

Enrollment No.....



Faculty of Engineering  
End Sem (Odd) Examination Dec-2019  
EC3ET04 / EI3ET04 Data Structures

Programme: B.Tech.

Branch/Specialisation: EC/EI

**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.

- Q.1 i. Assuming int is of 4 bytes, what is the size of int arr[15]? **1**  
(a) 15 (b) 19 (c) 11 (d) 60
- ii. The postfix form of the expression  $(A + B) * (C * D - E) * F / G$  is? **1**  
(a)  $AB + CD * E - FG / **$  (b)  $AB + CD * E - F ** G /$   
(c)  $AB + CD * E - * F * G /$  (d)  $AB + CDE * - * F * G /$
- iii. The no. of external nodes in a full binary tree with n internal nodes is? **1**  
(a) n (b) n+1 (c) 2n (d) 2n + 1
- iv. Why graph traversal is difficult than tree traversal? **1**  
(a) Because tree have root (b) Because tree is binary  
(c) Because tree is undefined (d) All of these
- v. What is the maximum height of an AVL tree with p nodes? **1**  
(a) p (b)  $\log(p)$   
(c)  $(\log(p))/2$  (d)  $p/2$
- vi. Why to prefer red-black trees over AVL trees? **1**  
(a) Because red-black is more rigidly balanced  
(b) AVL tree store balance factor in every node which costs space  
(c) AVL tree fails at scale  
(d) Red black is more efficient
- vii. If the given input array is sorted or nearly sorted, which of the following algorithm gives the best performance? **1**  
(a) Insertion sort (b) Selection sort  
(c) Quick sort (d) Merge sort

[2]

- viii. Which of the following algorithms has lowest worst case time complexity? **1**  
 (a) Insertion sort (b) Selection sort  
 (c) Quick sort (d) Heap sort
- ix. In linear search with array, how many comparisons are needed in best case? **1**  
 (a) 0 (b) 1 (c) n (d) n/2
- x. The method of access which uses key transformation is known as **1**  
 (a) Direct (b) Hash (c) Random (d) Sequential
- Q.2 Attempt any two:
- i. Write at least two differences between stack and queue also write the disadvantages of an array and how it can be overcome by linked list. **5**
- ii. A two-dimensional array defined as a [4...7, -1...3] requires 2 bytes of storage space for each element. If the array is stored in row-major form, then calculate the address of element at location a [6,2]. Given base address is 100. **5**
- iii. Use tabular method of stack and convert the following post fix expression to infix expression.  $PQ+S*TU-\wedge$  **5**
- Q.3 i. Define Graph and explain the following graph terminologies with the help of a graph **4**  
 (a) Connected component (b) Cycle  
 (c) Degree
- ii. Explain binary search tree, threaded binary tree, Complete binary tree and extended binary tree with the help of a diagram. **6**
- OR iii. The following sequence gives the preorder and inorder of the Binary tree T: **6**  
 Preorder: A B D G C E H I F  
 Inorder: D G B A H E I C F  
 Draw the diagram of the final tree step by step. Also write down the postorder traversal of the tree from the final tree

- Q.4 i. Explain AVL tree and Leftist tree. **4**  
 [3]
- ii. Start with an empty red-black tree and insert the following keys in the given order [15,14,13,12,11,10] Draw tree figures in node format [colour, key] and depict tree immediately after each insertion and following the rebalancing rotation or colour change (if any). Label all nodes with their colour and identify the rotation type(if any) that is done. **6**
- OR iii. What are the applications of Splay tree explain all types of rotation in a splay tree while inserting a key? **6**
- Q.5 i. Write algorithm of insertion sort. **4**
- ii. Build a max heap H from the following list of numbers: 46,34,52,21,64,56,79,56 **6**
- OR iii. Explain different types of external and internal sorting in details. **6**
- Q.6 i. 'a' is a linear array with 'n' elements, and 'item' is a given item of information. write algorithm to find the location 'loc' of 'item' in 'a', set loc=0 if the search is unsuccessful. **3**
- ii. What is Hash table and explain different types of uniform hash functions? **7**
- OR iii. Explain bucket overflow and write at least two types of approaches used for overflow resolution also Write down at least two application of each searching and indexing in computer field. **7**

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## Marking Scheme

### EC3ET04 / EI3ET04 Data Structures

Q.1	i.	Assuming int is of 4 bytes, what is the size of int arr[15]? (d) 60	1
	ii.	The postfix form of the expression (A+ B)*(C*D- E)*F / G is? (a) AB+CD*E-FG/**	1
	iii.	The no. of external nodes in a full binary tree with n internal nodes is? (b) n+1	1
	iv.	Why graph traversal is difficult than tree traversal? (a) Because tree have root	1
	v.	What is the maximum height of an AVL tree with p nodes? (b) log(p)	1
	vi.	Why to prefer red-black trees over AVL trees? (b) AVL tree store balance factor in every node which costs space	1
	vii.	If the given input array is sorted or nearly sorted, which of the following algorithm gives the best performance? (a) Insertion sort	1
	viii.	Which of the following algorithms has lowest worst case time complexity? (d) Heap sort	1
	ix.	In linear search with array, how many comparisons are needed in best case (b) 1	1
	x.	The method of access which uses key transformation is known as (b) Hash	1

Q.2	Attempt any two:		
	i.	Two differences between stack and queue	2 marks
		Disadvantages of an array	2 marks
		How it can be overcome by linked list.	1 mark
	ii.	Formula	1 mark
		Calculation step and Address of element at location a [6,2]=120	4 marks
	iii.	Table of stack for question	(0.5 mark*10)

Q.3	i.	Define Graph	1 mark	4
		(a) Connected component	1 mark	
		(b) Cycle	1 mark	
		(c) Degree	1 mark	
	ii.	Binary search tree with diagram	1.5 marks	
OR		Threaded binary tree with diagram	1.5 marks	6
		Complete binary tree with diagram	1.5 marks	
		Extended binary tree with diagram.	1.5 marks	
	iii.	Tree step by step (each step 1 mark)	5 marks	
		Postorder traversal	1 mark	
Q.4	i.	AVL tree	2 marks	4
		Leftist tree.	2 marks	
	ii.	Each insertion of key	(1 mark*6)	
	OR	iii.	Applications of Splay tree	
		Types of rotation in a splay tree	4 marks	
Q.5	i.	Each step of algorithm (1 mark)	4 marks	4
	ii.	Tree step by step (each step 1 mark)	6 marks	
	OR	iii.	External sorting	
		Internal sorting	4 marks	
Q.6	i.	Each step of algorithm (1 mark)	3 marks	3
	ii.	Hash table	1 mark	
		Different types of uniform hash functions	6 marks	
	OR	iii.	Bucket overflow	
		Types of approaches used for overflow resolution	2 marks	
			Two application of each searching and indexing	(2 marks*2)

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