CS F214
Logic in CS
BITS Pilani, Hyderabad Campus
Assignment -2
Due Date : 7th December 2022 (by Midnight)
Total Marks: 30 (weightage : 10%)

Objective:

We have already seen that there are different applications which requires a logical framework to check the proof of natural deduction in Propositional Logic/ Predicate Logic such as Flip (https://staff.washington.edu/jon/flip/www/). In the first assignment, you have taken the first step towards storing a well-formed propositional logic formula in a parse tree and do simple operations such as evaluation, traversal etc.

In this assignment you will take the next step to develop a tool for verifying whether a certain proof of a given sequent is valid or not. In order to keep it simple, in this assignment we will allow only the usage of the following proof rules:

1. Premise	[2]
2. AND introduction/elimination	[5]
3. OR introduction	[5]
4. IMPLIES elimination	[5]
5. MT	[5]

Definitions:

<statement> ::= p | ¬p | ¬(<statement>) | (<statement> ∧ <statement>) | (<statement> ∨ <statement>) | (<statement> → <statement>)

<rule> ::= ∧i | ∧e1 | ∧e2 | ∨i1 | ∨i2 | →e |P

Input:

First line:
n (number of statements)
Next n lines:
<statement>/<rule>[/line1[/line2]] (parameter in [] is optional whose existence will be determined by <rule>)

Output:

Valid Proof (or) Invalid Proof

Assumptions:

1. Line number starts from 1.
2. <statement> should be perfectly parenthesized, e.g. ((a ∧ b) ∧ c) is valid, (a ∧ b) ∧ c is invalid, ((a ∧ b)) is invalid, (a ∧ b) is valid, (a ∧ b ∧ c) is invalid, p is valid, (p) is invalid.
3. ¬ can be succeeded by a literal or '(' only.

Sample test case:

Input:
3
a/P
b/P
(a ∧ b)/∧i/1/2

Output: Valid Proof

Documentation:

You will produce the following documents:

1. Documentation of the code using Doxygen. **[3]**
2. Documentation of the algorithm for making this tool. Discuss about the algorithm for the tool, code design, example outputs, plan to extend it so that other rules can also be implemented. This documentation will be made as HTML pages. **[5]**

General Instructions:

1. This assignment will be done in groups of max four students. You should maintain to work with the same group.
2. **Code must be written in C or C++ only.**
3. There will be only one submission per group on the CMS.
4. The name of the file should be **id1_LOGIC_A2.zip**, where id1 refers to the BITS ID of the sender.
5. **You can discuss with your friends but refrain from copying the code and submitting. Also please do not use code downloaded from internet. Such codes will receive 0 credits.**
6. You have to demo the code to the instructor/TAs on a scheduled date and timing after submission. **It is important to attend the demo, as absence from demo will amount to no credit for the assignment. The tentative date for the Demo will be right after the submissions.**