CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY

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

November 2012

CE201 Data Structure and Algorithms

Date: 27.11.2012, Tuesday **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) Why do we need data structure? Explain types of data structure with example. [04]

(b) **Attempt Following.**

1. Define time complexity. [03]
2. What is deque?
3. How does circular queue differ from simple queue?

Q - 2 (a) Write an algorithm or C function to pop all the elements from stack and insert into queue using array. [04]

(b) Explain tower of hanoi problem for N=3 discs with recursive tracing. [05]

(c) Convert following notation into postfix notation using stack. [05]

A + (((B – C) * (D – E) + F) / G) ↑ (H – J)

OR

(c) Evaluate following notation using stack. (Here, A=4, B=8, C=2) [05]

(1) A B C + * C B A – + *

(2) + / * A B – C A * B C

(d) **Attempt any Two.** [04]

1. What are the differences between array and linked list?
2. Enumerate the methods to implement priority queue.
3. Compare bubble sort and selection sort.

Q - 3 (a) Define circular singly linked list. Write an algorithm or C function to count number of nodes in circular singly linked list. [05]

(b) For a given 2-D array A[13:20, 20:30] with base address of 400 and size of element is 4 bytes. Find address of element A[15, 25] for array stored in row-major order and column major order. [05]

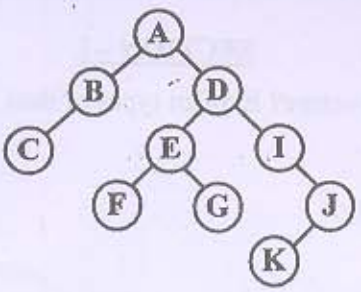
OR

Q - 3 (a) Define singly linked list. Write an algorithm or C function to exchange first and last node of the singly linked list. [05]

(b) For a given 3-D array A[-2:2, 1:4, 6:9] with base address 2000 and size of element is 4 bytes. Find out total number of elements and address of A[1, 3, 8] element in column major order. [05]

SECTION – II

Q - 4 (a) For the given binary tree, perform inorder, preorder and postorder traversal. [03]



(b) Define following terms. [04]

(1) graph (2) 2-3 tree (3) spanning tree (4) sparse matrix

Q - 5 (a) **Attempt (Any Three)** [09]

1. Generate index for each data using hash function and arrange them into an array A[9]. Use linear probing to resolve collision. Array index starts from 0.

   Hash function H(x) = (ASCII value of x) mod 9. (ASCII of A is 65)

   DATA: A, J, G, B, P, Z

2. Using following adjacency matrix, draw the weighted graph.

$$\begin{vmatrix} 0 & 4 & 0 & 2 & 0 \\ 0 & 0 & 0 & 7 & 0 \\ 0 & 5 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 3 \\ 0 & 0 & 1 & 0 & 0 \end{vmatrix}$$

3. Explain sequential file organization.

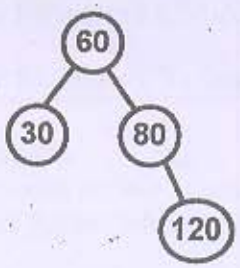
4. Which are the searching techniques? Compare all techniques.

(b) Construct binary search tree for following data. Also perform delete 23 operation on binary search tree. [05]

45, 23, 29, 85, 92, 7, 11, 35, 49, 51

Q - 6 (a) (1) Is the given tree an AVL tree? If not, convert into an AVL tree. [08]

(2) Insert the nodes 70, 125, 65, 71 and 61 in the AVL tree continuously. Insertion should be one by one and show the updated AVL tree after each step. Ensures that each resultant tree satisfies AVL properties.



(b) Trace the following data using quick sort. Select first element as a pivot. [04]

5, 9, 2, 15, 30, 92, 1, 24

(c) Using binary search technique, show the values of middle, low and high for searching element 8 from given array having index from [0] to [7]. [02]

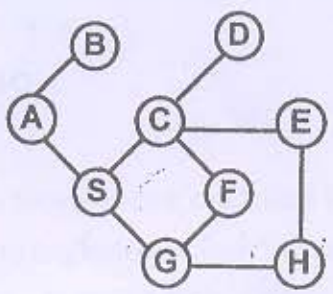
8, 11, 20, 26, 28, 32, 34, 40

OR

Q - 6 (a) Create max heap and perform heap sort for following data to arrange them in ascending order. [08]

-12, 16, 32, 24, 57, -11, 69, 99

(b) Give the sequence of traversal for the given graph using breadth first search and depth first search algorithms. For both the searching, show the appropriate data structure with vertices for complete traversal individually. Starting vertex is S. [06]



****