Name: Rollno:

CSE340: Theory of Computation (Quiz 2)

9th September, 2019

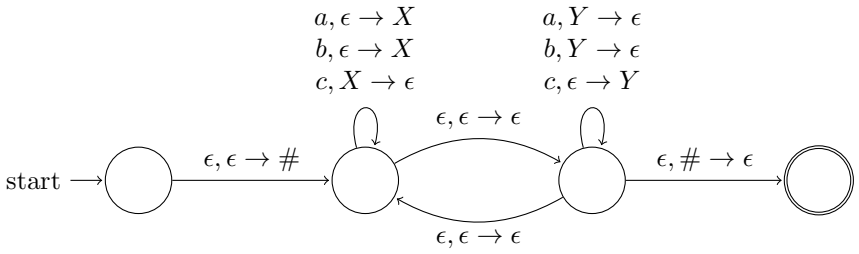
Total Number of Pages: 2 Total Points 20

Instructions

1. Cheating or resorting to unfair means will be severely penalized.
2. Using pens (blue/black ink) and not pencils. Do not use red pens for answering.

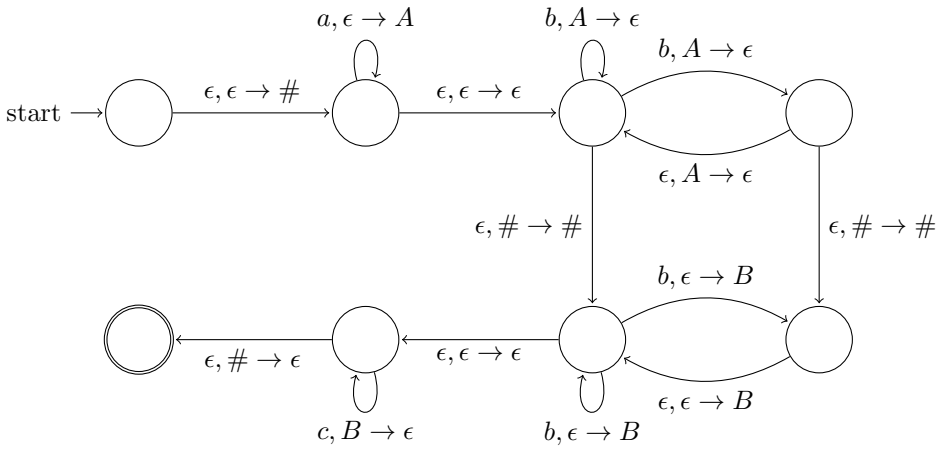
Question 1. Describe in the simplest possible terms the language accepted by the following PDAs:

(a) (5 points) P_1:



$L(P_1) = \{w \in \{a, b, c\}^* \mid \underline{\quad \#_a(w) + \#_b(w) = \#_c(w) \quad}\}$

(b) (5 points) P_2:



$L(P_2) = \{w \in \{a, b, c\}^* \mid \underline{\quad w = a^i b^j c^k,\ j \leq i + k \leq 2j \quad}\}$

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Question 2. (5 points) Design a CFG for the following language

$$L = \{a^m b^n \mid 2m = 3n,\ n, m \geq 0\}$$

Solution:

$$S \longrightarrow aaaSbb \mid \epsilon$$

Question 3. (5 points) State whether the following statements are true or false (write T or F):

(a) If L is a regular language then $L \cdot \overline{L}$ is **regular**. (Give the best possible answer)

(b) A PDA accepts an input if at any point in time, the PDA enters an accept state while reading the input. True or False. **False**

(c) Let G be a CFG and $w \in L(G)$. Then every left derivation of w with respect to G may not have the same length. True or False. **True**

(d) If G is a CFG in Chomsky normal form and h is the height of a parse tree of a string $w \in L(G)$ then $|w| \leq$ 2^h.

(e) The unary language $\{a^{n^2} \mid n \geq 0\}$ is context-free. True or False. **False**