Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA Integrated - SEMESTER– III • EXAMINATION – SUMMER 2016

Subject Code:4430602 **Date: 11-05-2016**

Subject Name: Data Structures (DS)

Time:02:30 pm To 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)** Answer the following:

(i) Differentiate between DFS and BFS algorithm. **04**

(ii) Write a recursive algorithm to solve Tower of Hanoi problem. **03**

(b) Answer the following:

(i) What is a threaded binary tree? Explain its advantages. **04**

(ii) What is data structure? State different categories of data structure. **03**

Q.2 **(a)** What do you mean by analysis of an algorithm? Explain different ways of measuring time and space complexity during algorithm analysis. **07**

(b) What is a linked list? Explain various types of linked list in detail. **07**

OR

(b) Convert the infix expression into a postfix expressing by specifying all the steps of conversion: x + y * (m + n * q) + z **07**

Q.3 **(a)** Explain different storage structure of two dimensional arrays using appropriate example. **07**

(b) Write an algorithm for preorder traversal of a binary tree. **07**

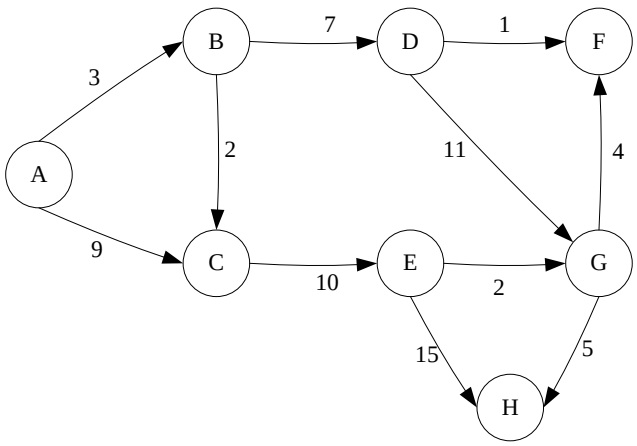
OR

Q.3 **(a)** Define complete binary tree. Explain the issues related to sequential representation of an incomplete binary tree using an appropriate example. **07**

(b) What is an expression tree? Draw an expression tree for the following infix expression: A + B * (C – D) * E. Mention the output of preorder and post-order traversal of the expression tree. **07**

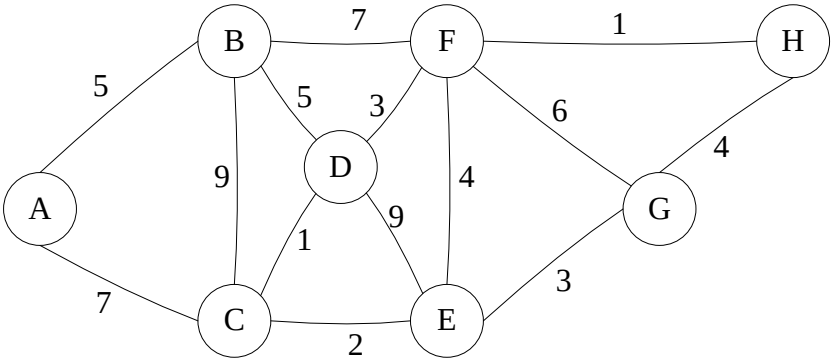
Q.4 **(a)** Define adjacency matrix and path matrix of a digraph. Explain how a path matrix can be calculated from the adjacency matrix of a simple digraph. **07**

(b) Explain the steps of implementing Dijkstra's algorithm on the following graph (consider 'A' as the source vertex): **07**



OR

Q.4 **(a)** Show various steps for computing a minimum spanning tree using Prim's algorithm by showing the tree at each step for the following graph starting at vertex 'A': **07**



(b) Write an algorithm for binary search and compare its performance with linear search for various possible cases. **07**

Q.5 **(a)** Write an algorithm for quick sort and sort the following values using quick sort: 18, 5, 9, 2, 15, 11 **07**

(b) Write an algorithm for bubble sort and compare its performance with selection sort for various possible cases. **07**

OR

Q.5 **(a)** What is hashing? Explain various techniques for collision resolution with appropriate example. **07**

(b) What is a height balanced tree? Create a height balanced tree by showing each step of its formation (including balancing whenever required) for the following data: 9, 2, 5, 4, 15, 1, 3 **07**

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