

GUJARAT TECHNOLOGICAL UNIVERSITY**MCA. Sem-II Examination June 2011****Subject code: 620001****Subject Name: Data Structures (DS)****Date: 20-06-2011****Time: 2:30pm TO 5:00pm****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) Calculate the complexity of the following code by using Big 'O' notation: **07**

```

1. scanf ("%d", &n);
2. for (i=1, m=n+66; i<=m; i++)
3. printf ("%d\n", i);
4. for (j=n/21, m=n/5; j<=m; j++)
5. printf ("%d\n", j);

```

Also compute the overall complexity of the given code.

(b) Write an algorithm to convert a given INFIX expression to POSTFIX expression with brackets. $(A * B) + (C * D / E) * F - G$. **07****Q.2 (a)** Write an algorithm for the multiplication of two polynomials in one variable **07****(b)** Construct an AVL tree from the following input list : 6 , 4 , 2 , 12, 10, 3. **07**
Applying appropriate rotation.**OR****(b)** Explain, with an example, the usefulness of height-balancing while constructing a Binary Search Tree. **07****Q.3 (a)** For a given problem with inputs of size n, Algorithms A and B are executed. In terms of running time, one of the algorithms is $O(n)$ and another is $O(n \log n)$. Some measured running times of these algorithms are given below : **07**

	512	1024	2048
A	70	134	262
B	42	86	182

Identify which algorithm is which and also find the running times. Which algorithm would you select for different values of n?

(b) Define multiple stacks. Write algorithm for its implementation. **07****OR****Q.3 (a)** Show that the lower ordered terms and the constant terms do not matter in computing the complexity of the algorithm in Big 'O' notation. **07****(b)** Write an algorithm for multiplication of two sparse matrices **07****Q.4 (a)** Write the algorithm for insertion and deletion of node in linked representation of Queue and explain the benefits of linked representation against array representation of Queue. Specify two applications of queue **07**

- (b) (i) Define the terms "Internal path length" and "External path length" for a binary tree. 07
(ii) Prove that for any binary tree of n nodes the External path length: Internal path length + $2n$.

OR

- Q.4** (a) What are the characteristics of a B-tree? Construct a B-tree of order 3 from the following data : 10, 20, 30, 40, 50, 60, 70, 80, 90, 100. 07
Showing the structure after each insertion.
- (b) Explain Dijkstra's algorithm with the help of an example. Which shortest path algorithm is the most efficient? And why? 07

- Q.5** (a) Construct a heap for the list given below. Clearly indicate the changes in each step. 07
29, 14, 9, 64, 76, 34, 88, 14, 96, 26.
- (b) What is Collision Resolution? Compare Linear probing and Quadratic probing with giving suitable examples. 07

OR

- Q.5** (a) Demonstrate Quick Sort on the following set of numbers. 07
91, 16, 53, 31, 98, 12, 79, 82, 63, 77.
Take the last number as pivot. Show the order the number changes during each step of Quick Sort.
- (b) Describe briefly Circular Linked List and a typical Node Structure used for it. Write the pseudo code of an Algorithm to Delete a Node from Circular Linked List whose address is specified. 07
