R20

SET - 1

III B. Tech I Semester Regular/Supplementary Examinations, December -2023
DATA STRUCTURES
(Com to CE,EEE,ME,ECE)

Time: 3 hours   Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from **Each unit**
All Questions Carry Equal Marks
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UNIT-I

1.	a)	Explain the insertion operation in linked list. How nodes are inserted after a specified node?	[7M]
	b)	Define ADT and Mention the features of ADT.	[7M]

(OR)

2.	a)	Discuss the merge operation in circular linked lists.	[7M]
	b)	When doubly linked list can be represented as circular linked list?	[3M]
	c)	Mention the merits and demerits of linked list.	[4M]

UNIT-II

3.	a)	Give the trace of searching for 5 in the list of elements: 2, 5, 8, 10, 11, 15, 32, 64, 78, 89 using binary search.	[7M]
	b)	Write a function to implement quick sort.	[7M]

(OR)

4.	a)	Give a comparison of the sorting approaches (bubble, insertion and selection sort) in terms of time complexity for best, average and worst case.	[7M]
	b)	Write an algorithm for merge sort and also sort the given elements using merge sort technique. 5, 20, 3, 15, 30, 25, 10, 12, 28, 52, 35, 2.	[7M]

UNIT-III

5.	a)	Give a brief note on binary, binary tree, threaded binary tree and distinguish among them.	[7M]
	b)	Write a function to find maximum element in binary tree	[7M]

(OR)

6.	a)	Construct and explain the procedure for expression tree for the given expression $(a + b) / (c + d) * (e - f)$	[7M]
	b)	Construct the BST for the following elements. 3, 2, 1, 6, 5, 4, 7, 9, 8, 12, 10	[7M]

UNIT-IV

7.	a)	Write and explain AVL tree using single and double rotations.	[7M]
	b)	Show the result of inserting these keys into an initially empty AVL tree: 34, 56, 74, 23, 19, 83, 23, 12, 96.	[7M]

(OR)

8.		Construct an AVL Tree using the following key elements: 18, 27, 9, 11, 36, 54, 21, 63, 92, 18, 72 and delete 9, 11, 54.	[14M]

UNIT-V

9.	a)	Explain the purpose of Red-Black Trees	[5M]
	b)	Construct the Red-Black Tree for the set of data values [10, 18, 7, 15, 16, 30} and also mention the step-by-step procedure.	[9M]

(OR)

10.	a)	Build a splay tree by inserting the following elements in the sequence shown in below 18, 11, 5, 40, 10, 150, 35, 0, 85, 260, 100.	[10M]
	b)	What are the conditions to be satisfied by a binary search tree to be Red-Black Trees?	[4M]

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UNIT-I

1. a) What are the postfix and prefix forms of the given below expression? A+B*(C-D)/(P-R) [7M]
    b) List three examples that uses linked list. [3M]
    c) What are the merits and demerits of array implementation of lists? [4M]

(OR)

2. a) Convert the infix (a+b)*(c+d)/f into postfix & prefix expression [7M]
    b) Write the routine to insert an element into a queue. [4M]
    c) Write the routine for insertion operation of singly linked list. [3M]

UNIT-II

3. a) Give a brief on hashing and its purpose. Following elements are inserted into an empty hash table with hash function $f(x) = x\%13$ and linear probing 112, 44, 52, 45, 37, 278, 89, 28, 61, 249.
    Draw the hash table for each insertion. [7M]
    b) Write an algorithm for selection sort with an example, and mention the time and space complexity of selection sort [7M]

(OR)

4. a) Define Heap sort? Explain heap sort technique for the following elements. 5, 20, 10, 15, 25, 35, 18, 22, 32, 2 [7M]
    b) Write and explain program for Linear Search. [7M]

UNIT-III

5. a) Explain the binary tree traversals with suitable example for each. [7M]
    b) Explain the operations of binary search tree with an example. [7M]

(OR)

6. a) Construct a binary tree for the following sequence of numbers.
    45, 32, 90, 34, 68, 72, 15, 24 Traverse the binary tree created in Inorder [7M]
    b) Write a function to find minimum element in a binary tree. [7M]

UNIT-IV

7. a) Explain with an example how a node is inserted into an AVL tree, explain different rotations that are to be used to maintain height balance. Illustrate with suitable example for each. [7M]
    b) Create B-Tree of order 5 from the following list of data items:
    20, 30, 35, 85, 10, 55, 60, 25. What will be the root note for the above B-Tree? [7M]

(OR)

8. a) Insert the following sequence of elements into an AVL tree, starting with an empty tree: 10, 20, 15, 25, 30, 16, 18, 19. and delete 30 in the AVL tree that you got. [7M]

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b) Show the B-tree that results when deleting A, then deleting V and then deleting [7M]
P from the B-tree shown in below Figure with a minimum branching factor of
t=2.
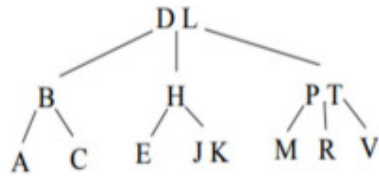
UNIT-V

9. What is priority Queue? How can priority queues can be implemented? Explain [14M]
in brief

(OR)

10. Construct a Red-Black tree using the following keys: [14M]
42, 12, 5, 7, 4, 25, 5, 14.

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SET - 3

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UNIT-I

1. a) A circular queue has a size of 5 and has 3 elements 10,20 and 40 where F=2 [10M] and R=4. After inserting 50 and 60, what is the value of F and R. Trying to insert 30 at this stage what happens? Delete 2 elements from the queue and insert 70, 80 & 90.
   Explain and also show the sequence of steps with necessary diagrams with the value of F & R

   b) Mention any four applications of stack.   [4M]

(OR)

2. a) What is a DeQueue? Explain its operation with example.   [6M]

   b) Define an efficient representation of two stacks in a given area of memory with [5M] n words and explain.

   c) What are the features of stacks?   [3M]

UNIT-II

3. a) Write and Explain merge sort algorithm with a suitable example. Give its trace [7M] in sorting : 45, 26, 39, 34, 12, 19, 33, 29, 35, 22, 37.

   b) Explain about various types of hashing techniques   [7M]

(OR)

4. a) Write a procedure for sorting a given list of elements using Quick sort method. [7M] Show the division of the list in the quick sort for a list of 10 numbers

   b) Write an algorithm for Binary Search? What are the implementation issues of [7M] binary search?

UNIT-III

5. a) Explain selection sort algorithm with example   [7M]

   b) What is binary search tree? Explain its operations   [7M]

(OR)

6. a) Compare full binary tree and complete binary tree   [4M]

   b) What is traversal in binary tree? Explain with an example   [10M]

UNIT-IV

7. a) Construct an AVL tree with the values 3, 1, 4, 5, 9, 2, 8, 7, 0 into an initially [7M] empty tree. Write the code for inserting into an AVL tree

   b) Construct B-Tree of order 5 (maximum 5 child nodes) using following [7M] sequence.
   23, 11, 4, 89, 119, 52, 98, 349, 164, 450, 333, 15, 12, 17.

(OR)

8. a) Explain the Four Rotations used to convert an unbalanced BST into Balanced [7M] AVL Tree.

   b) Construct an AVL Tree by inserting values 11 to 18.   [7M]

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UNIT-V

9. a) What is a Red-Black tree? Mention the properties that a Red-Black tree holds. [9M]
    b) Explain LLr, LRr, RRr, RLr rotations with suitable example. [5M]

(OR)

10. Mention the types of Priority Queue? Explain about representation of Priority [14M]
Queue in detail with a suitable example.

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UNIT-I

1. a) What are the limitations of queue? Explain the algorithms for various operations of circular queue. [7M]
   b) What are the applications of queue? [4M]
   c) Write a routine for IsEmpty condition of queue. [3M]

(OR)

2. a) What are the draw backs of single linked list? Write and explain the algorithm for search and modify operations in doubly linked list with example. [7M]
   b) What are enqueue and dequeue operations? [4M]
   c) Explain the usage of stack in recursive algorithm implementation? [3M]

UNIT-II

3. a) Find the number and position of 36in the array given below by using Binary Search 2,6,9,10,13,17,32,35,36,58,76,92 [7M]
   b) Write a program for insertion sort algorithm and explain with example [7M]

(OR)

4. a) Sort the following sequence by using Heap Sort. 88,74,98,54,67,32,34,56,90 [7M]
   b) What is the precondition to perform binary search. Write a program to implement binary search. [7M]

UNIT-III

5. a) Make a binary search tree for the following sequence of numbers: 45, 36, 76, 23,89,115,98,39,41,56,69,48 Traverse the tree in Preorder, Inorder and Postorder. [9M]
   b) Write a function to count number of leaf nodes in a binary tree. [5M]

(OR)

6. a) Write the Pseudo code for Abstract data type of binary tree. Write an algorithm to determine the height of a binary tree [9M]
   b) Write a function to delete a node specified by its data value from a BST [5M]

UNIT-IV

7. a) Show the results of inserting43, 11, 69, 72 and 30 into an initially empty AVL tree and also show the-results of deleting the nodes 11 and 72 one after the other of the constructed tree. [7M]
   b) Show how the following elements are inserted into a B-Tree of order 5. 12, 34, 56, 69, 5, 3, 17, 25, 32, 47, 63, 50, 29, 19. [7M]

(OR)

8. a) What are the steps to be followed to insert an element in to AVL tree? Explain it with an example [7M]
   b) Construct B-Tree of order 4 by inserting the given set of elements in the order. 100, 20, 10, 60, 30, 40, 45, 70, 80, 90, 105. [7M]

UNIT-V

9. a) Elaborate the significance of Red-Black Tree.   [7M]
    b) Write the procedure to implement Priority Queue   [7M]

(OR)

10. a) List and explain the properties of BST,AVL tree,B-Tree and Red-Black tree. [7M]
    b) Discuss the operations and applications of Priority Queue   [7M]

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