Q.6		Attempt any two:						
	i.	Write down algorithm of binary searching. What should be criteria for applying binary search?	**5**	2	5	1	1
	ii.	What is linear probing? How it is different from quadratic probing?	**5**	2	5	1	1
	iii.	Write down algorithm of Linear searching. Apply linear search on the following keys to search 32 in the given list of an array 12,26,10,15,19,32	**5**	2	5	1	1

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Total No. of Questions: 6 *Total No. of Printed Pages:4*

Enrollment No.....

Faculty of Engineering
End Sem Examination Dec 2024
EC3ET04 Data Structures

Programme: B.Tech. Branch/Specialisation: EC

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

			Marks	**BL**	**CO**	**PO**	**PSO**
Q.1	i.	What are the advantages of arrays? (a) Objects of mixed data types can be stored (b) Elements in an array cannot be sorted (c) Index of first element of an array is 1 (d) Easier to store elements of same data type	**1**	1	1	1	1
	ii.	Insertion of an element at the middle of a linked list requires the modification of how many pointers? (a) 1 (b) 2 (c) 3 (d) 4	**1**	1	1	1	1
	iii.	What is the average case time complexity for finding the height of the binary tree? (a) h = O(log(logn)) (b) h = O(nlogn) (c) h = O(n) (d) h = O(log n)	**1**	1	2	1	1
	iv.	In a full binary tree if number of internal nodes is I, then number of nodes N are? (a) N = 2*I (b) N = I + 1 (c) N = I – 1 (d) N = 2*I + 1	**1**	1	2	1	1
	v.	Suppose the numbers 7, 5, 1, 8, 3, 6, 0, 9, 4, 2 are inserted in that order into an initially empty binary search tree. The binary search tree uses the usual ordering on natural numbers. What is the in-order traversal sequence of the resultant tree? (a) 7 5 1 0 3 2 4 6 8 9 (b) 0 2 4 3 1 6 5 9 8 7 (c) 0 1 2 3 4 5 6 7 8 9 (d) 9 8 6 4 2 3 0 1 5 7	**1**	1	3	1	1

vi.	An AVL tree will become unbalance if balance factor is- (a) 1 (b) 0 (c) -1 (d) -2	**1**	1	3	1	1
vii.	Which of the following sorting algorithms in its typical implementation gives best performance when applied on an array which is sorted or almost sorted (maximum 1 or two elements are misplaced. (a) Quick Sort (b) Heap Sort (c) Merge Sort (d) Insertion Sort	**1**	1	4	1	1
viii.	You have to sort 1 GB of data with only 100 MB of available main memory. Which sorting technique will be most appropriate? (a) Heap sort (b) Merge sort (c) Quick sort (d) Insertion sort	**1**	1	4	1	1
ix.	What is a hash table? (a) A structure that maps values to keys (b) A structure that maps keys to values (c) A structure used for storage (d) A structure used to implement stack and queue	**1**	1	5	1	1
x.	What is a hash function? (a) A function has allocated memory to keys (b) A function that computes the location of the key in the array (c) A function that creates an array (d) A function that computes the location of the values in the array	**1**	1	5	1	1
Q.2 i.	What do you mean by average case, best case and worst case of an algorithm explain with suitable example?	**3**	2	1	1	1
ii.	What are the limitations of Simple Queues? How it can be overcome? Explain diagrammatically with the help of an example also write an algorithm for adding a node at the rear end in simple queue.	**7**	3	1	1	1

OR	iii.	Explain different types of linked list with proper diagram and also write algorithm for inserting a node at the end of linked list.	**7**	3	1	1	1
Q.3	i.	What are binary tree? How it can be represented in data structures with the help of an array? Explain it with the help of a simple tree and an array.	**3**	2	2	1	1
	ii.	Explain different types of tree traversals with the help of a simple tree diagram, also construct a binary tree with the following given information. POSTORDER: D F E B G L J K H C A INORDER: D B F E A G C L J H K	**7**	3	2	1	1
OR	iii.	Write down difference between Depth first search and breadth first search (any five), also apply depth first search and breadth first search on any simple graph.	**7**	3	2	1	1
Q.4	i.	What is the splay tree? Write it's any two applications.	**3**	2	3	1	1
	ii.	Create a Red Black tree of the following sequence-8,18,5,15,17,25,40 and 80 Write B above the node for black colour and write R above the node for red colour apply the rotation or colouring and mention the name of rotation or re colouring after every step.	7	3	3	1	1
OR	iii.	Construct an AVL Tree for the given Sequence 21, 26, 30, 9, 4, 14, 28, 18. Do it step by step and write the name of the rotation applied after every step.	7	3	3	1	1
Q.5	i.	Classify different types of sorting techniques used in data structures with its brief introduction.	**4**	2	4	1	1
	ii.	Sort the following keys in descending order Using Heap sort. 15,10,45,40,39,80	**6**	3	4	1	1
OR	iii.	Sort the following keys in descending order Using Quick sort. 9,7,5,11,12,2	**6**	3	4	1	1

Marking Scheme

EC3ET04 Data Structure

Q.1	i)	What are the advantages of arrays? d) Easier to store elements of same data type	1
	ii)	Insertion of an element at the middle of a linked list requires the modification of how many pointers? b) 2	1
	iii)	What is the average case time complexity for finding the height of the binary tree? d)h = O(log n)	1
	iv)	In a full binary tree if number of internal nodes is I, then number of node N are? d) N = 2*I + 1	1
	v)	Suppose the numbers 7, 5, 1, 8, 3, 6, 0, 9, 4, 2 are inserted in that order into an initially empty binary search tree. The binary search tree uses the usual ordering on natural numbers. What is the in-order traversal sequence of the resultant tree? Cross c)0 1 2 3 4 5 6 7 8 9	1
	vi)	An AVL tree will become unbalance if balance factor is d)-2	1
	vii)	Which of the following sorting algorithms in its typical implementation gives best performance when applied on an array which is sorted or almost sorted (maximum 1 or two elements are misplaced). d) Insertion Sort	1
	viii)	You have to sort 1 GB of data with only 100 MB of available main memory. Which sorting technique will be most appropriate? b) Merge sort	1
	ix)	What is a hash table? b) A structure that maps keys to values	1
	x)	What is a hash function? b) A function that computes the location of the key in the array	1

Q.2	i.	Each case 1 mark	3marks	3
OR	ii.	Limitation with diagram	4 marks	7
		Algorithm	3 marks	
	iii.	Type with diagram	4 marks	7
		Algorithm	3 marks	
Q.3	i.	Tree with an array	3 marks	3
	ii.	Different types of tree traversals	3 marks	7
		Construction of a tree	4 marks	
OR	iii.	Each difference 1 mark	5 marks	7
		Applying BFS and DFS on a simple graph	2 marks	
Q.4	i.	Spaly tree	2 marks	3
		2 Application	1 mark	
	ii.	Each step 1 mark	7 marks	7
OR	iii.	Each step 1 mark	7 marks	7
Q.5	i.	Classification	1 mark	4
		Description	3 marks	
	ii.	Each step 1 mark	6 marks	6
OR	iii.	Each step 1 mark	6 marks	6
Q.6				
	i.	Each step 1 mark		5
	ii.	Linear probing	2.5 marks	5
		quadratic probing	2.5 marks	
	iii.	Algorithm	4 marks	5
		Applying algorithm	1 mark	

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