



PES UNIVERSITY, Bangalore
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Department of Computer Science & Engineering

Automata Formal Languages & Logic

Question Bank - Unit 3

Questions from the Prescribed Textbook

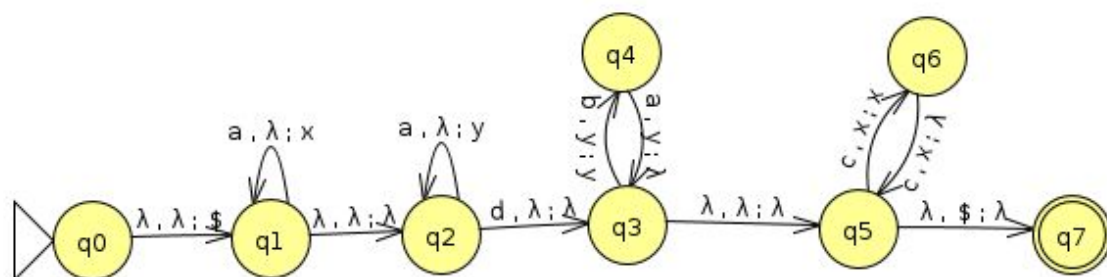
Topic	Exercise No.	Question No's
Pushdown Automata	7.1	1-17

Extra Questions

1. Create a PDA that recognizes the following context free languages:
 $L = \{a^*wc^k \mid w \in \{a,b\}^* \text{ and } k = |w|_a \text{ (} k = \text{the number of } a\text{'s in } w\text{)}\}$
2. Construct a PDA for the language of all non palindromes over $\{a,b\}$.
3. Consider the language $L = \{a^nba^n \mid n \geq 0\}$. Design the deterministic pushdown automata that recognizes the language.
4. Construct a PDA for the language over $\{a,b,c\}$ $L = \{ucv : u,v \in \{a,b\}^*, u \neq v\}$.
5. Construct a PDA for the language over $\{a,b,c\}$ $L = \{w \in \{a,b,c\}^* \mid 2 \cdot \#_a(w) \leq \#_b(w) \leq 3 \cdot \#_c(w)\}$.
6. Construct a PDA for the language over $\{a,b,c\}$ $L = \{ucv \mid u,v \in \{a,b\}^*, u \neq v \text{ but } |u| = |v|\}$.
7. $a^nbab^n, n > 0$. Make sure that the PDA is deterministic
8. $a^n b^m c^k$ where $2n = m$ and $k \geq 2$. Make sure that the PDA is deterministic.
9. Construct a PDA for the language $L = a^n b^m$ where $m = n \bmod 3$. How much stack memory do you need to handle this language?
10. The language of subtraction, that is, strings of the form $a^n b^m c^k$ where $k = n - m$ if $n \geq m$ or else $k = m - n$. Show an accepting sequence of configurations for the input aabbbbcc. Show the rejecting sequence of configurations for the input aaaabbccc.

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11. Construct a PDA for the language $\{w \in \{a,b\}^* : P(w)\}$, where $P(w)$ is the property:
 - a. $|w|$ is odd and the middle symbol of w is b .
 - b. w starts and ends with the same symbol.
12. $a^n b^m$ where $m = n \times 3$. Make sure that the PDA is deterministic.
13. Design a PDA to accept the language is the set of all strings of 0's and 1's such that no prefix has more 1's than 0's.
14. $a^n b^m$ where n is a multiple of 3 and m is $n/3$. Make sure that the PDA is deterministic.
15. Construct a PDA for the language over $\{a,b,c\}$ $L = \{ab(ab)^n(ba)^n \mid n \in \mathbb{N}\}$.
16. Construct a PDA that recognizes the language $\{a^{2^n} b^n \mid n \geq 0\}$ over $\Sigma = \{a,b\}$.
17. Proper nesting of parentheses and flower brackets. For example, $\{((()))()(({}))\{\{\}\}\}$. Show how it rejects $\{(){}(({}))\}$.
18. $a^n b^n a^m b^m$, $n \geq 0$, $m \geq 0$. Show, along with two different accepting sequences of configurations, how non-determinism works to accept the string $aaabbbb$ in two different ways.
19. $a^n b^m a^m b^n$. Can this be a deterministic PDA? Explain.
20. Consider the following PDA:



- a. Show that the PDA accepts the string $aaadbabacc$.
- b. Which language L does the given PDA accept?