

主管
领导
审核
签字

1. [10 points] Design a DFA for $L = \{w \in \{0,1\}^* \mid w \text{ has exactly three 0s.}\}$

2. [10 points] Design an NFA for the language:

$$L = \{w \in \{a,b,c\}^* \mid w \text{ starts with } ac \text{ and ends with } cb.\}$$

3. [10 points] Design regular expressions for languages over $\Sigma = \{a,b\}$.

(1) All strings that do not end with aba .

(2) $L = \{w \mid w \text{ has no more than 5 } a\text{'s.}\}$

4. [10 points] Prove that the language $L = \{w \in \{a,b\}^* \mid w = w^R\}$ is not regular with pumping lemma.

5. [10 points] Consider the following ε -NFA.

	ε	a	b	c
$\rightarrow p$	$\{q, r\}$	\emptyset	$\{q\}$	$\{r\}$
q	\emptyset	$\{p\}$	$\{r\}$	$\{p, q\}$
$*r$	\emptyset	\emptyset	\emptyset	\emptyset

(1) Compute the ε -closure of each state.

(2) Give all the strings of length three or less accepted by the automaton.

(3) Convert the automaton to a DFA by subset construction. (diagram of transition function)

6. [10 points] Give a CFG for $L = \{a^i b^j c^k \mid i, j, k \geq 0 \text{ and } i = j + k\}$.

7. [10 points] Find a grammar equivalent to

$$S \rightarrow AB \mid CA$$

$$A \rightarrow a$$

$$B \rightarrow BC \mid AB$$

$$C \rightarrow aB \mid b$$

with no useless symbols.

8. [10 points] Design a PDA for $L_{eq} = \{w \in \{0,1\}^* \mid w \text{ contains the same number of 0's and 1's}\}$.

9. [10 points] Prove or disprove: if L_1 is CFL and $L_1 \cup L_2$ is also CFL, then L_2 must be CFL.

10. [10 points] Design Turing machine for the language $\{0^{2n}1^n \mid n \geq 0\}$.