<table>
<tr><td colspan="2">University of Science and Technology of Hanoi
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Mid-term
Subject: Algorithms and Data Structures
Sheet: 01 No of pages: 01</td><td colspan="2">Academic year: 2025–2026
Date: 07/10/2024 Time: 45 minutes
<u>Important instructions</u>
(according to lecturer’s decision)
1. No documents or communication devices are allowed.
2. Copying or using Internet will lead to heavy penalty</td></tr>
<tr><td>Pathway coordinator</td><td></td><td>Lecturer (or Head of Subject)</td><td>Dr. Đoàn Nhật Quang</td></tr>
<tr><td>Student name</td><td></td><td>Student’s ID</td><td></td></tr>
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Question 1 (16 pts)

An Armstrong number is a number that equals the sum of its own digits, each raised to the power of the total number of digits in the number.

For example, 153 is an Armstrong number with 3 digits and $1^3 + 5^3 + 3^3 = 1 + 125 + 27 = 153$. Other examples include 370, 371, 407, 1634, and 8208.

$370 = 3^3 + 7^3$

$1634 = 1^4 + 6^4 + 3^4 + 4^4$

- Implement a program in C/C++ using **Iteration** to verify whether a number is an Armstrong number. (7pts)
- Implement another **function using Recursion** to complete the above question. (7pts)
- Calculate the complexity of your functions or algorithms. Justify the answer (*comment directly in your source files*). (2pts)

Question 2 (4 pts)

Note: *The student can answer this question in a text format. The submitted file can be either .c or .text.*

Suppose that we have a singly linked list: Head → 10 → 20 → 30 → 40 → NULL. We want to display the elements of this list in **reverse order** (output: 40 30 20 10).

- Propose an appropriate **data structure** to handle the display task. Justify your choice. (2pts)
- What are the basic functions to manipulate the proposed data structure? (1pt)
- Calculate the complexity of the display process. (1pt)

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