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# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

M.Tech I Semester End Examinations (Supplementary) - May, 2019

Regulation: IARE-R16

## DATA STRUCTURES AND PROBLEM SOLVING

**Time: 3 Hours**

**(CSE)**

**Max Marks: 70**

**Answer ONE Question from each Unit**

**All Questions Carry Equal Marks**

**All parts of the question must be answered in one place only**

### UNIT – I

1. (a) Explain how insertions and deletions are done in a circular linked list. [7M]
  - (b) Explain briefly stack data structure along with algorithms for push and pop operation. [7M]
  2. (a) Describe the Big O, Omega and Theta notations with an example. [7M]
  - (b) What is the space complexity of the following code? Justify your answer [7M]
- ```

int sum(int A[], int n)
{
    int sum = 0, i;
    for(i = 0; i < n; i++)
        sum = sum + A[i];
    return sum; }

```

### UNIT – II

3. (a) Explain with an example how hash table collisions are resolved using linear probing. [7M]
- (b) Demonstrate the insertion of the keys 5, 28, 19, 15, 20, 33, 12, 17, and 10 into a hash table with collisions resolved by chaining. Let the table have 9 slots, and let the hash function be  $h(k) = k \bmod 9$ . [7M]
4. (a) What is rehashing? When is rehashing done and explain with example. [7M]
- (b) Given the values 2341, 4234, 2839, 430, 22, 397, 3920, a hash table of size 7, and hash function  $h(x) = x \bmod 7$ , show the resulting tables after inserting the values in the given order with each of these collision strategies: separate chaining, linear probing, quadratic probing and double hashing. [7M]

### UNIT – III

5. (a) How is non-recursive traversal of a binary tree done? Explain with an example [7M]
- (b) With an example, trace the working of the Dijkstra's algorithm for single source shortest path problem. [7M]
6. (a) What are threaded binary trees? Give an example and explain. [7M]
- (b) Write the algorithm for finding the minimum cost spanning tree proposed by Kruskal. [7M]

#### UNIT – IV

7. (a) Write an algorithm for insertion of an element into a binary search tree. [7M]  
(b) Create a binary search tree by repeated insertion of the following elements : 50, 70, 20, 10, 30, 67, 89, 12, 14. Now, delete element 20 and draw the resultant tree. [7M]
8. (a) How do you find the smallest and largest numbers in a binary search tree? [7M]  
(b) Write two methods in Java to find the successor and predecessor of a given node. Assume that a class `TreeNode` that represents nodes in the BST already exists. [7M]

#### UNIT – V

9. (a) Illustrate importance of Huffman coding for compression with an example. [7M]  
(b) Show the red-black trees that result after successively inserting the keys 41, 38, 31, 12, 19, and 8 into an initially empty red-black tree. [7M]
10. (a) What are the B trees and write any three applications of B trees? [7M]  
(b) What is B-Tree? List any four properties of B-Tree. What is KMP Algorithm? Outline the KNUTH-MORRIS-PRATT (KMP) Algorithm. [7M]

