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Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
(GIET University)

M.Tech. (First Semester – Regular/Supplementary) Examinations, January – 2026

24MCSPC11002 – Advanced Data Structures
(CSE)

Time: 3 hrs | Maximum: 60 Marks

Answer ALL questions
(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions	CO #	Blooms Level
a. What is a hash function? Mention two properties of a good hash function.	CO1	K1
b. What is the main motivation behind using skip lists instead of linked lists?	CO2	K2
c. Why are Red-Black Trees considered self-balancing?	CO3	K2
d. What are the two main properties required for applying Dynamic Programming?	CO4	K2
e. Define range searching and find the general time complexity.	CO5	K1

PART – B **(10 x 5 = 50 Marks)**

Answer ***ALL*** the questions	Marks	CO #	Blooms Level
2. a. Define hash table and hash function. What is collision in hashing? Explain linear probing and quadratic probing with suitable example.	5	CO1	K1
b. Explain with an example about the collision handling by using a double hashing technique.	5	CO1	K1
(OR)			
c. Explain the problem of clustering in open addressing. Compare how linear probing and quadratic probing handle primary and secondary clustering.	5	CO1	K2
d. The keys 12, 18, 13, 2, 3, 23, 5 and 15 are inserted into an initially empty hash table of length 10 using open addressing with hash function h(k) = k mod 10 and linear probing. What is the resultant hash table?	5	CO1	K3
3.a. Write the Need for Randomizing. List out the different data structures and algorithms of randomizing	5	CO2	K2
b. Explain the structure of a skip list and its basic operations. Using a step-by-step example, demonstrate how search is performed in a skip list.	5	CO2	K3
(OR)			
c. Explain probabilistic skip lists and deterministic skip lists in detail. Highlight the key differences in their construction and maintenance, with suitable illustrations.	5	CO2	K2
d. Explain how a skip list supports efficient operations. Using a suitable example, explain search, insert, and delete operations, and analyze their time complexities.	5	CO2	K3
4.a. Create a binary search tree with the following data elements 45, 15, 79,90, 10, 55, 12, 20, 50	5	CO3	K3
b. What is an AVL TREE? Construct an AVL tree with the following sequence of nodes: 50,20,60,10,8,15,32,46,11,48	5	CO3	CO3
(OR)			

c.	With suitable examples, construct a Red–Black Tree for the key sequence 50, 40, 60, 30, 45, 55, 70 Indicate the type of rotation performed at each step.	5	CO3	K3
d.	What are 2-3 trees how it works with data structures discuss with an example?	5	CO3	K2
5.a.	Write the KMP algorithm and explain with an example how it avoids backtracking.	5	CO4	K3
b.	Write the Boyer–Moore string matching algorithm. Illustrate its working with a suitable example, clearly showing how the pattern is matched against the given text using the bad character heuristic.	5	CO4	K3
	(OR)			
c.	Construct the Huffman coding for the given string. Compare the resulting variable-length Huffman code with a fixed-length code for the same set of characters, and explain which coding method is more efficient and why.	5	CO4	K4

B	C	C	A	B	B	D	D	A	E	C	C	B	B	A	E	D	D	C	C

d.	Find the Longest Common Subsequence (LCS) of the following two sequences: X= "A B C B" Y= " B D C A B"	5	CO4	K4
6.a.	Construct a problem for clustered model with 2-dimensional range searching.	5	CO5	K2
b.	What is Priority Search Trees? Create a priority search tree and search an element by querying process.	5	CO5	K2
	(OR)			
c.	Describe Quad trees and its functions.	5	CO5	K2
d.	What is hashing? Explain about message digest and password verification.	5	CO5	K3

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