Final Report: Real-Time Grammar-Based Syntax Highlighter

Student Information

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1. Programming Language

I used **Python** for the entire project due to its built-in `re` module for lexical analysis and `tkinter` for GUI support.

2. Grammar Choice

The grammar is a simplified version suitable for small expressions involving assignment, control structures (e.g., `if`, `while`), and arithmetic operations.

3. Lexical Analysis

Method: State Diagram & Program Implementation

Implemented a custom lexical analyzer using Python's `re` module. Token types include:

- Keywords (`if`, `while`)

- Identifiers

- Numbers

- Operators

- Punctuation

Whitespace is ignored. Unrecognized characters are labeled as `UNKNOWN`.

4. Syntax Analysis

Method: Top-Down (Recursive Descent Parser)

The parser validates statements, assignments, and expressions following the CFG.

5. Real-Time Highlighting

Implemented with `tkinter.Text` widget using tags. Highlighting is re-applied on every key release. Tags are color-coded by token type.

6. GUI

The GUI is built using Python's `tkinter` module. It features:

- A large editable text area

- Real-time syntax highlighting

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