09820CS 337100 - Formal Language

Note

1. **10 points for each question. The total is 110 points (but the upper bound of the score is 100 points)**
2. **Pay attention to the requirement of each question (if any), you would get 0 point if not meeting the requirements**
3. **You cannot consult any other source or person in any way (Close Book).**

(1) Let $\Sigma = \{a,b\}$. Find a grammar that generates the language.
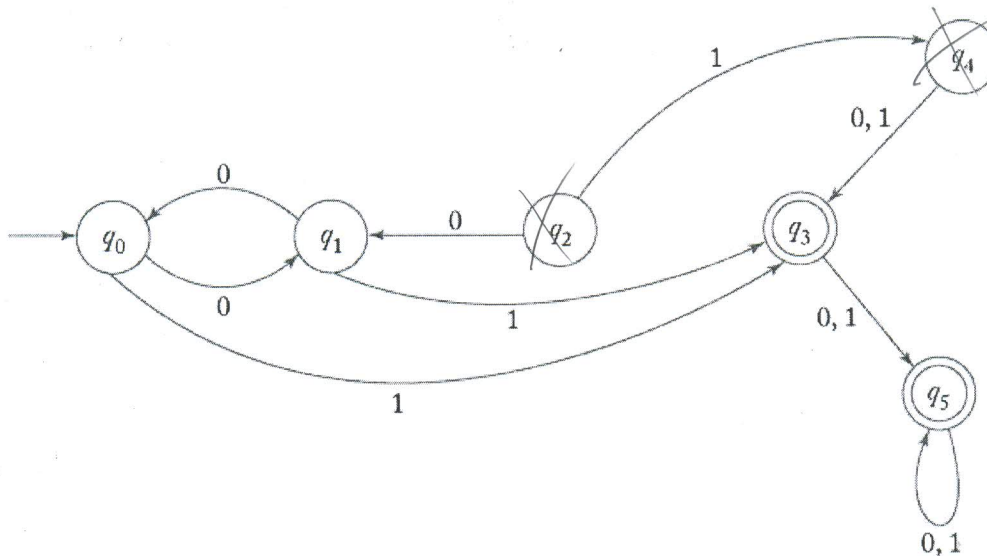$$L = \left\{ a^n b^{n-3} : n \geq 3 \right\}$$

(2) Find a dfa for the language on $\Sigma = \{a,b\}$. (Note: no more than 5 states, including q_0)
$$L = \left\{ w : |w| \bmod 3 = 0 \right\}$$

(3) Construct an nfa with three states that accepts the language $\{ab, abc\}^*$.

(4) Show that if L is regular, so is L^R.

(5) Minimize the states in the dfa depicted in the following diagram. (Note: no more than 4 states)

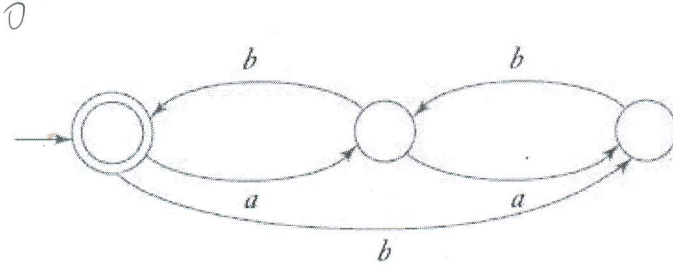(6) Write a regular expression for the language L on $\{0,1\}$.

　　L: all strings containing an even number of 0's

(7) Find a dfa that accept the language.

　　(Note: no more than 10 states)

$$L(aa^* + aba^*b^*)$$

(8) Find a regular expression for the language accepted by the automaton:

(9) Find a right-linear grammar for the language on $\{a,b\}$:

$$L = \{w : n_a(w) \text{ and } n_b(w) \text{ are both even}\}$$

(10) Prove that the language is not regular:

$$L = \{a^n b^l a^k : k \geq n + l\}$$

(11) Is the language regular? Prove your answer.

$$L = \{uww^R v : u, v, w \in \{a,b\}^+\}$$