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|  | **Entrance Examination**  **February 2023** |
| **COMPUTER SCIENCE**  Time allowed: 1.5 hours (90 minutes)  **The questions in this paper are divided into two sections: A and B.**  **Answer TWO questions in total, i.e. the only question in section A and your choice of question from section B. Each question answered will be worth 50 marks.** | |

### **SECTION A**

1. a) In a ‘typed’ programming language of your choice (not in a database), what data structures or primitive data types would be most appropriate for storing each of the following? Please specify the programming language used. You should provide reasons for your answers:

* The age of every person in a room
* The outdoor humidity percentage
* The distance between two points on the map
* The result of mathematical comparison such as ((2x-y+z) > 0)
* A student attendance report including information about every module
* The information about a person’s pets: their age, species, and gender
* Similar information for all pet club members.
* The work schedules for employees at a company
* The results table for a motor race
* The state of minesweeper game

[15 marks]

b) Write an algorithm in clear pseudo code, i.e. write down the detailed steps using ideas like:

if (something is true) then

do action 1

else

do action 2

while (some condition is true)

do some action

repeatedly

**or**

that describes how you can compute n-th Fibonacci number. The n+1-th Fibonacci number can be computed by adding n-th and n-1-th Fibonacci numbers, and some first numbers are 1, 1, 1+1=2, 1+2=3, 2+3=5 etc.

Your answer should specify the data structures that you use, list any optimisations that you have made, and may describe other optimisations that you could make, specifically addressing the trade-off between memory use and execution speed. You may wish to add additional comments to explain your algorithm.

[17 marks]

c) In clear, detailed steps (as in question1. b, above) indicate how you could find the maximum number of sequential similar characters (lower and higher case of similar letter are different characters) given from input. For example, for input string ‘aacCccabAbbtttcccA’ the answer is 3 for substrings ‘ccc’ and ‘ttt’.

[18 marks]

**SECTION B**

2. Giving examples from your own experience where necessary:

a) Explain the concept of cloud storage. Discuss how safe it is for information storage and the reasons for this.   
 [20 marks]

b) Explain what you understand to be the differences between **working memory** and **permanent** **storage**. Your answer should include the physical and the conceptual difference between the two.  
 [10 marks]

c) Discuss the differences between mobile and desktop **Operating System.**  
 [20 marks]

3. a) Describe the interaction between a computer’s Operating System and USB Flash Drive. Why it is necessary for USB Flash Drives to be safety removed from a computer.

[25 marks]

b) Smart home automation systems are very popular and available nowadays. They use a lot of different multilevel software to make our everyday life at home easier and more comfortable. Describe the technologies that can be used to enable this to happen and discuss what you see as the pros and cons of transforming our homes to fully automated ones.

[25 marks]