Problem #1. Construct a PDA equivalent to the CFG

\[ S \rightarrow aCBbC \mid CC, \quad B \rightarrow CSC \mid BCB, \quad C \rightarrow aS \mid bS \mid a \]

Problem #2. Construct an equivalent CFG for the following PDA:

Problem #3. Which of the following are CFLs? (Justify your answer!)

1. \( \{a^i b^j \mid j = i^2\} \)
2. \( \{a^i b^j \mid i \neq j \text{ and } i \neq 2j\} \)
3. \( \{b_2 \# b_i \mid b_i \text{ is } i \text{ in binary without leading 0's, } i \geq 2\} \)
4. \( \{xww \mid w, x \in (a+b)^*\} \)

Problem #4. Construct a PDA to accept binary strings in which the number of 0's is not equal two times the number of 1's.

Problem #5. Show that if \( L \) is a CFL, so is \( L^R := \{u^R \mid u \in L\} \)