

Seat No.: \_\_\_\_\_

Enrolment No. \_\_\_\_\_

# GUJARAT TECHNOLOGICAL UNIVERSITY

MCA SEMESTER II –EXAMINATION –SUMMER 2016

**Subject code:620001**

**Date:24/05/2016**

**Subject Name: Data Structures**

**Time:10.30 TO 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)** What do you mean by running time of program? Calculate the running time of following program fragment. **07**

```
int add ( int N)
{
    int i, Sum;

    Sum=0;
    for(i=0; i<=N; i++)
        Sum+=i * i * i;
    return Sum;
}
```

- (b)** Given input { 89,18,49,58,69} and a hash function  $h(X) = X(\text{mod } 10)$ , show the resulting: **07**

- a. Open addressing hash table using linear probing.
- b. Open addressing hash table using quadratic probing
- c. Open addressing hash table with second hash function  $h_2(x) = 7 - (X \text{ mod } 7)$ .

Table size is 0-9

- Q.2 (a)** Write an algorithm to insert a node into a singly linked list. Where the list is an ordered list. The node to be inserted may be in the beginning of the list or may be at the end of the list. **07**

- (b)** Differentiate between Stack and Queue. Convert the following Infix expression to the corresponding Reverse Polish expression: **07**  
 $3 + 4 * 2 / (9 - 5) ^ 4$   
Give the trace of the steps including Stack Contents.

**OR**

- (b)** Write an algorithm for the multiplication of two polynomials in one Variable **07**

- Q.3 (a)** Define Binary Search Tree. Insert 9, 4, 50, 100, 80, 40, 42, 30, 69, 110, 45, 35, 75 and 85 in an initial empty BST. Draw the resulting tree. Delete the following from this tree. For each deletion, give explanation and redraw the tree. **07**

- a. Delete 45
- b. Delete 30
- c. Delete 50
- d. Delete 9

- (b)** Explain, with an example, the usefulness of height-balancing while constructing a Binary Search Tree.(HINT:AVL) **07**

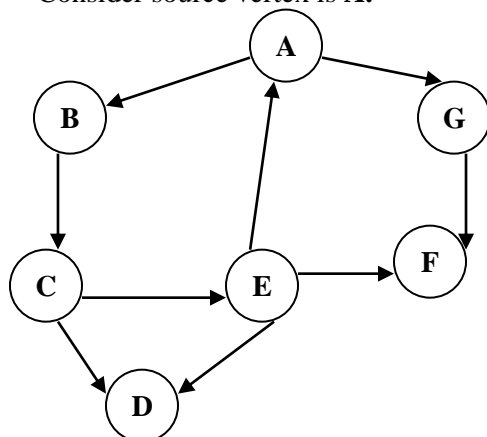
**OR**

- Q.3 (a)** Write a short note on expression tree. **07**

- (b)** What are the characteristics of a B-tree? Construct a B-tree of order 5 from the following data : **07**  
C, N, G, A, H, E, K, Q, M, F, W, L, T, Z, D, P, R, X, S

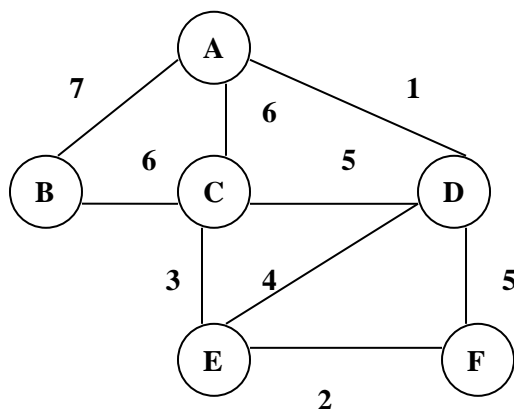
- Q.4 (a)** Define Circular queue. Consider a circular queue characters, implemented as an array of 6 memory cells and front=2, rear=3, Array\_Queue: ---, H, L, ---, ---, --- where --- denotes an empty space. Describe the status of the queue after each of the following operations: **07**
- Element 'P' is added.
  - Element 'S' is added.
  - Two elements are deleted.
  - Three elements C, F, and D are added.
  - One letter is deleted.
- (b)** Write an algorithm for the depth first traversal of a graph. Using Following Example. **07**

Consider source vertex is A.



**OR**

- Q.4 (a)** Write an algorithm for inserting an element into output - restricted queue. **07**
- (b)** Define minimum spanning tree. Find the minimum spanning tree of the following graphs by krushkal's algorithm. **07**



- Q.5 (a)** What is sorting? Explain selection sort algorithm and trace it with sample data. **07**
- (b)** Write short note on 2-3 tree. **07**

**OR**

- Q.5 (a)** Write an algorithm for Binary Search. **07**
- (b)** Define binary heap tree and show the result of inserting 15, 63, 1, 18, 6, 4, 8, 17, 3, 9, 12, 7, 24, 11 and 13, one at a time into an initially empty minimum binary heap. **07**

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