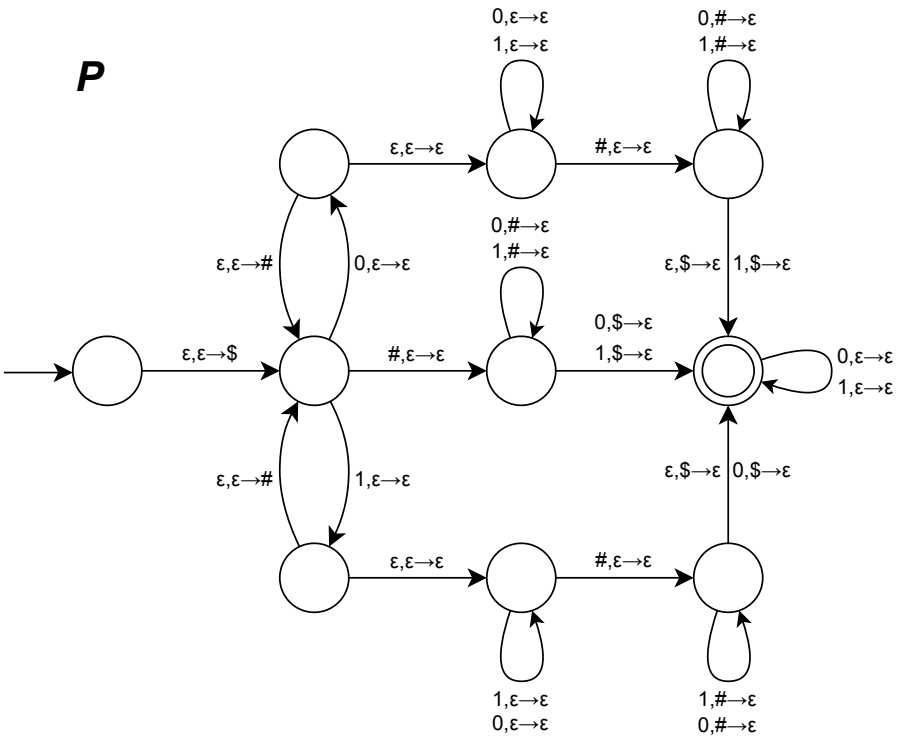

Problem 2.22. Let $C = \{x\#y \mid x,\ y \in \{0,1\}^* \text{ and } x \neq y\}$. Show that C is a context-free language.

Informal description. A PDA can be constructed to recognize C as follows:

1. Repeatedly compare each symbol x_i of the string x with the corresponding symbol y_i of the string y. Accept, if $x_i \neq y_i$, or y_i does not exist, which means that $|x| > |y|$.
2. Also accept, if $|x| < |y|$.

Proof. To show that C is a context-free language, give state diagram of a PDA P that recognizes C.



State diagram of a PDA P that recognizes C. Each time P reads a symbol x_i, it non-deterministically compares it with y_i and writes a # on the stack. This way, the PDA P tracks the number of x_i's read and compared.

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