University of Science and Technology of Hanoi *** **Final Examination** **Subject: Algorithms and Data Structures** Code: 01 No of pages: 01	*Date: 25/10/2024* *Academic year: 2024–2025* *Time: 60 minutes* *Important instructions* Only the course slides and your own exercises' code are allowed. 1. Copy or using Internet will lead to heavy penalty.	
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Student name		**Student's ID**	

Follow this instruction:
- Create a folder "YOURNAME_STUDENTID" in the Desktop.
*- Create the source files **question1.c** (or cpp) and **question2.c** for the corresponding problems.*
*- **Remove the executable files** (.exe) and **zip** all your source codes, submit it to Google Classroom.*

Question 1: (12pts)
In this problem, we check whether a sum of a given natural number and its reverse is palindromic or not. A number is palindromic if it remains the same when its digits are reversed.
For example:
N = 56 and its reverse = 65, their sum is 121 = palindromic
N = 132 and its reverse = 231, their sum is 363 = palindromic
N = 605 and its reverse = 506, their sum is 1111 = palindromic
- Propose and implement a **recursive function** to solve the above problem. (8pts)
- Calculate the complexity of the proposed algorithm. (2pts)
- Propose a method to optimize the checking process. Justify your answer. (2pts)

Question 2: (6 pts)
- Write a program to solve the Question 1 using **a Stack data structure with necessary functions**. (6 pts)
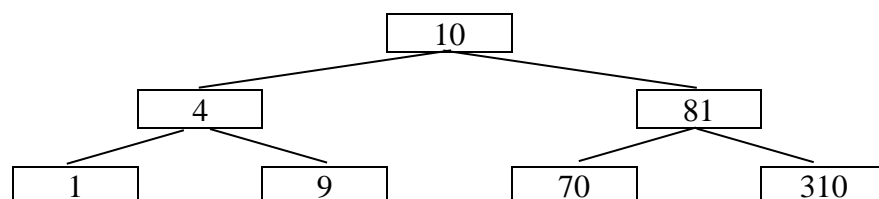 *Note: stacks can be used to reverse the number digits.*

Question 3: (2 pts)
This problem requires to traverse and display a binary search tree using the following process:
-   Starting from the root:
    o   Recursively traverse the current node's right subtree.
    o   Display the node's value.
    o   Recursively traverse the current node's left subtree.
Justify and show the traversal result for the below tree.

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