1. Design a PDA to accept the strings in \((0+1)^*\) such that no prefix has more 1’s than 0’s. 01001011001 is a string in this language. Say whether your PDA accepts by final state or empty stack.

Accepts by final state.

2. Design a PDA to accept \(\{a^ib^jc^k \mid i=j\text{ or } j=k\}\). Say whether this accepts by final state or empty stack.

Accepts by empty stack.
3. Design a PDA to accept \( \{0^n1^m \mid n \leq m \leq 2n\} \)

4. Convert the following grammar into a PDA that accepts by empty stack.

\[
\begin{align*}
S &\rightarrow 0S1 \mid A \\
A &\rightarrow 1A0 \mid S \mid \epsilon \\
\end{align*}
\]

Chomsky’s algorithm gives a grammar equivalent to this PDA, with grammar symbols of the form \([pXq]\). Give a derivation in this grammar for the string 0101.

5. Here is a PDA that accepts strings in \((0+1)^*\) with the same number of 0’s and 1’s. This PDA accepts by empty stack. Chomsky’s algorithm gives a grammar equivalent to this PDA, with grammar symbols of the form \([pXq]\). Give a derivation in this grammar for the string 0101.