

DA53: Compilation and Language Theory - Mid-Term Exam A2023

Duration: 1h30. No document allowed.
English recommended, French accepted.

Part 1: Introduction (6 points)

Question 1.1:

What is a syntax tree in the context of a compiler?

Question 1.2:

What is a parse tree in the context of a compiler?

Question 1.3:

List the different stages that are followed by a compiler for generating binary executable code from a source program.

Part 2: Lexical Analysis (7 points)

Let the language that is composed of:

1. the “if-then-else” statement: `if (CONDITION) then STATEMENT else STATEMENT`
2. the “print v” statement that print out its parameter “v”.
3. the number constants (integer or decimal number), e.g., “1.456”.
4. the comparison operators “=”, “<>”, “<”, “<=”, “>”, “>=”.

Example:

```
if 4 < 5 then
  if 7 <> 4 then
    print 1
  else
    print 2
```

```
else  
  print 3
```

Question 2.1:

What is the alphabet of this language?

Question 2.2:

Write the table that is matching the regular expressions, the lexemes, the tokens and the attributes of the tokens.

Question 2.3:

Write the Nondeterministic Finite Automata that is recognizing the language.

Part 3: Syntax Analysis (7 points)

In this part, you must use the same language as in Part 2.

Question 3.1:

Write the grammar rules (using the Backus Naur Form for example) for the language that is described in Part 2.