INTERNATIONAL CENTRE FOR APPLIED SCIENCES
MAHE, MANIPAL
B.Sc. (Applied Sciences) in Engg.
End – Semester Theory Examinations – May 2021
**IV SEMESTER: DESIGN AND ANALYSIS OF ALGORITHMS (ICS 244)**
(BRANCH: CSE)

Time: 3 Hours	Date: 24 May 2021	Max. Marks: 50

✓ **Answer ALL Questions.**
✓ **Missing data, if any, may be suitably assume.**

1A. Write an algorithm to check the primality of a positive number n. Also, explain how to determine the input size of the number n with the help of Asymptotic notation**?**   **(3)**

1B. Generate an 2-3 tree for the keys: 10, 6, 9, 4, 3, 5, 8.
At each step, mention the rotation applied and why?   **(3)**

1C. Show that the efficiency analysis framework ignores multiplicative constants and concentrates on the count's order of growth to within a constant multiple for large-size inputs.   **(4)**

2A. Perform a DFS traversal starting with k and follow alphabetical order to construct a DFS forest with the tree (solid line) and back edges (dashed line). Show the traversal (the first subscript number indicates the order in which a vertex is visited and pushed onto the stack; the second one indicates the order in which it is popped).   **(5)**
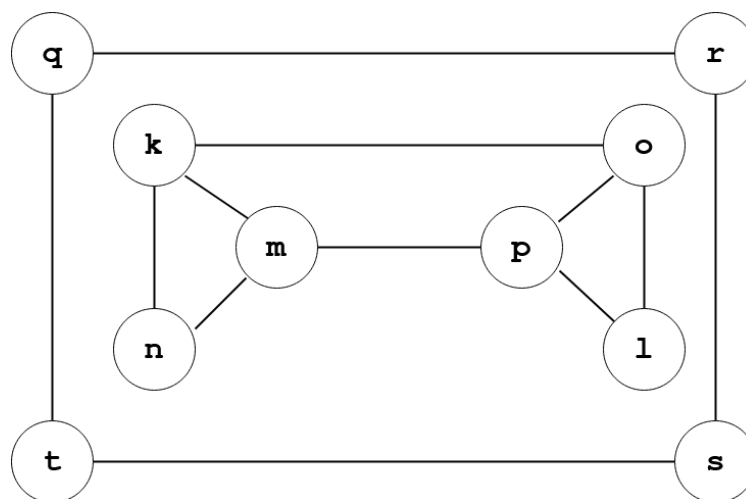
2B. What is a brute force algorithm? Write an algorithm for a 3-digit combination lock of a suitcase and explain the same.   **(5)**

3A. Determine the number of character comparisons made by the brute-force algorithm in searching for the pattern GANDHI in the text.
THERE_IS_MORE_TWO_LIFE_THAN_INCREASING_ITS_SPEED

Count underscore symbol as a character as well. **(4)**

3B. Write the pseudocode of bubble sort algorithm and sort the given list in ascending order: 90, 46, 69, 91, 30, 35, 18. Show each pass of the algorithm. **(3)**

3C. Compute the time complexity for the above algorithm. How it can be computed with the help of Input size, basic operation, C(n). **(3)**

4A. Generate an AVL tree for the keys: 41, 21, 11, 26, 31, 23, 51. **(5)**
At each step mention the rotation applied and why.

4B. What is Travelling Salesman Problem? Explain Hamiltonian circuit.
Find the optimal tour for the given circuit. **(5)**
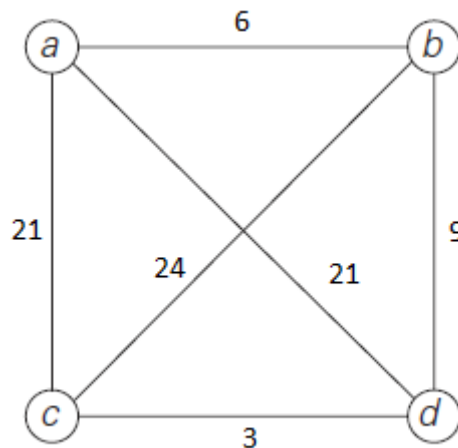
5A. Perform comparison-counting sort for the numbers 60, 30, 85, 90, 20, 45.
Show detailed steps and contents of the extra array used to perform the sort. **(4)**

5B. Consider the following algorithm. **(6)**

```
ALGORITHM Foo(n)
//Input: A nonnegative integer n
Sum ← 0
for i ← 1 to n do
    Sum ← Sum + i/i!
return Sum
```

a. What does this algorithm compute?
b. What is its basic operation?
c. How many times is the basic operation executed?
d. What is the efficiency class of this algorithm?

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