Supplemental Questions on: Grammars and PDAs

C1: Let L be the language $\{\, 0^i 1^j : j \geq 2i \,\}$. For example, `011`, `01111` and `0011111` are in L.

    (a) Give a CFG for L

    (b) Give the diagram for a PDA for L

C2: Let D be the following language $\{\, 0^a 1^b 2^c : b = a + c \,\}$. For example, `00011112` is in the language. Give a context-free grammar for D.

C3: Consider the following CFG:

$$S \to SSS \mid \texttt{b}S \mid \texttt{a}$$

    (a) Give a derivation tree for the string `ababa`.

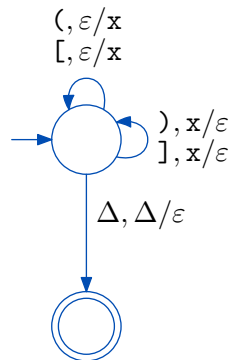   (b) Explain in English what language this grammar generates:

C4: Consider the following language L with alphabet $\{0, 1\}$.
The empty string is **not** in L. If the string is nonempty and has **even** length, then it is in L. If the string has **odd** length, then it is in L if and only if it is a palindrome.
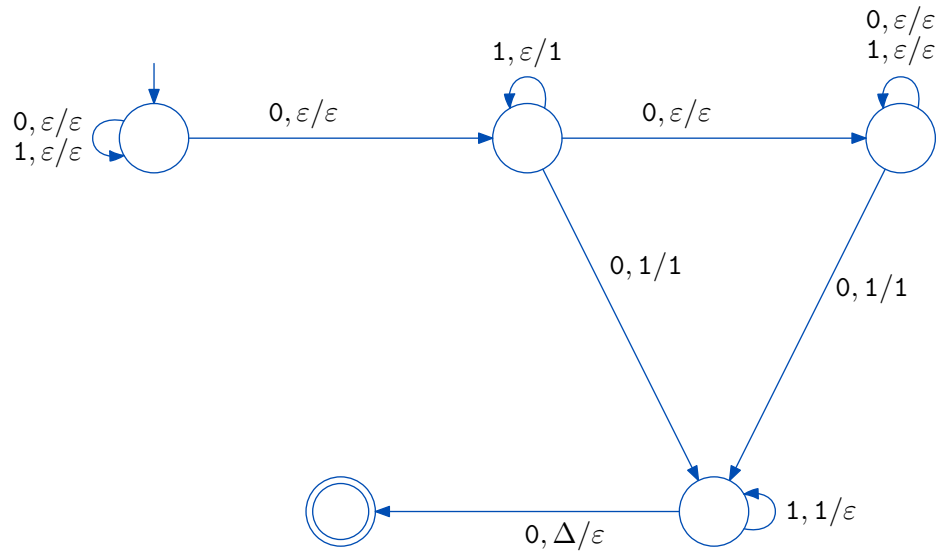   (a) Give a CFG for L.
    (b) Give a PDA for L.

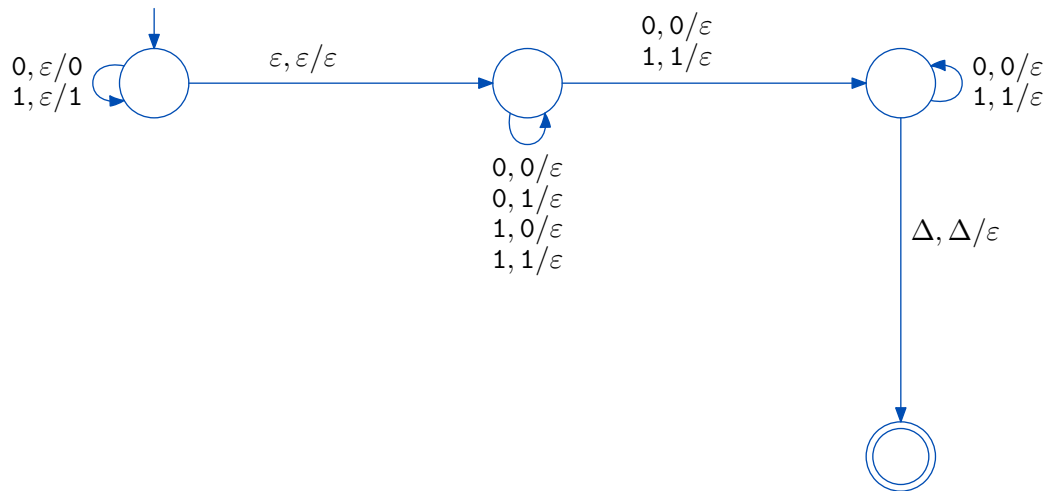C5: Explain in **English** what language the following PDA accepts.

C6: Consider the following PDA.

(a) Give the shortest string accepted by this PDA.
(b) Give two more strings accepted by this PDA.
(c) Describe in succinct English the language of this PDA.

C7: Consider the following PDA with alphabet $\{0, 1\}$.

(a) List one binary string of length 4 that this PDA accepts.
(b) List one binary string of length 4 that this PDA does **not** accept.
(c) Give a precise short English summary description of the language of this PDA.