CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY

Fourth Semester of B. Tech (CE) Examination
April-May 2019
CE245/CE201.02/CE201.01/CE201 Data Structure and Algorithms

Date: 29.04.2019, Monday	Time: 10.00 a.m. To 1.00 p.m.	Maximum Marks: 70

Instructions:
1. The question paper comprises two sections.
2. Section I and II must be attempted in separate answer sheets.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculator is allowed.

SECTION – I

Q - 1   Answer the questions below.

(i)   Given is an array after the first partition of quicksort: 3, 0, 2, 4, 10, 8, 7, 6, 9.   **[01]**

Which of the element could be the pivot?

(ii)   How many steps are required to solve Tower of Hanoi problem with N discs?   **[01]**

(iii)   How many comparisons are required to find element 45 using Binary Search?   **[02]**

27 34 36 37   38 40 42 45 60

(iv)   Given an array A[-3:4, 6:10], Find the address of A[0][7] if array elements are organized   **[03]**
in Row-Major order. Base Address is 2100. Each element takes 2 bytes for storage.

Q - 2 (a)   Answer the questions below.   **[10]**

(i)   Consider the following list of 10 numbers: 35, 65, 15, 45, 95, 75, 85, 55, 25,5. Perform
the Bubble Sort on the list and show the data after each pass. What is the Number of
Exchanges and comparisons?

(ii)   Convert the given arithmetic expression into postfix form using stack:

A+B*(C/D)-(E/F)+G

Q-2 (b)   What are the different types of Queues? Explain each with suitable example.   **[04]**

Q-2 (c)   Sort the following numbers using Quick Sort algorithm: 4,9,6,12,34,1,90,45,23. Show the   **[04]**
Steps.

OR

Q-2 (c)   Define stable sorting algorithm. Is selection sort stable? Justify your answer with   **[04]**
appropriate example

Q – 3   Answer the questions below.   **[10]**

(i)   What can be the condition to check for overflow and underflow in circular queue? Explain
with example.

(ii)   Consider the given singly linked list in which nodes contain INFO and LINK fields.Write steps to insert the node with INFO 28 such that it preserves the ordering of the terms in increasing order of their INFO fields.

OR

Q – 3   Answer the questions below.   **[10]**

(i)   The Given function `tofront()` takes a singly-linked list as input argument. Add the Conditions and Statements to move the last element to the front of the list and returns the modified list.

```
struct node
{
  int info;
  struct node *link;
};

struct node *tofront(struct node *head)
{
  struct node *trav, *pred;
  if (Add Conditions Here)
   {
    return head;
   }
  pred = NULL; trav = head;
  while(trav-> link! =NULL)
  {
    pred = trav;
    trav = trav->link;
  }
      Add Statements Here

  return head;
}
```

(ii)   Write an algorithm to insert a node at beginning in circular linked list.

SECTION – II

Q - 4   Answer the questions below.

(i)   What can be the maximum number of nodes in binary tree with height 4?   **[01]**

(ii)   What is the chromatic number of a complete graph with n vertices?   **[01]**

(iii)   State True or False: Inorder Traversal of a Binary search tree gives data in descending **[01]** order.

(iv)   In a complete Binary Tree, every internal node has exactly 2 children. What are the **[02]** number of leaves in such a tree with N internal nodes? Justify with any example.

(v)   What is the maximum height of any AVL-tree with 7 nodes? Assume that the height of a **[02]** tree with a single node is 0.

Q - 5 (a)   A hash table of length 9 uses hash function h(k)= k mod 9, and linear probing for collision **[03]** resolution. Insert the following values in given order into the hash table.
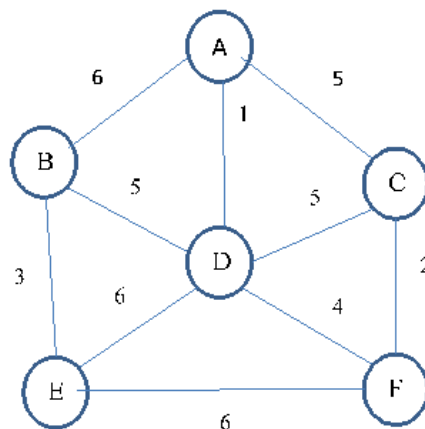
        9,12,15,33,80,53,50,95

Q - 5 (b)   Construct Binary search tree from the following numbers: **[05]**

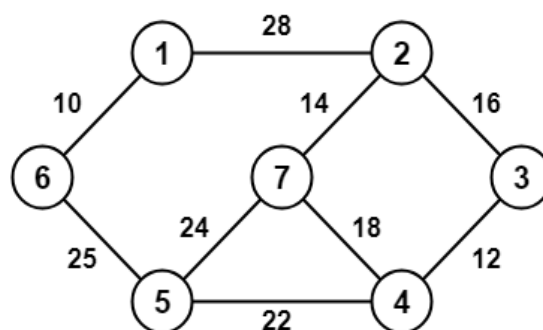23, 56, 45, 32, 89,12, 9, 36, 90, 22, 8, 10, 87

Delete 56 and 12. Show BST after each deletion.

Q - 5 (c)   Find the minimum spanning tree of a given Graph using Kruskal's algorithm. **[05]**

OR

Q - 5 (c)   Find the total weight of the minimum spanning tree using Prim's algorithm. **[05]** Start vertex is 1.

Q - 6   **Attempt the following: (Any Three)**   **[15]**

(i)   Perform ascending order sorting for following data using Max Heap Tree.
2,7,26,25,19,17,1,90

(ii)   The Inorder and Postorder traversals of a binary tree are given below:

Inorder: G D H B E I A F J C

Postorder: G H D I E B J F C A

Construct a binary tree and write down the preorder traversal of the binary tree.

(iii)   Given the adjacency matrix of a directed graph. Find the DFS sequence.

(Start vertex is 1)

	0	1	2	3	4	5	6	7
0								
1			1	1		1		
2	1						1	
3								
4								
5		1					1	1
6								1
7							1	

(iv)   Construct an AVL Tree from given instructions. Show balance factors with each step.

1. Insert 56   6. Insert 90

2. Insert 45   7. Delete 45

3. Insert 12   8. Insert 95

4. Insert 34   9. Insert 9

5. Insert 30

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