CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY

Third Semester of B. Tech. (CE/IT) Examination

November 2013

CE201 Data Structure and Algorithms

Date: 21.11.2013, Thursday **Time: 01:30 p.m. To 04:30 p.m.** **Maximum Marks: 70**

Instructions:

1. The question paper comprises of two sections.
2. Section I and II must be attempted in separate answer sheets.
3. Make suitable assumptions and draw neat figures wherever required.

SECTION – I

Q - 1 (a) What is Data Structure? Why do we need to study it? Classify hierarchy of data structures. **[04]**

(b) State whether the following statements are True or False. **[03]**

1. Deque is a general representation of both stack and queue.
2. Selection sort uses divide and conquer approach.
3. For linear search, data must be in ascending order.
4. Replacing null pointer in the last node of a list with the address of its first node creates doubly linked list.
5. List of fields known as a record.
6. The time complexity of binary search is O(*nlog n*) in worst case.

Q - 2 (a) For given array Z[-4:-1, 10:13, -1:1] find the total number of elements. Assume that the base address is 5001 and each element required 2 bytes. Find address of Z[-2,12,0] element if it is stored in (a) row major order (b) column major. **[05]**

(b) Covert the given expression into its equivalent postfix expression using stack. Show the contents of stack for each step. **[05]**

$$(a+b)*(c\,\hat{}\,(d-e)+f)-g$$

(c) Attempt any **TWO**. **[04]**

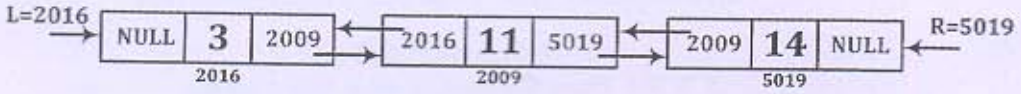
1) Write down the disadvantage of simple queue. Which data structure is used to counter the disadvantage?

2) If Tower of Hanoi has 11 disks in source and to move a single disk from one tower to another takes 2 Seconds. How many minutes it will take to move all disks from source to destination using intermediate tower?

3) Evaluate the given expression with the help of stack. Show each step.

2 3 4 * + 1 5 / 2 * -

Q - 3 (a) For the given doubly linked list perform the following operations such that it maintain ascending order of data. Draw linked list after each operation. [05]



1. Insert 10 having node address 4092.
2. Insert 15 having node address 3014.
3. Delete 14.

(b) Trace the following numbers using radix sort. [05]

9, 1106, 9099, 6, 7101, 990, 15, 99, 10, 909.

(c) Explain insertion operation in the Circular queue with all the conditions. [04]

OR

(b) Trace the following numbers using insertion sort. [05]

9, 1106, 6, 7101, 990, 15, 99, 10.

(c) Explain priority queue in detail. [04]

SECTION – II

Q - 4 (a) Create Binary Search Tree for the following numbers [04]

90, 31, 75, 42, 67, 55, 62, 58, 65, 64.

After creation of BST, delete 62 and draw final tree.

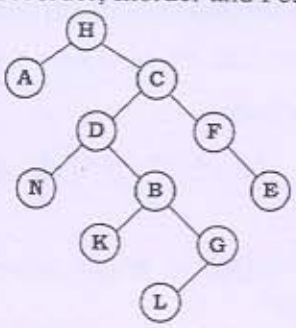
(b) Define the following terms. (i) path (ii) spanning tree (iii) directed graph. [03]

Q - 5 (a) Arrange the following data in the array using hash function H(x). Calculate hash key and use linear probing to resolve collisions. Array size is 8 (index starts from 0) [05]

Data: 214, 4563, 789, 2477, 1579, 4566, 1000, 6745

Hash function H(x) = x modulo 5 + 1

(b) Traverse the following tree in Preorder, Inorder and Postorder. [03]



(c) Create AVL Tree for the given numbers. Show the tree after each operation. [06]

7, 1, 6, 2, 5, 4, 3.

Apply Delete (1) and then Insert (9).

OR

(b) Explain 2-3 tree with example. [03]

(c) What is Max Heap Tree? Perform descending order sorting for following data using Max Heap Tree: 103, 11, 101, 110, 111, 119, 19 and 91. [06]

Q - 6 (a) Attempt any **TWO**. [04]

1. Prove that Total No. of nodes in a complete binary tree is $2^{d+1} - 1$, where d is depth of a tree.
2. If a list contains 400 elements then in a worst case how many iterations binary search will take to conclude?
3. If strictly (fully) binary tree contains 19 nodes then find no. of leaves in a tree with diagram.

(b) Traverse the graph shown in Figure (A) using Depth First Search strategy. Starting node is 1. Prepare adjacency matrix for the graph before traversal. Also show the step by step contents of the data structure used in traversal. [05]

(c) Explain sequential and indexed file organizations. [05]

OR

(b) Traverse the graph shown in Figure (A) using Breadth First Search strategy. Starting node is 1. Prepare adjacency matrix for the graph before traversal. Also show the step by step contents of the data structure used in traversal. [05]

(c) Define graph. Explain storage representation techniques of a graph. [05]

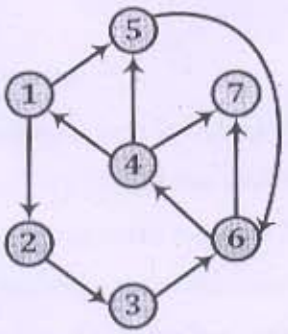


Figure (A)