Faculty of Mathematics and Computer Science
Department of Computer Science

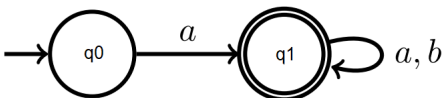<div align="center">

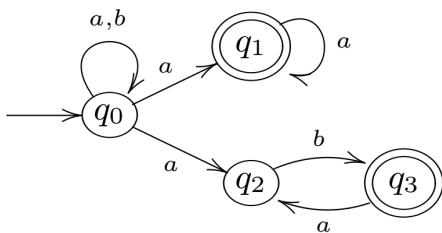**Formal Verification and Specification**
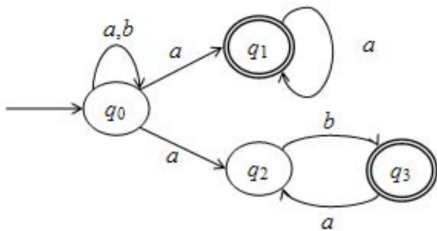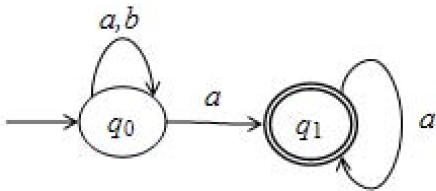**Lab Session (TP) 03**

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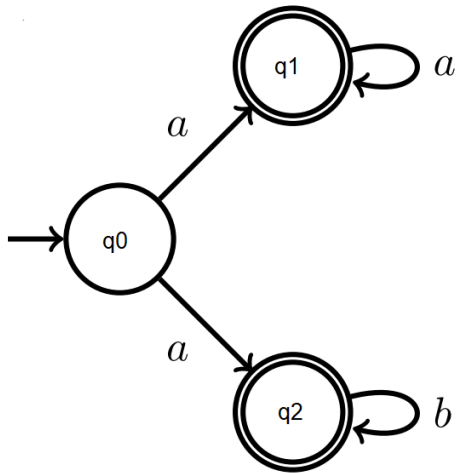1. **LTL Buchi automaton:**
   Given the alphabet $\Sigma = \{A, B\}$, introduce for each of the following a Büchi automaton:

   - Each B should be followed by two A.
   - There are finitely many Bs in each path or sequence
   - After every A, we have either an even number of consecutive B or there must be infinite number of consecutive B.
   - Each path is of the form $X\alpha$, where $X = (BA)^k$, such that $k \geq 1$, and $\alpha \in \Sigma^\omega$, where.

2. **LTL Buchi automaton:**
   Give the accepting $\omega-$language for each of the following $\omega-$automata:

3. **LTL Buchi automaton:**
   Find three(03) accepting runs and three (03) rejecting runs for the following automata :
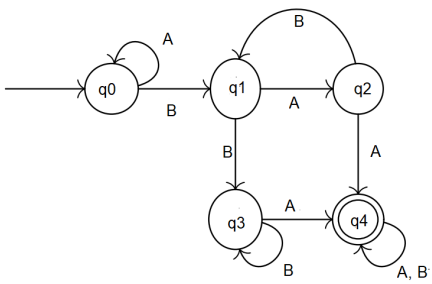

Figure 1: $\mathbb{A}$

Answers

1. **LTL Buchi automaton:**
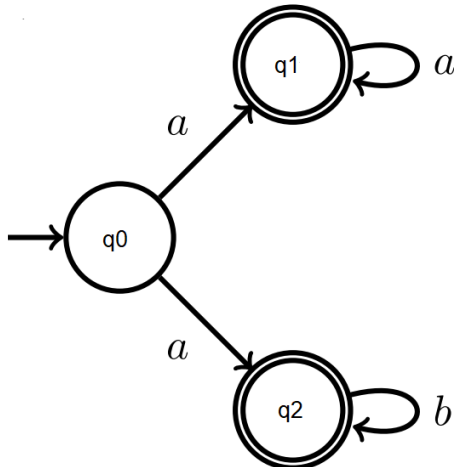   Given the alphabet $\Sigma = \{A, B\}$, introduce for each of the following a Büchi automaton:

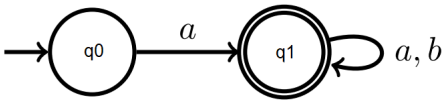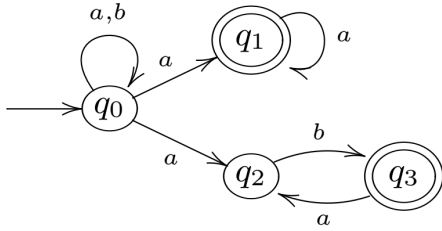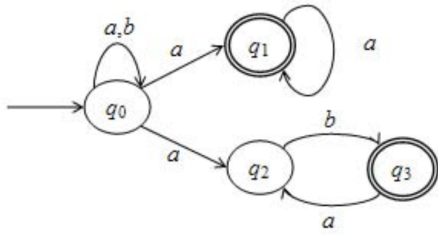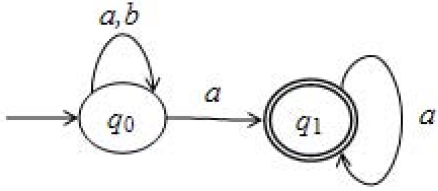   - Each B should be followed by two A.
   - There are finitely many Bs in each path or sequence
   - After every A, we have either an even number of consecutive B or there must be infinite number of consecutive B.
   - Each path is of the form $X\alpha$, where $X = (BA)^k$, such that $k \geq 1$, and $\alpha \in \Sigma^\omega$, where.
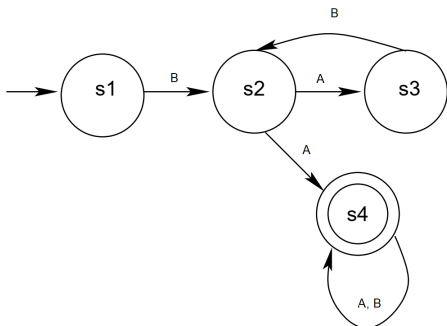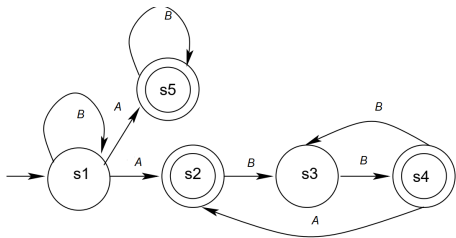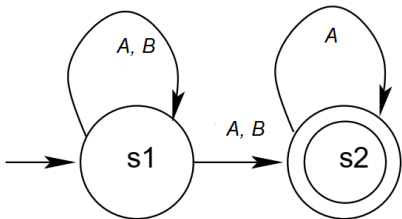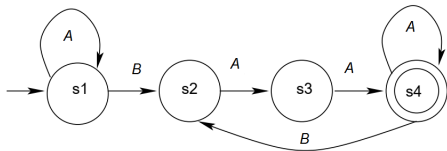
   Answer:

2. **LTL Buchi automaton:**
   Give the accepting ω−language for each of the following ω−automata:

a,b

q_0 $\quad a \quad$ q_1 $\quad a$

a,b

a $\quad q_1 \quad$ a

q_0

b

a $\quad q_2 \quad\quad q_3$

a

a,b

$q_1 \quad a$

a

q_0

b

a $\quad q_2 \quad q_3$

a

$q0 \quad a \quad q1 \quad a,b$

$q1 \quad a$

a

$q0$

a

$q2 \quad b$

Answer:
- $\Sigma^* a^\omega = (a+b)a^\omega$
- $\Sigma^* a^\omega U \Sigma^* (ab)^\omega = (ab)^*(a^\omega + ab^\omega)$
- $(a+b)^* a^\omega + (a+b)^*(ab)^\omega$
- $a(a+b)^\omega$
- $a^\omega + ab^\omega$

3. **LTL Buchi automaton:**
Find three(03) accepting runs and three (03) rejecting runs for the following automata :
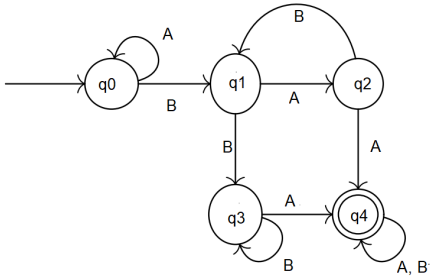

Figure 2: $\mathbb{A}$

Answer:
- $ABAA, BABBAB, BBAAB \in L(\mathbb{A})$
- $AAB, BBBB, ABABA \notin L(\mathbb{A})$