Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA Integrated - SEMESTER–III • EXAMINATION – WINTER • 2014

Subject Code: 4430602 Date: 01-12-2014

Subject Name: Data Structures

Time: 02:30 pm - 05:00 pm Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Do as directed. **07**

i) Differentiate complete binary tree and full binary tree.
ii) Define Big-Oh notation.
iii) Definespanning tree.
vi) Enlist collosion-Resolution techniques.
v) State whether the following statements are TRUE or FALSE.
a) Stacks are used in recursion.
b) A connected graph is a graph that can be partitioned without removing any edge.
c) A deque is a double-ended queue in which items can be inserted in the middle and removed from either end.

(b) (i) Define data structure.Explain Linear and Non-Linear data structure. **04**

(ii) What is KWIC Indexing? Explain in brief. **03**

Q.2 **(a)** Write an algorithm to convert infix expression into postfix form. Using expression trace your algorithm showing the contents of data structure used. *(A+B)*C*D/F*. **07**

(b) (i) Describe Tower of Hanoi Problem and give its three rules. Also give Recursive algorithm for Tower of Hanoi Problem. **04**

(ii) Is the following matrix a Sparse matrix? **03**

$$\begin{bmatrix} 0 & 0 & 0 & 4 & 0 & 0 & 1 & 0 \\ 9 & 0 & 0 & 0 & 0 & 0 & 0 & 3 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 6 & 7 & 8 & 0 & 0 & 0 & 0 \\ 20 & 0 & 0 & 0 & 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 5 & 7 & 0 & 0 & 0 & 13 & 0 & 0 \end{bmatrix}$$

Use Multilist to represent the above matrix.

OR

(b) Write an algorithm for inserting and deleting an element into circular queue. **07**

Q.3 **(a)** (i) Draw an expression tree for the expression a+(b* C-d)+ e/f . **04**

(ii) Define threaded binary tree. Describe its node structure and advantages over unthreaded binary tree. **03**

(b) (i) A Binary Tree has 5 nodes.The inorder and post order traversal of following sequence of nodes are given below. **04**
Inorder : D B A C E
Postorder : D B E C A
Draw the binary tree. And show its pre order traversal sequence.

(ii) Construct a 2-3 tree from the following data : **03**
21,78,14,74,85

OR

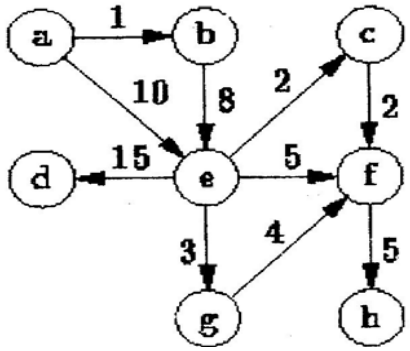
Q.3 **(a)** Develop a height-balanced tree for the keys given below. Show also all steps. **07**
10, 5, 16, 36, 21, 12, 11, 2.

(b) (i) Construct a binary search tree for following elements: **04**
52, 27, 62, 45, 88, 33, 48
Reconstruct this tree after Node 45 is deleted.

(ii) Draw a trie for all the three-letter sequences built from a, b, c where the first letter is b. **03**

Q.4 **(a)** Write and Explain BFS algorithm with suitable example. **07**

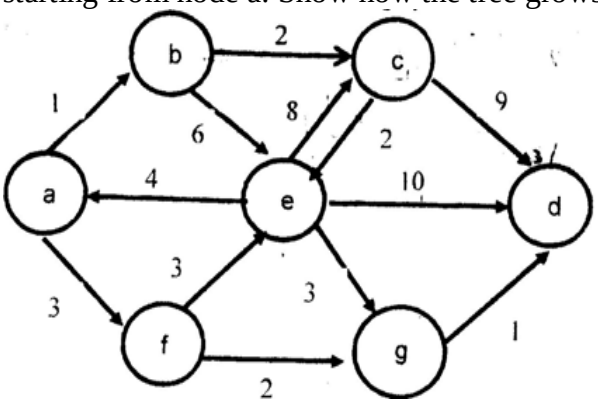
(b) Explain Dijkstra's algorithm using following figure(Take 'a' as source vertex). **07**



OR

Q.4 **(a)** Draw an arbitrary weighted directed graph (having atleast 5 nodes). What is it's adjacency matrix? Represent graph using a node directory structure. Traverse the graph using depth-first approach. **07**

(b) Demonstrate Prim's algorithm for computing a minimum spanning tree, starting from node a. Show how the tree grows at each step. **07**



Q.5 **(a)** Sort the following data using heap sort. **07**
20,65,43,53,78,10,40,39,29

(b) Write an algorithm for radix sort & sort the following data using radix sort. **07**
50, 31, 66, 309, 408, 201,49,53,576,11

OR

Q.5 **(a)** Sort the following data using quick sort. **07**
10, 23, 64, 21, 74, 95, 2, 59, 44, 87, 55

(b) What is hashing function? Explain the following hashing methods with examples. **07**

A) The Folding Method
B) The Division Method
C) The Midsquare Method

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