1. Give the state diagram of an NFA over the alphabet \{ a, b \} that accepts

\{ w | w has each a immediately followed by b \}

Note that the only restriction in the language is that IF an 'a' is in a particular string, then it must be followed IMMEDIATELY by a 'b'.

![NFA State Diagram](image1)

2. Give the state diagram of a DFA over the alphabet \{ 0, 1 \} that accepts

\{ w | w has \( (3m + 1) \) 1's for some integer \( m \geq 0 \) \}

Remember that \( m \) can be any nonnegative integer (this includes 0!). The FA must accept any string with \( (3m+1) \) 1's. Strings with \( (3m) \) or \( (3m+2) \) 1's should be rejected.

![DFA State Diagram](image2)

3. Describe \( L(M) \) where \( M \) is given by the following state diagram.

![State Diagram](image3)

\( L(M) = \{ w | w \text{ is a string over the alphabet } 0,1 \text{ which contains the substring } 111 \} \)

4. Define the term alphabet.

An alphabet is defined to be a finite set of symbols.