Course Code: 25CS5801 **R25**

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
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QUESTION BANK

Subject with Code: Advanced Data Structures & Algorithms (25CS5801)
Course & Branch: M.TECH CSE
Year &Sem: I-M.TECH & I-Sem Regulation :R25

UNIT – I
Introduction

1	**a**	Write a detailed notes on Static representation of Single Linked List.	**[CO1][L2]**	**[5M]**
	b	Write a detailed notes on Dynamic representation of Single Linked List.	**[CO1][L2]**	**[5M]**
2	**a**	What are the advantages and disadvantages of circular linked list?	**[CO1][L2]**	**[5M]**
	b	Write an algorithm to Insert a node on to a single linked list.	**[CO1][L3]**	**[5M]**
3		Explain briefly about various types of linked lists with suitable examples.	**[CO1][L2]**	**[10M]**
4		Explain the following operations in a doubly linked list: (a) Create an empty list. (b) Insert the elements 10 and 20 at the front of the list. (c) Insert the elements 30 at the middle of the list. (d) Insert the elements 15, 45 at the end of the list. (e) Delete the middle element from the list.	**[CO1][L3]**	**[10M]**
5	**a**	What is a circular linked list? Write routines for inserting and deleting elements in single circular linked list.	**[CO1][L3]**	**[6M]**
	b	Write any four applications of queues.	**[CO1][L1]**	**[4M]**
6		Examine the algorithms to implement the doubly linked list and perform all the operations on creating the doubly linked list.	**[CO1][L4]**	**[10M]**
7		What is queue? Explain the linked list representation of it with suitable example.	**[CO1][L2]**	**[10M]**
8		Explain the Tower of Hanoi problem containing 3 discs and write the algorithm to solve it.	**[CO1] [L3]**	**[10M]**
9	**a**	Convert an infix expression to a postfix expression using stack for the following expression: ((A + B) – C * (D / E)) + F	**[CO1] [L6]**	**[5M]**
	b	Convert an infix expression to a prefix expression using stack for the following expression: ((A + B) – C * (D / E)) + F	**[CO1] [L6]**	**[5M]**
10	**a**	Write an algorithm to perform the following operations on a single linked list. (i) Insert new node at the beginning of list. (ii) Count the number of nodes.	**[CO1][L3]**	**[5M]**
	b	What is the difference between the single linked list and double linked list, circular linked list?	**[CO1][L2]**	**[5M]**

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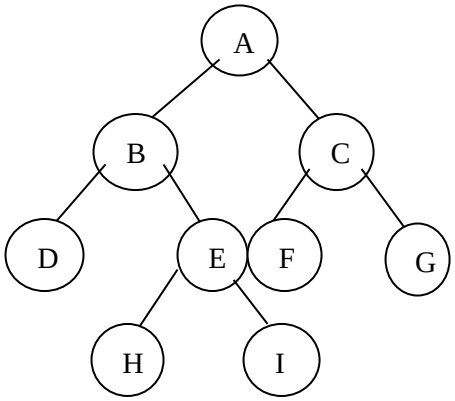
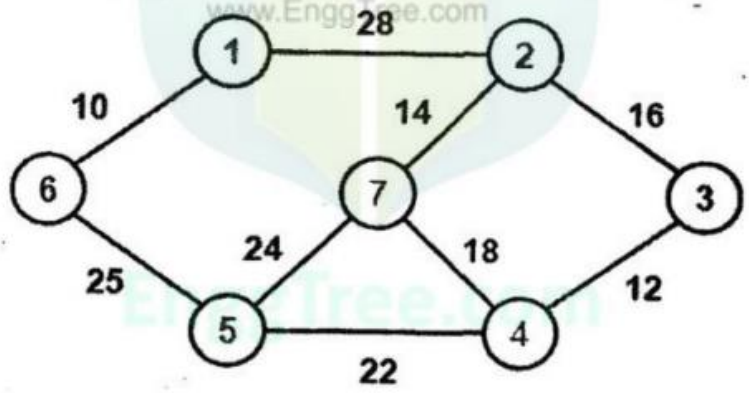
UNIT – II
Searching and Sorting

1	**a**	Compare binary search and linear search techniques.	**[CO2][L4]**	**[4M]**
	b	Find the number 77 from the following set of numbers using binary search: 6, 12, 17, 23, 38, 45, 77, 84, 90.	**[CO2][L3]**	**[6M]**
2		Write and explain linear search procedure or algorithm with a suitable example.	**[CO2][L2]**	**[10M]**
3		What is the logic behind Heap sort and sort the following elements 12,98,67,44,88,70.	**[CO2][L3]**	**[10M]**
4		Write an algorithm to perform Quick sort and analyse the best case complexity of it. Apply it to sort 24,56,47,35,10,90,82,31.	**[CO2][L4]**	**[10M]**
5		State and explain algorithm to perform Radix sort? Sort the following numbers using radix sort: 170, 45, 75, 90, 802, 24, 2, 66.	**[CO2][L3]**	**[10M]**
6		What is meant by sorting? Write an algorithm for Shell sort and illustrate with an example?	**[CO2][L2]**	**[10M]**
7		Write Binary Tree traversal for the given tree 	**[CO2][L3]**	**[10M]**
8		With examples, explain the two methods of binary tree implementation	**[CO2][L2]**	**[10M]**
9		Construct the minimum spanning tree (MST) for the given graph using Prim's Algorithm. Find the Cost of Minimum Spanning Tree. 	**[CO2][L3]**	**[10M]**
10	**a**	Explain Breadth First Search (BFS) with an example	**[CO2][L2]**	**[5M]**
	b	Explain Breadth First Search (BFS) with an example	**[CO2][L2]**	**[5M]**

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UNIT-III

Dictionaries and Hashing

1		What is a dictionary? Explain dictionary ADT and write various implementations.	**[CO3][L2]**	**[10M]**
2		Explain how dictionaries are implemented using hashing with an example.	**[CO3][L3]**	**[10M]**
3		With the help of suitable example, explain the linked list collision resolution technique	**[CO3][L2]**	**[10M]**
4		Which are the different methods of implementing hash function? Explain any two in detail.	**[CO3][L2]**	**[10M]**
5		Describe open addressing and Chaining	**[CO3][L2]**	**[10M]**
6	**a**	What is meant by hashing? Why we need it? Explain hashing techniques.	**[CO3][L2]**	**[6M]**
	b	Write short notes on bucket hashing.	**[CO3][L2]**	**[4M]**
7		Compare bucket hashing with open hashing and closed hashing. Write algorithm to search key value, insert value and a delete key value in bucket hashing.	**[CO3][L4]**	**[10M]**
8		Following elements are inserted into an empty hash table with hash function f(x) = x% 17 and quadratic probing 20,10,5,30,40,57,35,25,18,22,21.	**[CO3][L3]**	**[10M]**
9		Given input {4371, 1323, 6173, 4199, 4344, 9679, 1989} and a hash function h(x) = x(mod 10), show the resulting: (i) Open hash table using linear probing. (ii) Open hash table using quadratic probing. (iii) Open hash table using double hashing with second hash function h2(x) =7-(x mod 7).	**[CO3][L3]**	**[10M]**
10	**a**	Explain rehashing. When is it necessary? Demonstrate with an example.	**[CO3][L3]**	**[6M]**
	b	Explain extendible hashing in detail with diagrams.	**[CO3][L4]**	**[4M]**

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UNIT – IV

Priority queues

1	**a**	Write an algorithm to insert an element in to a heap. Explain with a suitable example.	**[CO4][L3]**	**[5M]**
	b	Explain the concept of priority queue with suitable example	**[CO4][L2]**	**[5M]**
2		Define a Priority Queue. Write its ADT and explain each operation with suitable examples.	**[CO4][L2]**	**[10M]**
3		Construct a binary heap with the following values: 23, 7, 92, 6, 12, 14, 40, 44, 20, 21.	**[CO4][L3]**	**[10M]**
4		Explain in detail how a binary heap can be used to implement a priority queue.	**[CO4][L2]**	**[10M]**
5		Define a Binary Search Tree. Explain its properties and write its ADT.	**[CO4][L2]**	**[10M]**
6		Construct a binary search tree for given values. consider the first value as root node 45,23,29,85,92,7,11,35,49,51.	**[CO4][L3]**	**[10M]**
7		Explain how BSTs are used in dictionary ADTs and symbol table implementations.	**[CO4][L4]**	**[10M]**
8		Describe the linked representation and array representation of a Binary Search Tree.	**[CO4][L2]**	**[10M]**
9	**a**	Explain the time complexity of search, insert, and delete in a BST.	**[CO4][L4]**	**[5M]**
	b	What are the advantages and disadvantages of Binary Search Trees?	**[CO4][L4]**	**[5M]**
10		Illustrate the deletion operation in BST by explaining the three cases: i)Node with no child ii)Node with one child iii)Node with two children	**[CO4][L3]**	**[10M]**

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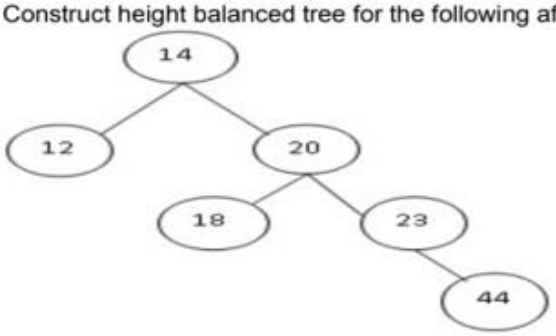
UNIT – V
Search Trees

1		What is an AVL tree? Explain various rotations of AVL trees maintaining balance factor while insertion and deletion takes place.	**[CO5] [L3]**	**[10M]**
2		What is an AVL Tree? Insert the following elements into AVL tree: 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15	**[CO5] [L3]**	**[10M]**
3		Discuss the performance and applications of AVL trees.	**[CO5] [L4]**	**[10M]**
4	**a**	Construct height balanced tree for the following after rotation. 	**[CO5] [L4]**	**[6M]**
	b	List out the properties of Red-Black trees.	**[CO5] [L1]**	**[4M]**
5		Explain Red-Black trees in detail.	**[CO5] [L2]**	**[10M]**
6		Define red black tree and discuss insert and delete operations on it with illustrations.	**[CO5] [L4]**	**[10M]**
7	**a**	Compare Splay Trees with AVL and Red-Black trees.	**[CO5] [L5]**	**[4M]**
	b	Describe Splay tree algorithm with example.	**[CO5] [L3]**	**[6M]**
8		Explain insertion, deletion and search in Splay Trees.	**[CO5] [L3]**	**[10M]**
9		Explain insertion and deletion operations in B - trees with suitable examples.	**[CO5] [L3]**	**[10M]**
10		What is a B-Tree. Specify its properties and describe the construction of a B-Tree for the following elements 5, 2, 13, 3, 45, 72, 4, 6, 9, 22.	**[CO5] [L4]**	**[10M]**

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