# Important Questions for Mid-1
Subject: ATCD

1. a) Define DFA. Design DFA to accept strings with 'a' and 'b' such that number of b's are divisible by 4. Represent DFA by transition table. Show the moves of DFA for the string **ababbab**

   b) Differentiate between NFA and DFA?

2. a) What is DFA? Design a DFA to accept the language L = {w |w has both an even number of 0's and an even number of 1's}.Represent DFA by transition table. Show the transitions of DFA for the string **110101.**

   b) Bring out the differences between Moore and Mealy machines?

3. a) What is minimal DFA? Minimize the following DFA where q_1 is the start state and q_6 is the final state.

δ	0	1
q_1	q_2	q_3
q_2	q_4	q_5
q_3	q_6	q_7
q_4	q_4	q_5
q_5	q_6	q_7
q_6	q_4	q_5
q_7	q_6	q_7

   b) Describe the procedure of converting NFA to DFA. Convert the given NFA to equivalent DFA
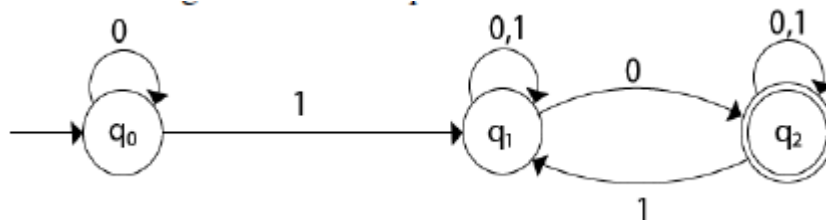

4. a) Define NFA with ∈- moves. Convert the following NFA-ε to NFA
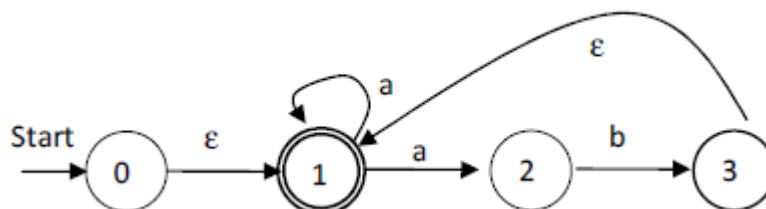
   b) Design a Moore machine and Mealy machine for 2's complement of binary number

5. a) Define regular expression. Give regular expression for the following languages.

   i) Strings over the alphabet {a, b} ending with ab

   ii) Strings over the alphabet {0,1} that contain substring 10

   iii) Strings over the alphabet {0,1} that contain 1 in the 3rd position from right end

   b) Construct a NFA then DFA for the Regular expression (0+1)* (00+11) (0+1)* ?

6. a) Write the steps to construct regular expression from given DFA? Convert the following DFA to a regular expression.
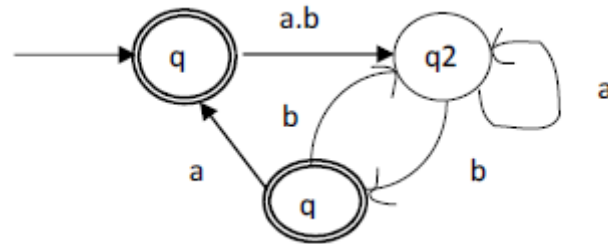
b) Describe the closure properties of Regular sets.

7. a) Construct a NFA-ε equivalent to the regular expressions
   i) $10(0+11)0*1$
   ii) $(a+b)*b(a+b)$
   b) State and explain the pumping lemma for Regular languages.

8. a) What is regular expression? Write regular expressions for the following languages:
   i)The set of strings over alphabet {a,b,c} containing at least one a and at least one b.
   ii)The set of strings over alphabet {0,1} containing alternating 0's and 1's
   iii)The set of all strings over {0,1} of length 6 or less.
   b) Explain about the identity rules of Regular Expressions?

9. a) Define NFA and DFA? Find the NFA's and DFA's accepting for the following languages over the alphabet {a,b,c}:
   i) The set of all strings with **abc** as a substring
   ii) The set of all strings ending in **abc**
   iii) The set of all strings starting with **abc**
   b) Convert the following Mealy machine into equivalent Moore machine.
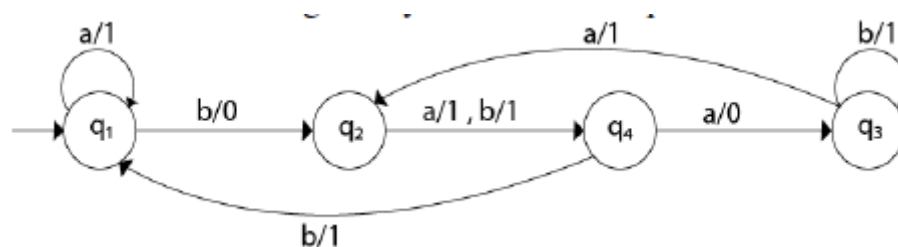
10. a) Construct a PDA for L={a^nb^n /n ≥1}. Draw transition diagram. Using the instantaneous description notation process the string **aaabbb**
    b) Define Push Down Automata. Explain the basic structure of PDA with a neat graphical representation

11. a) Define PDA and instantaneous description of PDA. Obtain a PDA to accept the language L={ wcw^R : w ∈{a,b}*}.Draw transition diagram of PDA. Show the moves by this PDA for string **abbcbba**
    b) Differentiate between Deterministic PDA and Non-deterministic PDA.

12. Design PDA's for the following languages by Empty Stack?
    i) L = { a^n b^n c^m /n, m>=1}
    ii) L = { a^m b^n c^{m+n} /n, m>=1}
    iii) L = { $a^nb^mc^m$ d^n /n, m>=1}