1 Exercise 1

i Let $M_A$ have the following state diagram:

![State Diagram A](image)

Describe as simply as possible the crucial characteristic of the language recognized by this automaton.

ii Let $M_B$ have the following state diagram:

![State Diagram B](image)

Describe as simply as possible the crucial characteristic of the language recognized by this automaton.

iii Construct $M'$ that recognizes $L(M_A) \cap L(M_B)$. Spell out its formal description, draw its diagram, and describe as simply as possible the characteristic of the language recognized by this automaton.

$M_1 = \langle Q, \Sigma, \delta, q_0, F \rangle$, where

1. $Q = \ldots$
2. $\Sigma = \ldots$
3. $\delta$ is defined as
\begin{tabular}{|l|l|}
\hline
0 & 1 \\
\hline
\(\langle q_0,q_3 \rangle\) & \\
\(\langle q_0,q_4 \rangle\) & \\
\(\langle q_1,q_3 \rangle\) & \\
\(\langle q_1,q_4 \rangle\) & \\
\(\langle q_2,q_3 \rangle\) & \\
\(\langle q_2,q_4 \rangle\) & \\
\hline
\end{tabular}

4. The start state is \\
5. \(F = \). \\

2 Exercise 2 \\
Give a state diagram for the deterministic FSA that recognizes the following language: 
\(L = \{w : w \text{ contains an even number of } 0\text{s or exactly two } 1\text{s (or both)} \}\) \\

Check that the prediction for the following strings is correct: 
\begin{enumerate} 
\item a. 0111 Not accepted 
\item b. 0100010 Accepted 
\item c. 010010100001 Accepted 
\item d. 1111000 Not accepted 
\item e. 1100 Accepted 
\end{enumerate} \\

3 Exercise 3 \\
Exercise 4 in Partee et al. p. 482, about non-deterministic FSA. \\

4 Exercise 4 \\
Give non-deterministic finite state automata diagrams with the specified number of states recognizing each of the following languages: 
\begin{enumerate} 
\item a. The language \(\{w : w \text{ starts with } 010 \}\) with four states. 
\item b. The language \(\{w : w \text{ has no block of } 5 \text{ or more consecutive } 0\text{s} \}\) with five states. 
\item c. The language \(001^* \) with three states. 
\item d. The language \(0^*1^*0^*0^* \) with three states. 
\end{enumerate}