Exam.Code:0915
Sub. Code: 6391

2123

B.E. (Computer Science and Engineering)

Third Semester

CS-301: Data Structures

Time allowed: 3 Hours **Max. Marks: 50**

NOTE: Attempt five questions in all, including Question No. 1 (Section-A) which is compulsory and selecting two questions each from Section B-C.

x-x-x

Section-A

1.	a) void function(int n)
	{
	int count = 0;
	for (int i=n/2; i<=n; i++)
	for (int j=1; j<=n; j = 2 * j)
	for (int k=1; k<=n; k = k * 2)
	count++;
	}
	Write the time complexity for above code
	b) Suppose an unsorted linked list has a representation with head pointer. List the operations that can be implemented in O (1) time.
	c) The postfix expression for infix expression A+B*(C+D)/F+D*E is_____.
	d) Discuss linked list representation of Binary Trees.
	e) Discuss memory representations of a graph with suitable example.
		10

Section-B

2.	a) Give explicit definitions of Big Oh, Omega Theta notations for defining the asymptotic performances of non-negative functions. Also, find tight bounds for the following functions. Justify your answers. (i) f(n) = 2 +1 n (ii) f(n) = 6n3+ 5n2-I- 10 b) Write a program to count number of occurrences of a given key in a singly linked list and then delete all the occurrences. For example, if given linked list is 1->2->1- >2->1->3->1 and given key is 1, then output should be 4. After deletion of all the occurrences of 1, the linked list is 2->2->3.	5 5
3.	a) Define Queue and its possible operations. b) A single array A[1..MAXSIZE] is used to implement two stacks. The two stacks grow from opposite ends of the array. Variables top1 and top2 (topl< top 2) point to the location of the topmost element in each of the stacks. If the space is to be used efficiently. Write the condition for "stack full". Also implement push and pop operations for both stacks.	4 6
4.	a) Explain divide and conquer approach and discuss it with the Merge sort on a given array with 9 elements as 77,33,44,11,88.22,66,55,99. Find the time complexity of merge sort for the given numbers. b) Consider an array of elements **arr[5]= {5,4,3,2,1}** , How many steps will insertion sort and quick sort take to sort these numbers.	5 5

Section-C

5.	a) A binary search tree contains the numbers I, 2, 3, 4, 5, 6, 7, 8. When the tree is traversed in preorder and the values in each node printed out, the sequence of values obtained is 5, 3, I. 2, 4, 6, 8, 7. Draw the BST and write its post order traversal. b) Differentiate between following i) B-trees and B+ trees ii) BST and AVL	6 4
6.	a) You are given a min-heap of size 10, represented as an array: [10, 15, 20, 17, 25, 30, 35, 40, 50, 45] - Draw the min-heap tree corresponding to this array. - Suppose you want to increase the value of the element at the root (10) to 5. Describe the steps to restore the min-heap property after this modification. - Now, suppose you want to remove the minimum element from the heap and restore the min-heap property. Describe the steps to achieve this. b) Consider the following AVL tree: 20 / \ 10 30 /\ / \ 5 15 25 35 / / 2 23	5 5

P.T.O.

	Perform the following operations on the AVL tree: 1. Insert the value 40 into the tree. 2. Delete the value 10 from the tree. After each operation, show the resulting AVL tree and specify the rotations (if any) that were performed to maintain the AVL tree property. Please provide the final AVL tree after both operations, including any necessary rotations.	
Q7.	(a) Determine the shortest paths to all the vertices which can be reached from source vertex 'A' (Fig. 1) using Dijkstra's shortest path algorithm. Illustrate each intermediate step.	7

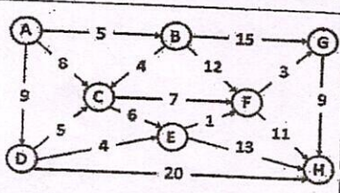

Fig. 1

A	→ B 5	→ C 8	→ D 9	
B	→ C 4	→ F 12	→ G 15	
C	→ E 6	→ F 7		
D	→ C 5	→ E 4	→ H 20	
E	→ F 1	→ H 13		
F	→ G 3	→ H 11		
G	→ H 9			

b) Consider a 13 element hash table for which f(key)=key mod 13 is used with integer keys. Assuming linear probing is used for collision resolution, at which location would the key 103 be inserted, if the keys 661, 182, 24 and 103 are inserted in that order? 3

x-x-x