Seat No.: ________ Enrolment No.______________

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA- IInd SEMESTER–EXAMINATION –JUNE - 2012

Subject code: 2620001 **Date: 08/06/2012**

Subject Name: Data Structures (DS)

Time: 10:30 am – 01:00 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) State weather followings are true/false. Justify it. **07**

(i) Binary search takes ***O(n)*** time to execute.

(ii) Maximum number of nodes in binary tree of depth ***k*** is $2^{(k+1)} - 1$.

(iii) Hashing taken place when two or more keys maps to the same memory location.

(iv) Stack is used in a non-recursive implementation of a recursive algorithm.

(v) At most one cycle could be present in tree.

(vi) A preorder traversal technique lists the nodes of binary search tree in ascending order.

(vii) Exponential algorithms run faster than polynomial time algorithms.

(b) Answer the following questions. **07**

(i) List the characteristics of spanning tree.

(ii) Define a Graph.

(iii) Give the equivalent postfix expression for the infix expression ***a / b * c – d + f / e***

(iv) Which data structure is used for Breadth First Traversal of graph?

(v) Differentiate Complete Binary Tree and Full Binary Tree.

(vi) How does a linked stack differ from a linear stack?

(vii) Obtain the address of A[i][j][k] for an 3-dimensional array A[u_1:u_2:u_3] where α is the base address and each element allocates 1 word in memory.

Q.2 **(a)** Discuss the various applications of stack. **07**

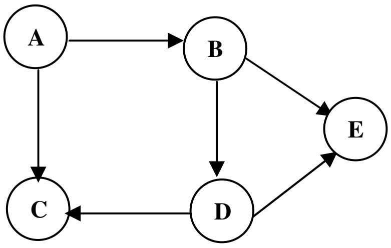
(b) **(i)** Explain how stacks are used in non-recursive implementation of recursive program by giving suitable example. **03**

(ii) Construct an expression tree for given infix expression: ***(A + B) * C – D***. State the result of preorder traversal of the tree. **04**

OR

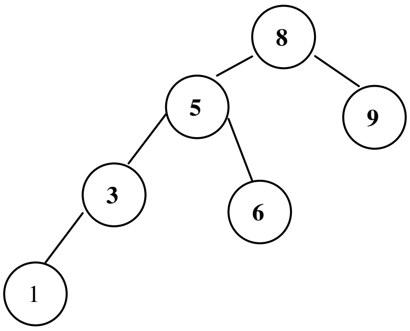
(b) **(i)** Write an algorithm to create sorted order polynomial in two variables. **03**

(ii) Write a Warshall's algorithm to find path matrix of a graph. Find the path matrix for following graph. **04**



Q.3 **(a)** Consider a hash table of size = 10. Using quadratic probing, insert the keys 72, 27, 36, 24, 63, 81 and 101 into the table. Take c_1=1 and c_2=3. **07**

(b) Write a non-recursive algorithm for preorder traversal of binary tree. Give the preorder traversal of following binary tree also show the content of stack. **07**



OR

Q.3 **(a)** Show all passes of merge sort algorithm for following data:39, 9, 89, 45, 90, 26, 71, 18. Also analyze merge sort algorithm in best case, worst case and average case. **07**

(b) What is the significance of Threaded Binary Tree? Give the node structure of it. Also explain advantages of threaded binary tree. Construct threaded binary tree for given data: 67, 34, 12, 11, 56, 89, 54, 33, 98, 17 **07**

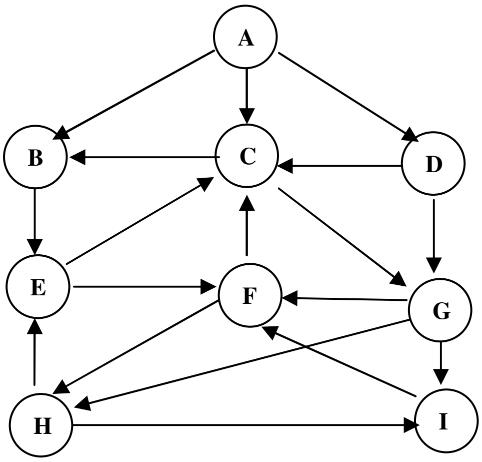
Q.4 **(a)** Define the characteristics of B-tree. Construct B-tree of order 5 by inserting the following elements: 3, 14, 7, 1, 8, 5, 11, 17, 13, 6, 23, 12, 20, 26, 4, 16, 18, 24, 25, and 19 **07**

(b) Show all passes of Heap Sort for the list: { 15,35,55,75,5,95,85,65,45,25} . **07**

OR

Q.4 **(a)** Construct an AVL tree by inserting the following elements in the given order. 63, 9, 19, 27, 18, 108, 99, 81 by applying appropriate rotation. **07**

(b) Write an algorithm for Depth First Traversal. Give the DFT traversal from vertex H for following graph and show the content of stack. **07**



Q.5 **(a)** **(i)** Explain the Trie in detail by giving suitable example. **04**

(ii) Write an algorithm to convert postfix expression to assembly code. **03**

(b) Define a recurrence relation for Tower of Hanoi problem. Also find the solution of it. **07**

OR

Q.5 **(a)** **(i)** Write an algorithm to insert element at front in queue. **04**

(ii) Define O (big oh) , Ω (omega) and θ (theta) notations of time complexity. **03**

(b) Explain the Dijkstra's algorithm by giving suitable example. **07**

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