Tutorial 2

Thapar Institute of Engineering and Technology Patiala

Computer Science and Engineering Department (CSED)

1. Write down a R.E. over {0, 1} such that no. of 1's are divisible by 4.
2. Write down a regular expression for language L over {a, b, c} such that every string in L contains a substring ccc.
3. Write down a R.E. for the language L={w: | w | mod 5=0}, $w \in (a,b)^*$ }
4. Write down a R.E. over alphabet $\sum = \{a,b,c\}$ containing at least one a and at least one b.
5. Write the Regular expression for the language of all even length strings defined over $\sum = \{a,b\}$.
6. Write the Regular expression for the language of all even length strings defined over $\sum = \{a,b\}$.
7. Write the Regular expression for the language $L = \{a^n b^m \mid n,m \geq 1\}$ over $\sum = \{a,b\}$.
8. Write the Regular expression for the language $L = \{a^n b^m \mid n,m \geq 0\}$ over $\sum = \{a,b\}$.
9. Write down a R.E. over {0, 1} whose fifth symbol from the right end is 1.
9. Design the DFA for the problem given in Q1-8.

dfa and regular expression for following

Tutorial 3

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1. Design a DFA over $\{a, b\}$ that accepts only those words that do not end with ba.

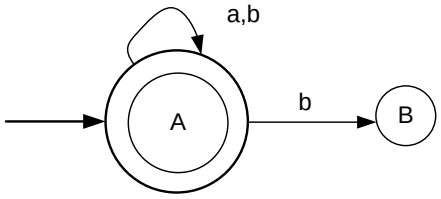
2. Design a DFA over $\{0,1\}$ that accept all strings not containing substring 00 .

3. Design a DFA over $\{0,1\}$ that accepts all strings not containing even number of letters.

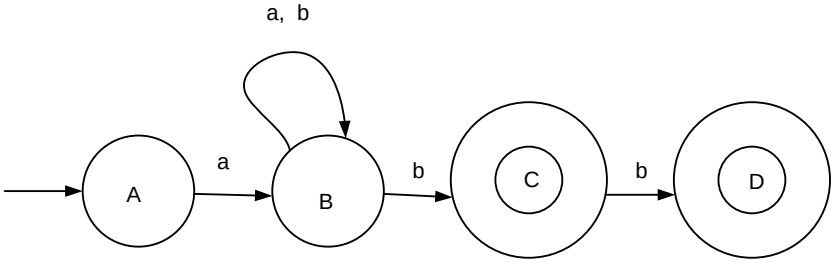
4. Design a DFA that accepts only those words that begin or end with a double letter.

5. Convert each of the following NFA's in to DFA's.

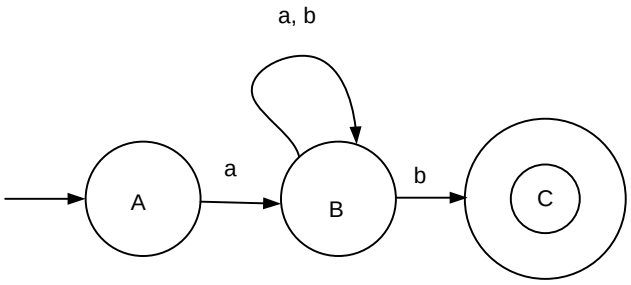
(a)



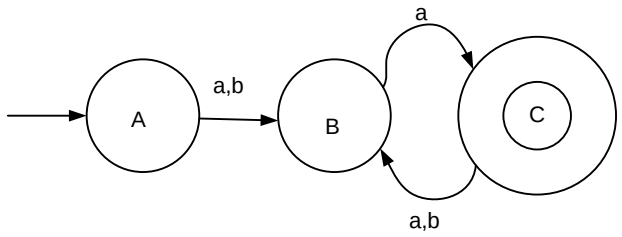
(b)



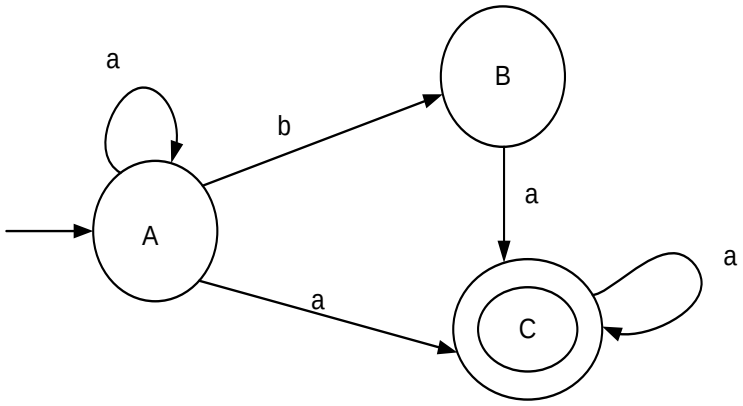
(c)



(d)



(e)



6. Find a string of minimum length in $\{0,1\}^*$ not in the language corresponding to the given regular expression.

a. $1^*(01)^*0^*$

b. $1^*(0+10)^*1^*$

c. $(0^*+1^*)(0^*+1^*)(0^*+1^*)$

7. For each of the following regular expressions, draw an FA recognizing the corresponding language.

(a) $(0+1)^*(1+00)(0+1)^*$

(b) $(11+10)^*$

(c) $(0+1)^* 0$

TUTORIAL 4

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1. Design a Moore machine over $\sum = \{a, b\}$ which counts the occurrences of substring aab in the input string.

2. Design a Moore machine which determines the residue mod-3 for each binary string treated as binary integer.

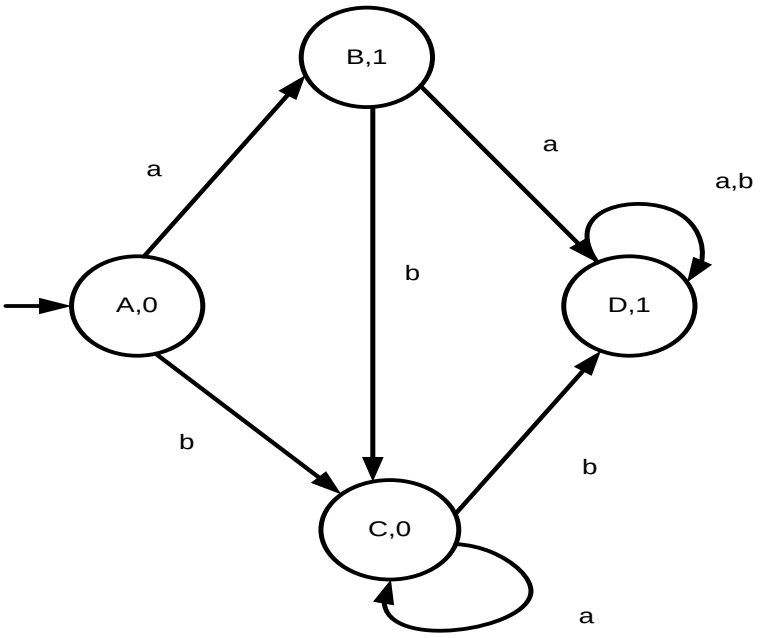
3. Design a Mealy machine which calculates residue mod-4 for each binary string treated as a binary integer.

4. Design a Mealy machine which can output EVEN (E) ODD (O) according as total number of 1's encountered is even or odd. The input symbols are 0 and 1.

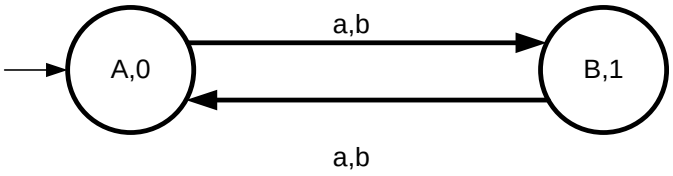
5. Design the Mealy and Moore machine for the following processes. For input from $(0+1)^*$, if the input ends in 101, output A; if input ends in 110, outputs B, otherwise output C.

6. Convert the following Moore machine into Mealy machine:

(a.)

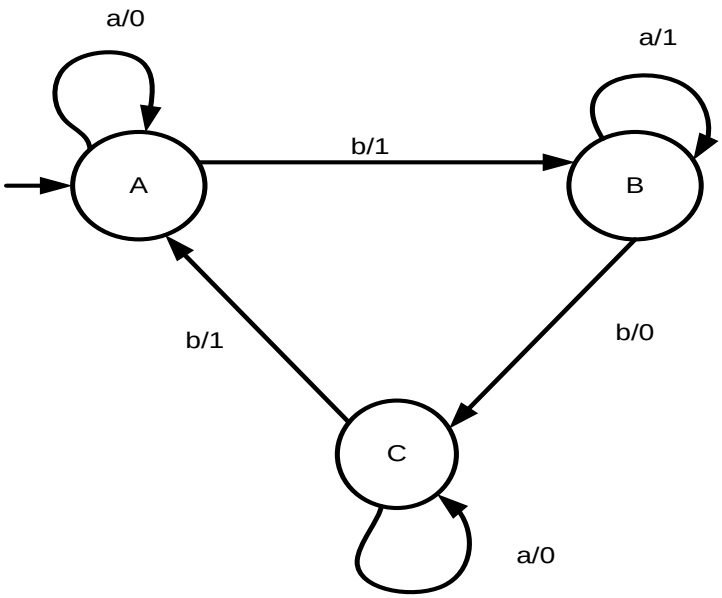


(b)

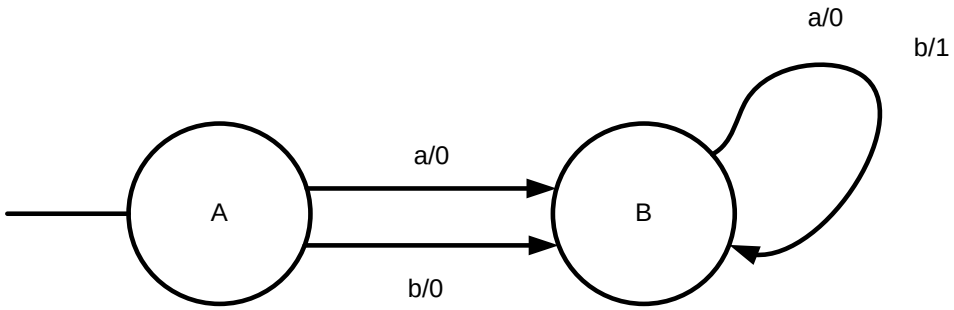


7. Convert the following Mealy machine into Moore machine:

(a.)



(b)


a/0
b/1
a/0
A
B
b/0

TUTORIAL 5

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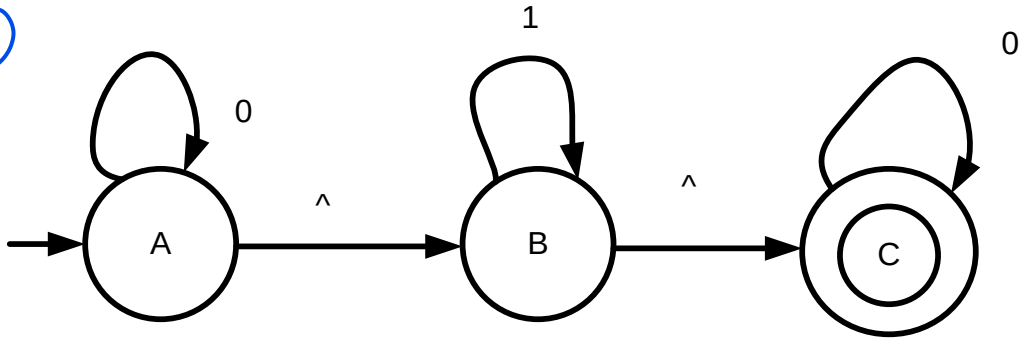
1. Consider the NFA given by the following diagram:



Find the equivalent NFA without $\wedge$ – transitions.

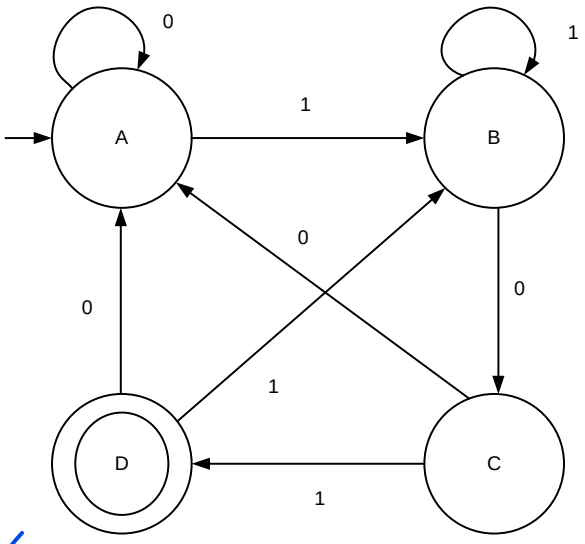
2. Use Thompson's construction to construct a NFA for the following regular expression

$(aa \mid b)^*(a \mid cc)^*$ and convert this NDFA into DFA by using subset construction and then minimize it.

3. Use Thompson's construction to construct a NFA for the following regular expression

$(a \mid b)a^*$ and convert this NDFA into DFA by using subset construction and then minimize it.

4. Find the regular expression corresponding to the figure by using state elimination method and Arden Theorem



5. Write the left-linear and right-linear regular grammar over $\sum = \{a, b\}$, such that string contains at least one ***a*** or one ***b***.

6. Write the left-linear and right-linear regular grammar over $\sum = \{0,1\}$, containing substring ***001.***

7. Write a left-linear and right-linear regular grammar over $\sum = \{a, b\}$, such that string contain at most three ***a's***.

8. Using Pumping Lemma, prove that $L = \{ww \mid w \in \{0,1\}^*\}$ is not regular.