node splitting criteria during insertion. CO3 (5)
- b) Analyze the probabilistic nature of a Skip List and describe how it achieves logarithmic search times. CO3 (4)
- 14 a) Evaluate the use of Tango Trees for optimizing search patterns in dynamic data sets. CO3 (5)
- b) Outline the algorithm for posting list intersection used in Information Retrieval and WWW applications. CO3 (4)

Module -4

- 15 a) Illustrate the mechanism of node additions and removals in a Distributed Hash Table (DHT) to maintain consistent hashing. CO4 (5)
- b) Analyze the application of Cryptographic Hashing in securing distributed data structures. CO4 (4)
- 16 a) Design a Distributed Binary Search Tree (BST) of your own and explain how data is partitioned across nodes. CO4 (5)
- b) Examine the role of Wavelet Trees in string transformations and data compression. CO4 (4)
