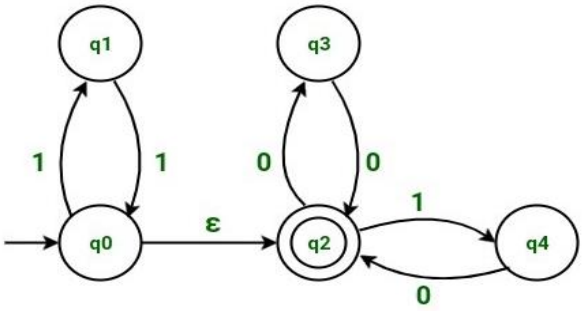
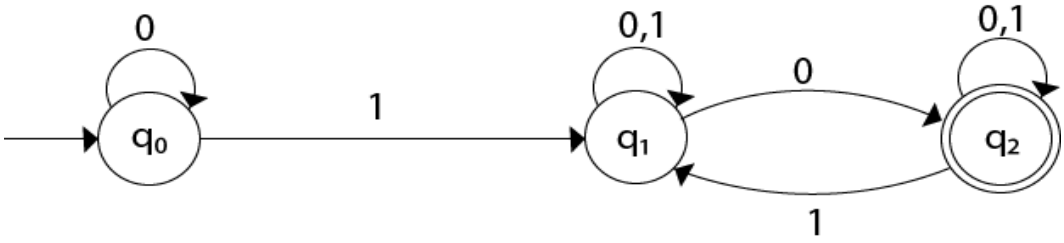
Tutorial-1

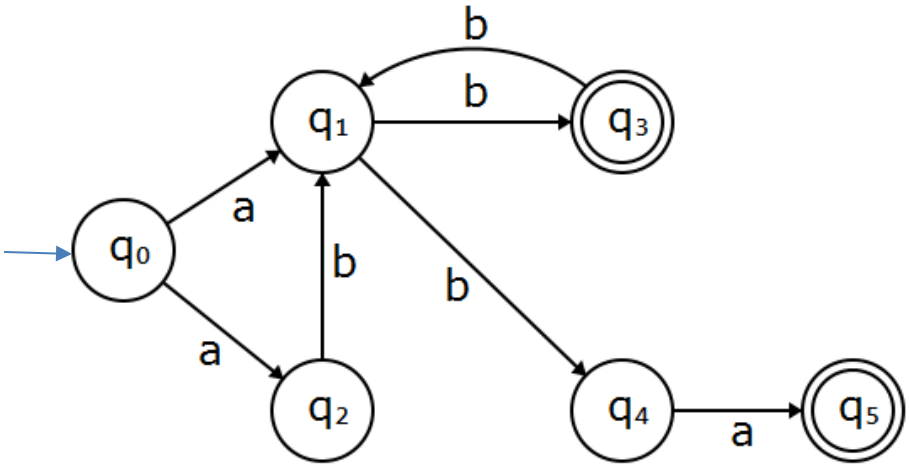
1. Differentiate between DFA, NFA and ε-NFA. Design a deterministic finite automata for the following language:
   a) Accepting string over {a, b} containing either 'ab' or 'bba' as substring.
   b) Which accepts the strings with an even number of 0's followed by a single 1.
   c) For the regular expression (a(ab)*b)*
2. Convert into DFA:
   a)



   b)



   c)



3. Construct a NFA for the language (ab*a* ∪ b*aa). Provide any two accepted strings and two rejected strings.
4. Minimize the following DFA (Draw initial diagram first). Specify performed operations in each step

δ/Σ	0	1
$\rightarrow q_0$	q_1	q_2
$*q_1$	q_1	q_3
$*q_2$	q_2	q_2
$*q_3$	q_5	q_2
$*q_4$	q_4	q_2
$*q_5$	q_4	q_2
q_6	q_5	q_6
q_7	q_5	q_6

5. Describe the closure properties of regular languages.
6. State Pumping Lemma for regular language. Show that the following language are not regular using Pumping Lemma
   a) $L= \{0^n12^n : n \geq 0 \}$
   b) $L = \{1^n : n \text{ is a prime number}\}$
   c) $1 = \{a^nb^{2n} : n \geq 1\}$
7. Define countably infinite and uncountable sets with example. What are the differences between-reflexive relation and reflexive closure?
8. Justify that "The complement of diagonal set is different from each row sets." with the help of diagonalization principle. Show that if 3n+2 is odd then n is odd by using proof by contradiction technique.
9. State Pigeonhole Principle. What is the basic principle of proof using Mathematical Induction? Illustrate with any one example.
10. Define function with its types and example. Explain equivalence relations and partial order relations with examples of each.