## Note:

- During the attendance check a sticker containing a unique code will be put on this exam.
- This code contains a unique number that associates this exam with your registration number.
- This number is printed both next to the code and to the signature field in the attendance check list.


## Master EFV August 2023

$\begin{array}{ll}\text { Exam: } & \text { IN0000 / aptitude-08-2023 } \\ \text { Examiner: } & \text { Prof. Dr. }\end{array}$
$\square$

Date: Tuesday $22^{\text {nd }}$ August, 2023
Time: 10:00-11:30


## Working instructions

- This exam consists of 8 pages with a total of 3 problems.

Please make sure now that you received a complete copy of the exam.

- The total amount of achievable credits in this exam is 6 credits.
- Detaching pages from the exam is prohibited.
- Allowed resources:
- one analog dictionary English $\leftrightarrow$ native language
- The exam consists of Multiple-Choice questions only. Please note the following instructions:


## Mark correct answers with a cross

To undo a cross, completely fill out the answer option To re-mark an option, use a human-readable marking

- Do not write with red or green colors nor use pencils.
- Physically turn off all electronic devices, put them into your bag and close the bag.
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## Problem 1 Logical Thinking (2 credits)

There are three types of people on the island of truth-tellers and liars: Truth-tellers who always tell the truth, liars who always lie, and ordinary people who lie sometimes and tell the truth other times. Out of three people A, B and C, there is exactly one truth-teller, exactly one liar, and exactly one ordinary person. They make the following statements one after another:
A: I am an ordinary person
B: The statement by $\mathbf{A}$ is true
C: I am not an ordinary person
Who is the ordinary person, who is the liar and who is the truth-teller among $A, B$ and $C$ ?
$\square \mathbf{A}$ is a liar, $\mathbf{B}$ is a truth-teller and $\mathbf{C}$ is an ordinary person.
$\square \mathbf{A}$ is a truth-teller, $\mathbf{B}$ is a liar and $\mathbf{C}$ is an ordinary person.
$\square \mathbf{A}$ is an ordinary person, $\mathbf{B}$ is a truth-teller and $\mathbf{C}$ is a liar$\mathbf{A}$ is a truth-teller, $\mathbf{B}$ is an ordinary person and $\mathbf{C}$ is a liar$\mathbf{A}$ is an ordinary person, $\mathbf{B}$ is a liar and $\mathbf{C}$ is a truth-teller.$\mathbf{A}$ is a liar, $\mathbf{B}$ is an ordinary person and $\mathbf{C}$ is a truth-teller
Additional area for notes. (Not considered for points)

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## Problem 2 Theoretical Computer Science (2 credits)

Note: an alphabet $\Sigma$ is a finite set.
Convention: a nondeterministic finite automaton (NFA) has exactly one start state.
Let $A, B, C \subseteq \Sigma^{*}$ be languages. Which of the following statements is true?
$\square|A||B| \leq|A B|$
$\square A \cup B^{*}$ is countable.
$\square A \neq B \Longrightarrow A^{*} \neq B^{*}$
Additional area for notes. (Not considered for points)


## Problem 3 AVL-Trees (2 credits)

Delete the element 1 from the following AVL-Tree. Choose the correct resulting tree from the choices below.


Additional space for solutions-clearly mark the (sub)problem your answers are related to and strike out invalid solutions.





