Total number of printed pages: **UG/5th Semester/UCSE519**

2022

Data Structure & Algorithm

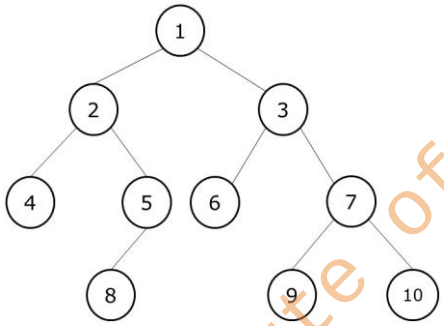
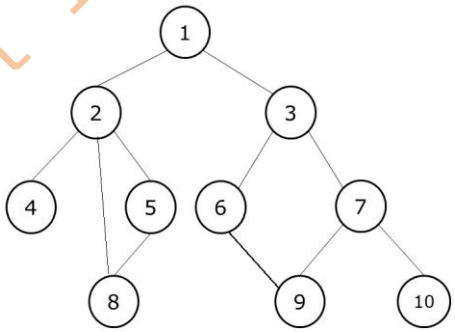
Full Marks: 100

Time: Three hours

The figures in the margin indicate full marks for the questions.

*Answer question **no 1** and any **four** from the rest.*

1.	a)	Which of the following is a non-linear data structure? (i) 2-D array (ii) Stack (iii) Binary search tree (iv) Linked list	10 x 2
	b)	In an array a[2] is equivalent to (i) *a + 2 (ii) *(a + 2) (iii) *(*a + 2) (iv) &(a + 2)	
	c)	What is the main disadvantage of array data structure?	
	d)	What should be the content of stack (assumed that initially it is empty) after the operations: pop(); push(1); push(2); pop(); (i) 1 (ii) 2 (iii) 1 2 (iv) Invalid operation	
	e)	Which of the following data structures finds its use in recursion? (i) Stack (ii) Queue (iii) Array (iv) Linked list	
	f)	A queue follows the principle (i) LIFO (ii) FIFO (iii) Priority (iv) Random	
	g)	What is the time complexity of the binary search algorithm? (i) O(n) (ii) O(1) (iii) O(logn) (iv) $O(n^2)$	
	h)	In a connected graph of ***n nodes*** and ***n edges***, we can conclude that (i) Must be one cycle (ii) May be a cycle (iii) At most one cycle (iv) None	
	i)	In a full binary tree of ***height d***, the number of node is (i) 2^d (ii) $2^d + 1$ (iii) $2^{d+1} - 1$ (iv) 2d	
	j)	The number of fields in each node to represent a binary tree is (i) 1 (ii) 2 (iii) 3 (iv) 4	

2.	a)	What is data structure? What are the primitive data structures?	5
	b)	Define Algorithm. What is the time complexity of an algorithm?	5
	c)	Write the algorithm of bubble sort. What is its time complexity?	10
3.	a)	Define the linked list. What is the time complexity to search a linked list?	4+2
	b)	Write the delete operation of a particular node of a linked list.	8
	c)	What is sparse matrix? Write an efficient way to represent a sparse matrix.	6
4.	a)	Define queue. What are the operations of a queue?	4+2
	b)	Explain the ***insert()*** and ***delete()*** operation in a queue.	6
	c)	Define recursion. Write a recursive function to calculate ***n!***.	8
5.	a)	What is meant by tree traversing? Describe any tree traversal technique.	2+6
	b)	Traverse the following tree using your described technique.  	6
	c)	Convert the infix (a+b)*(c+d)/f into postfix & prefix expression	6
6.	a)	Describe the Depth First Search (DFS) is a graph traversal algorithm	8
	b)	Apply the above algorithm on the following graph  	7
	c)	Calculate the number of edges in K_n (Complete graph with edge ***n***)	5