University of Science and Technology of Hanoi *** **Final Examination** **Subject: Algorithms and Data Structures** Sheet: 01 ICT + CS only No of pages: 02		***Intake**: BI11* ***Academic year**: 2021–2022* ***Date**: 26/11/2021* ***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**	

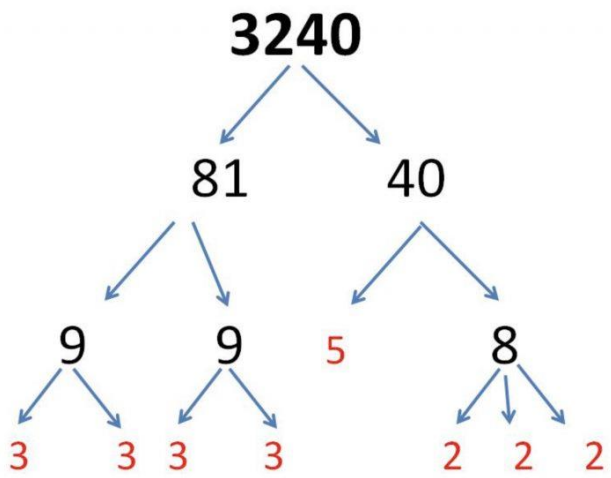
Follow this instruction:
- Create a folder "ADS_YOURNAME_STUDENTID" in the Desktop.
*- Create the source files **question1.c** (or cpp) and **question2.c** for the corresponding problems.*
*- **Remove the executable files** (.exe) and **zip** all your source codes, submit to the Google classroom:* https://classroom.google.com/c/MzgyODQxMzI1Mzky?cjc=6khijwf
- Verify your name in the files and mails, un-named or incorrect-name files lead to 0.

Problem:
In this problem, we would like to perform a prime factorization of a given natural number N:
N = 120 = 2 * 2 * 2 * 3 * 5;
N = 84 = 2 * 2 * 3 * 7

Question 1: (12 pts)
- Write a pseudo-code to implement the factorization using **Recursion (**combined with iteration if necessary**)**. (3 pts)
- Implement the proposed pseudo-code using C/C++. (7 pts)
- Calculate the complexity of your program (Best scenario, Worst scenario, Average). Justify your answer. (2 pts)

Question 2: (8 pts)
We would like to improve the factorization by using Divide and Conquer strategy and Binary recusion:
Step 1: Given a natural number N;
Step 2: Find two biggest divisors of N denoted by d1, d2;
Step 3: If a divisor d1 or d2 is not a prime, then call step 1 for d1 or d2, respectively; else continue;
Step 4: If d1 and d2 are both prime then exit;

- Implement the proposed pseudo-code using C/C++ (6 pts)
- Calculate the complexity of this algorithm. Justify your answer. (2 pts)



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