Tribhuvan University
Institute of Science and Technology
2065
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Bachelor Level/ First Year/ Second Semester/ Science — Full Marks: 60
Computer Science and Information Technology (CSc. 154) — Pass Marks: 24
(Data Structure and Algorithm) — Time: 3 hours.

Candidates are required to give their answers in their own words as for as practicable.
The figures in the margin indicate full marks.

Section A

Attempt any TWO questions: **(10x2=20)**

1. What do you mean by binary tree? Explain the binary search tree with example.
2. What do you mean by recursion? Explain the implementation of factorial and Fibonacci sequences with example.
3. Explain the implementation of stack and queue with example.

Section B

Attempt any EIGHT questions: **(8x5=40)**

4. What are the difference between two dimention array and multidimension array?
5. What are the major characteristics of algorithms?
6. How can you convert from infix to post fix notation?
7. How can you use Queue as ADT?
8. What is Post-order traversal?
9. What is sorting? Describe the Insertion.
10. Explain the binary searching.
11. Differentiate between Pre-order and In order traversal.
12. Explain the tower of Hanoi algorithm.
13. Explain the Kruskal's algorithm.

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Section A

Attempt any TWO questions. **(10x2=20)**

1. Write a menu program to demonstrate the simulation of stack operations in array implementation.

2. State relative merits and demerits of contiguous list and Linked list. Explain the steps involved in inserting and deleting a mode in singly linked list.

3. A binary tree T has 12 nodes. The in-order and pre-order traversals of T yield the following sequence of nodes:

   In-order : VPNAQRSOKBTM

   Pre-order : SPVQNARTOKBM

   Construct the Binary tree T showing each step. Explain, how you can arrive at solution in brief?

Section B

Attempt any EIGHT questions. **(8x5=40)**

4. Consider the function:

```
Void transfer (int n, char from, char to, char temp)
    { if (n > 0)
        { transfer ( n – 1, from, temp, to_;
            Print if ( “In Move Disk  % d from % C to % C” N, from, to);
            Transfer ( n – 1, temp, to, from);
        }
```

   Trace the output with the function Cell!

```
Transfer ( 3, ‘R’, ‘L’, ‘C’);
```

5. “To write an efficient program, we should know about data structures.” Explain the above statement.

6. Write C function to display all the items in a circular queue in array implementation. Write assumptions, you need.

7. Explain Divide and Conquer algorithm taking reference to Merge Sort.

8. Trace Binary Search algorithm for the data:
   21, 36, 56, 79, 101, 123, 142, 203
   And Search for the values 123 and 153.

9. Differentiate between tree and graph. What are spanning forest and spanning tree. Explain MST (Minimum cost Spanning Tree) problem.

10. A file contains 100 symbols in which following character with their probability of occurrence. Build a Huff man tree according to Greedy Strategy.

a	→	48
b	→	11
c	→	9
d	→	14
e	→	7
f	→	11

11. Explain the use of Big O notation in analyzing algorithms. Compare sorting time efficiencies of Quick-Sort and Merge-Sort.

12. Explain CLL, DLL, DCLL (Circular, Doubly, Doubly Circular Linked List).

13. Write Short notes on **(any two):**

    a) Hash function
    b) External Sorting
    c) ADT.

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Section A

Attempt any two questions. (10x2=20)

1. Define stack as ADT. Describe its primitive operations on Array implementation and linked list implementation.

2. Describe the properties of Binary search tree. Write recursive algorithms for constructing BST and its traversals. Illustrate them with an example.

3. What are external and internal sorting? Explain partition strategies of Merge sort and Quick sort. Trace these sort algorithms for following data:

   11, 45, 61, 33, 55, 9, 83, 25.

Section B

Attempt any eight questions. (8x5=40)

4. Write recursive algorithm to get Fibonacci term. Illustrate it drawing recursion tree.

5. Instruct an expression tree from the following postfix:

   AB + C*DC - - FG + $.

6. Differentiate between Singly linked list, DLL, CLL and DCLL.

7. Describe circular Queue operations in array implementation.

8. Compare and Contrast between Binary searching and Binary tree searching.

9. State collision resolution techniques in hashing. Explain Double hashing and Quadratic probing techniques.

10. State MST (Minimum cost spanning tree) problem and shortest path (single source and all other destination) problem. Name the algorithms for solving these problems.

11. Justify the statement: "To write an efficient program, we should know about data structures and Algorithms".

12. Discuss the merits and demerits of contiguous list and linked list.

13. What is priority queue? How is it best implemented?