University of Science and Technology of Hanoi *** **Retake Examination** **Subject: Algorithms and Data Structures** Sheet: 01 No of pages: 01		***Intake***: *BI11* ***Academic year***: *2021–2022* ***Date***: *12/01/2022* ***Time***: *90 minutes* ***Important instructions*** *(according to lecturer's decision)* 1. Only the course slides and your own exercises' code are allowed in the examination venue. 2. Copy or using Internet will lead to heavy penalty.	
Pathway coordinator		**Lecturer (or Head of Subject)**	**Dr. Đoàn Nhật Quang**
Student name		**Student's ID**	

Follow this instruction:
- Create a folder "ADS_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 to the Google classroom:* https://classroom.google.com/c/MzgyODQxMzI1Mzky?cjc=6khijwf
- Verify your name in the files and mails, un-named or incorrect-name files lead to 0.

Problem:
Given a positive natural number N = 3450, we would like to study numbers by:
- Count the number of odd, even digits of N. Note that 0 is even.

Example:
- The number of odd digits of N = 3450 is 2 with odd digits = {3, 5};
- The number of even digits of N = 3450 is 2 with even digits = {4, 0}.
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Question 1: (12 pts)
- Propose two **recursive** pseudo-code algorithms to count the number of odd and even digits of N (one function for odd, one function for even). (2 pts)
- Implement the proposed algorithms in C/C++. (8pts)
- Calculate the complexity of your program (Best scenario, Worst scenario, Average). Justify your answer. (2 pts)

Question 2: (8 pts)
- Implement the Question 1 using a **Linked List** data structure. (8pts)

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