Lab Assignment 2: Context-Free Grammars and Pushdown Automata

Objective: The objective of this lab assignment is to practice working with context-free grammars (CFGs) and constructing pushdown automata (PDAs).

Instructions:

- Create a new file and name it "cfg_pda.c".
- Implement the following functions:
    - **`int matchCFG(char cfg[], char input[])`**: This function should take a CFG and an input string as parameters and return 1 if the input string belongs to the language generated by the CFG, or 0 otherwise. You can use any approach you prefer to implement this function, such as constructing a pushdown automaton (PDA) from the CFG and simulating its execution on the input string.
    - **`void convertToPDA(char cfg[])`**: This function should take a CFG as input and convert it to an equivalent pushdown automaton (PDA). You can use any method you prefer for the conversion, such as the standard PDA construction algorithm.
- In the **`main()`** function, provide a menu-driven program to interact with the CFG matching and PDA conversion functions. The menu should provide the following options:
    - Match a CFG with an input string
    - Convert a CFG to a PDA
    - Exit the program
- Test your program with various CFGs and input strings to validate the correctness of the matching and conversion operations.
- Document your code and include appropriate comments to explain the purpose of each function and significant sections of code.
- Submit your code along with a brief report summarizing your implementation, any challenges faced, and how you addressed them.

Note: You can use standard libraries or existing implementations for regular expression matching and PDA simulation if available, or you can choose to implement them from scratch.