Hall Ticket No | | | | | | | | | | | Question Paper Code: BCS002

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

M.Tech I Semester End Examinations (Regular) - January/February, 2018

Regulation: IARE–R16

DATA STRUCTURES AND PROBLEM SOLVING

(Computer Science and Engineering)

Time: 3 Hours **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) Consider the code in Table 1 snippets. Derive the time complexity **[7M]**

Table 1

int count = 0; N = 1000	int count = 0; N = 1000
for (int i = 0; i < N; i++)	for (int i = N; i > 0; i - -)
for (int j = 0; j < i; j++)	for (int j = 0; j < i; j++)
count++;	count++;

(b) Explain briefly stack data structure along with algorithms for push and pop operation. **[7M]**

2. (a) Explain briefly array based internal representation of heap with a suitable example. **[7M]**

(b) What is the space complexity of the following code? Justify your answer int sum(int A[], int n) { int sum = 0, i; for(i = 0; i < n; i++) sum = sum + A[i]; return sum; } **[7M]**

UNIT – II

3. (a) Write algorithms for dictionary search and insertion using skip list. **[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 mod 9. **[7M]**

4. (a) Describe linear probing and quadratic probing with suitable 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 mod 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) Explain Depth First Search (DFS) Method. **[7M]**

   (b) Assume that you have been given the following binary tree shown in Figure 1. Write Java function to perform InOrder traversal of this tree using iterative and recursive approach. **[7M]**

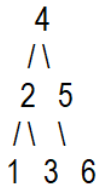

Figure 1

6. (a) Discuss Dijkstra's algorithm w.r.t data structure with a suitable example. **[7M]**

   (b) Use Kruskal's algorithm to find a minimum spanning tree of the given graph in Figure 2. Draw the resulting spanning tree and list the edges in the order they are picked by Kruskal's algorithm.

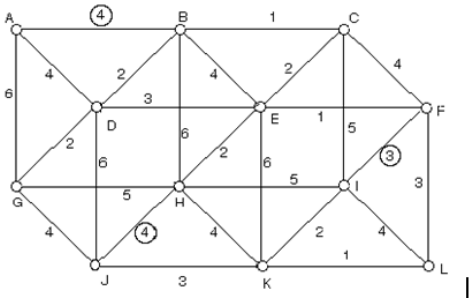

Figure 2

[7M]

UNIT – IV

7. (a) Outline the steps for searching an element in AVL tree. **[7M]**

   (b) Write two methods in Java to find the successor and predecessor of a given node. Assume that a class Tree Node that represents nodes in the BST already exists. **[7M]**

8. (a) Show result of inserting 2, 1, 4, 5, 9, 3, 6, 7 into an empty AVL tree. **[7M]**

   (b) Design a class to find the K^{th} largest element in a Binary Search Tree. **[7M]**

UNIT – V

9. (a) What is B-Tree? List any four properties of B-Tree. **[7M]**

   (b) What is KNUTH-MORRIS-PRATT Algorithm? Outline the (KMP) Algorithm **[7M]**

10. (a) 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]**

    (b) How text compression can be done using Huffman coding? Describe clearly. **[7M]**

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