

Course Code: CS3005	Course Name: Theory of Automata
Student Roll No:	Section No:

Question # 1 (5 Points)

Prove or Disprove the following alphabet

$\Sigma = \{CaC, C, Cb, CC\}$ is valid by any example string of your choice

CaC: If you make tokens of this word it would create ambiguity

Alphabets can't have same prefixes.

$$c^+a^*b^*$$

Question # 3 (5+5 Points)

Write down the RE for following languages.

a) $\{awaa: w \geq 3, w \in \{b\{a, b\}^*bb\}\}$

$$ab(a+b)^*bbaa$$

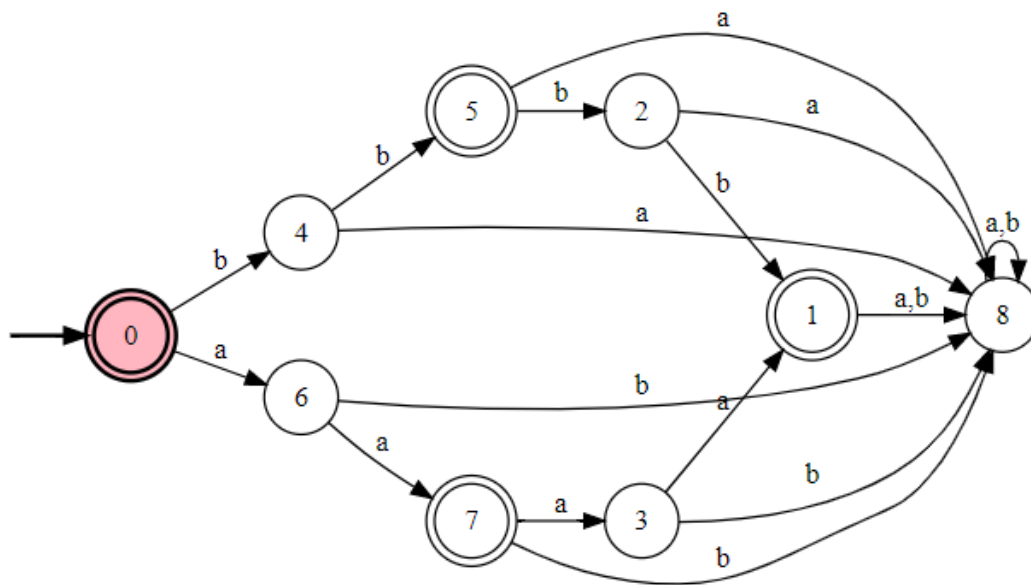
b) Language of the words that **start and end with different double letters** and have **bab** as a substring.

$$aa(a+b)^*bab(a+b)^*bb + bb(a+b)^*bab(a+b)^*aa + bbab(a+b)^*aa$$

Question # 4 (5+5 Points)

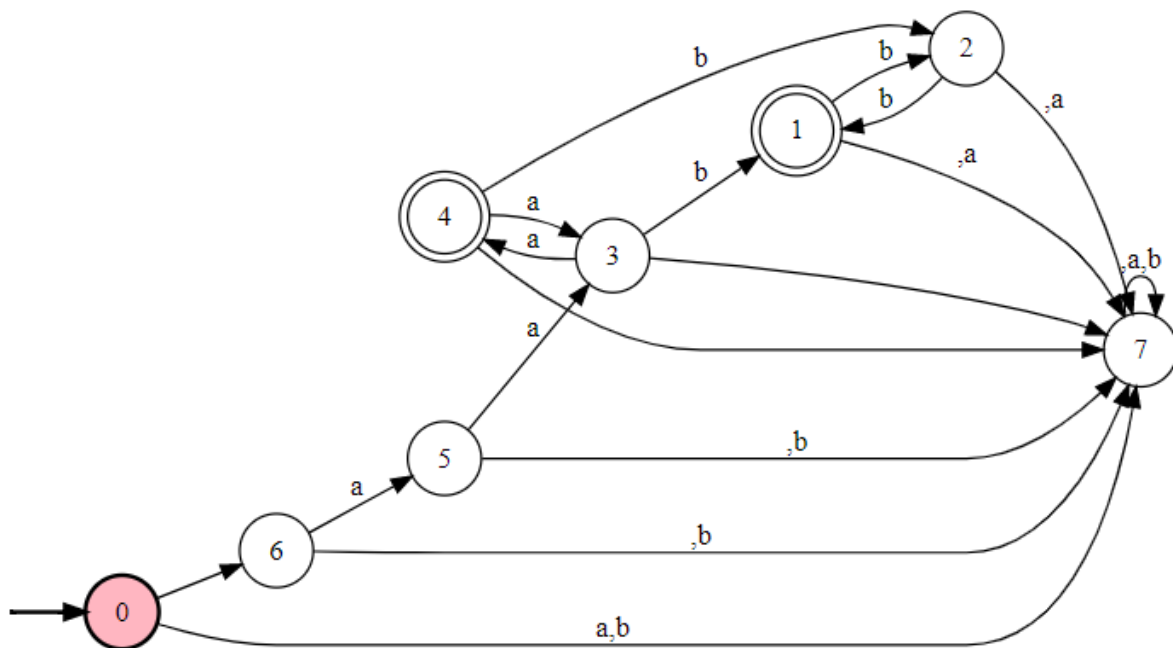
Design the FA for following languages

a. $L = \{aa, bb, aaaa, bbbb, \lambda\}$



b. $L = \{vwz: |w| = 1, v \in \{aa\}^+, z \in \{bb\}^*, w \in \{a, b\}^* \}$

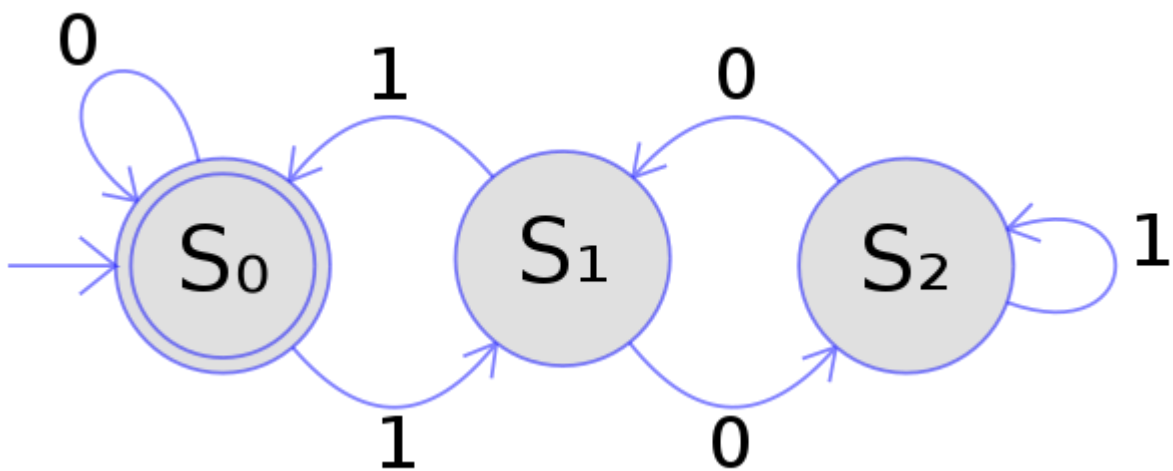
$$(aa)^+(a+b)(bb)^*$$



Question # 5 (5 Points)

Convert the following NFA to DFA

This is DFA already as I said every DFA is single ton NFA.



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Question # 1 (5 Points)

Prove or Disprove the following alphabet

$\Sigma = \{D, F, Daa, DB\}$ is valid by any example string of your choice

DaaD, when we tokenize this word, we would go in ambiguity so the alphabet is ambiguous.

Question # 3 (5+5 Points)

Write down the RE for following languages.

c) $\{aawab: |w| \geq 4, w \in \{ba\{a, b\}^*ba\}\}$

$$aaba(a + b)^*ba$$

d) Language of the words that **start with aa and end bb** and have **aab** as a substring.

$$aabb + aaabb + aa(a + b)^*aab(a + b)^*bb$$

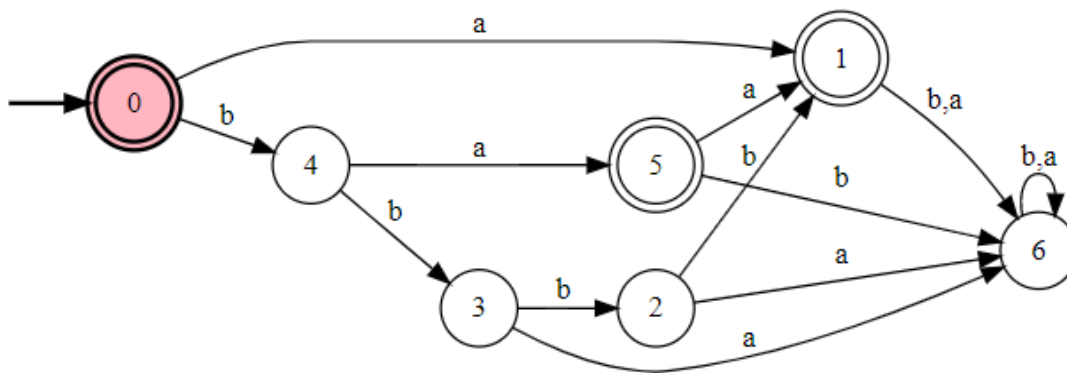
If we take aabb the word would be aabb, which has substring aab.

Same for aaab.

Question # 4 (5+5 Points)

Design the FA for following languages

c. $L = \{bbbb, a, \lambda, ba, baa\}$

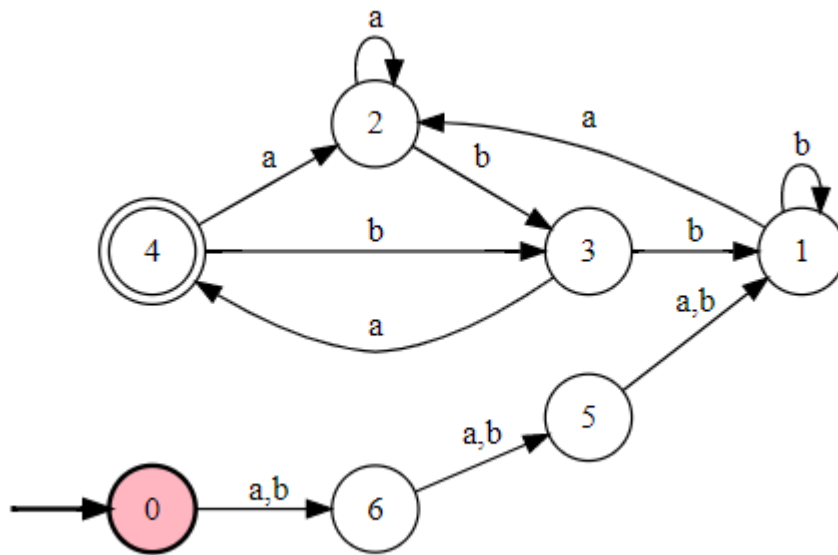


d. $L = \{zwv : |w| = 2, w \in \{a, b\}^+, z \in \{a, b\}^+, v \in \{aba\}^+ \}$

$$(a + b)^+(a + b)(a + b)^+(aba)^+$$

OR

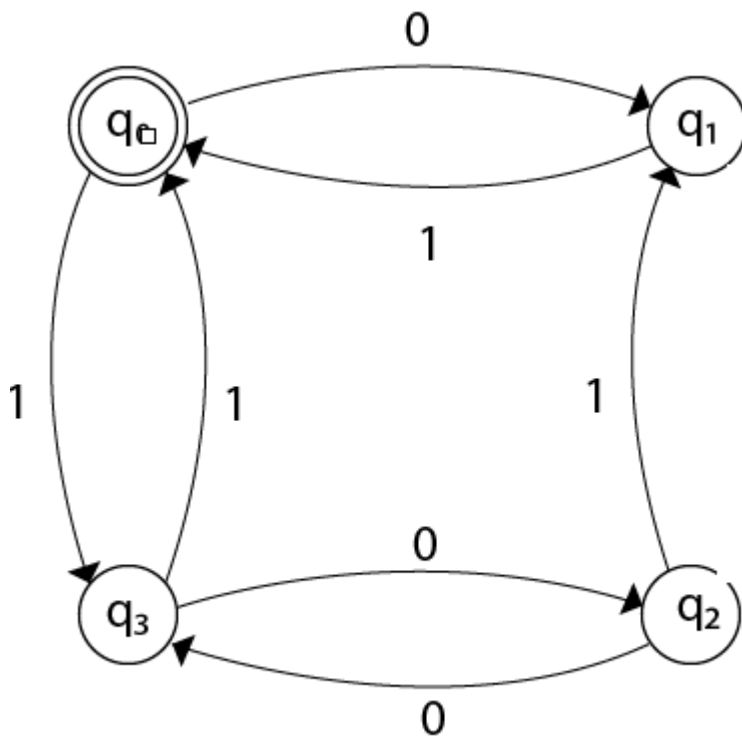
$$(a + b)(a + b)(a + b)^+(aba)^+$$



Question # 5 (5 Points)

Convert the following NFA to DFA

In a precise way send 0 from q2 to dead state



Question # 1 (5 Points)

Prove or Disprove the following alphabet

$\Sigma = \{Da, bb, aa, CC\}$ is valid by any example string of your choice

This is a valid alphabet there are no same prefixess

Question # 3 (5+5 Points)

Write down the RE for following languages.

e) $\{abwba : |w| \leq 3, w \in \{b\{a, b\}^*b\}\}$

$$abb(a + b + \lambda)bba$$

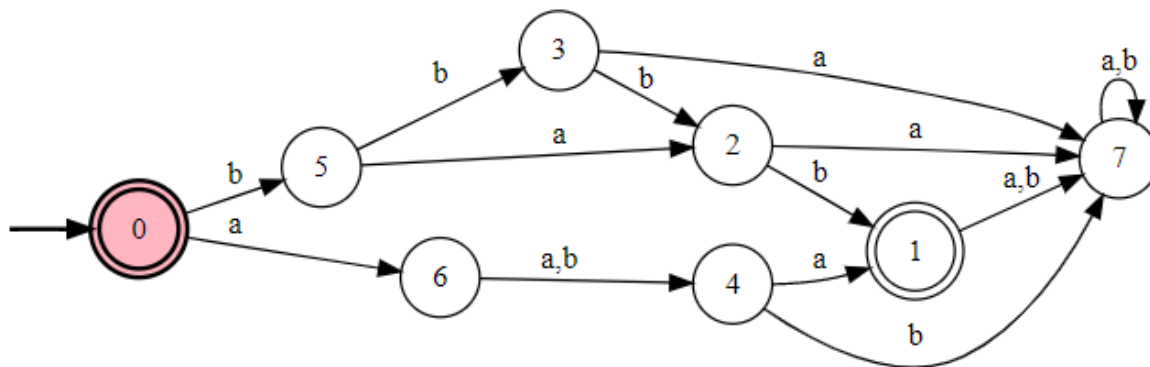
f) Language of the words that **start with ba** and **end with ab** and have **bbb** as a substring.

$$ba(a + b)^*bbb(a + b)^*ab$$

Question # 4 (5+5 Points)

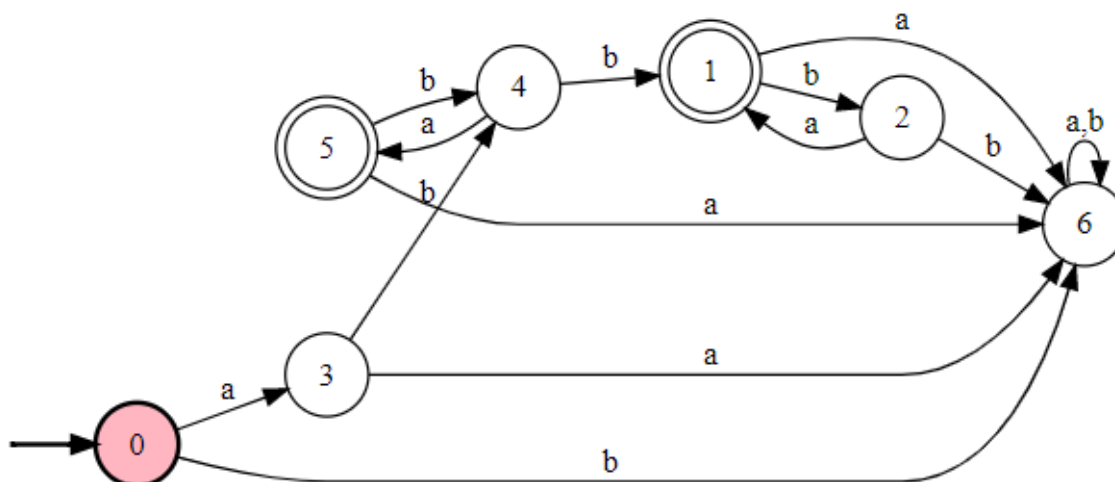
Design the FA for following languages

e. $L = \{aaa, bab, aba, bbbb, \lambda\}$



f. $L = \{vwz : |w| = 1, v \in \{ab\}^+, z \in \{ba\}^*, w \in \{a, b\}^*\}$

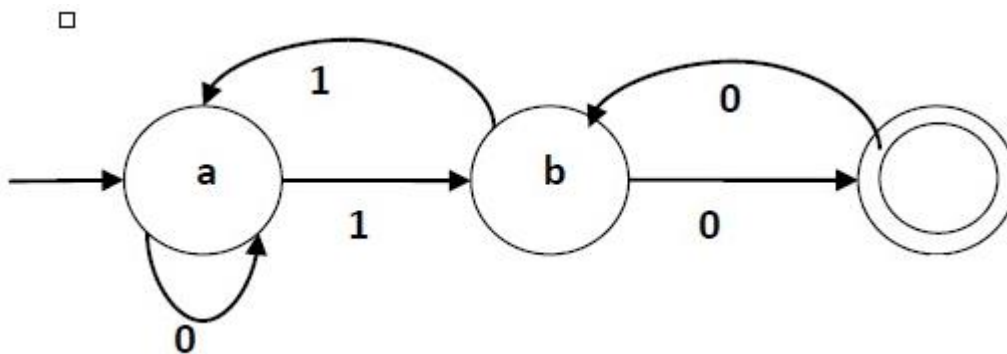
$$(ab)^+(a+b)(ba)^*$$



Question # 5 (5 Points)

Convert the following NFA to DFA

Draw outgoing transition of final state to a newly introduced dead state.



Question # 1 (5 Points)

Prove or Diprove the following alphabet

$\Sigma = \{C, Ca, Cb, aaa\}$ is valid by any example string of your choice

CCa, in this lexical analyser would get confused so this is not valid alphabet.

Question # 3 (5+5 Points)

Write down the RE for following languages.

g) $\{abbwbba: |w| \leq 3, w \in \{a, b\}^+ b\}$

$abba(a + b + \lambda)bbba$

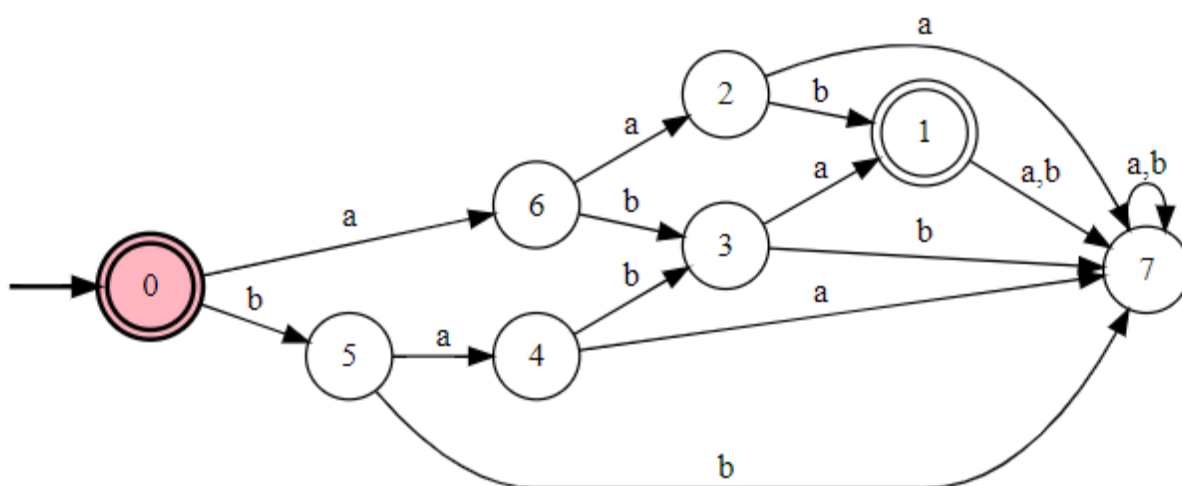
h) Language of the words that **start with aaa** and **end with abbb** and have **bbb** as a substring.

$aaa(a + b)^*abbb$

Question # 4 (5+5 Points)

Design the FA for following languages

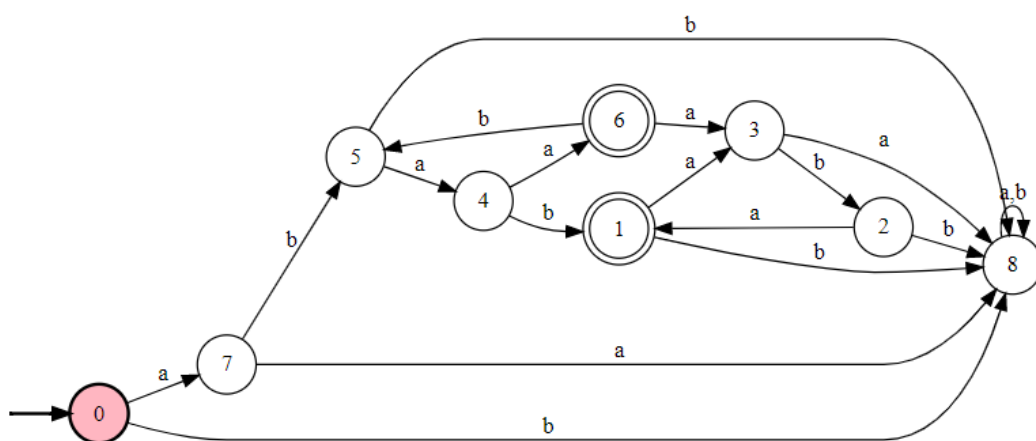
g. $L = \{aba, baba, aab, \lambda\}$



h. $L = \{vwz: |w| = 1, v \in \{aba\}^+, z \in \{aba\}^*, w \in \{a, b\}^*\}$

$$(aba)^+(a+b)(aba)^*$$

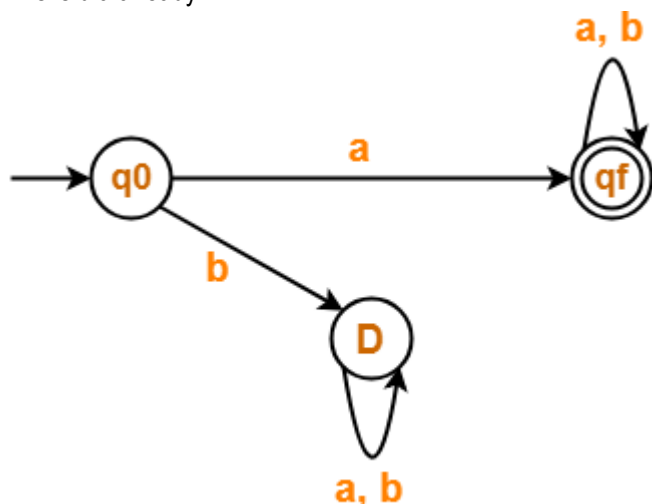
Type equation here.



Question # 5 (5 Points)

Convert the following NFA to DFA.

This is dfa already



Question # 1 (5 Points)

Prove or Disprove the following alphabet

$\Sigma = \{CaA, CA, Cb, CC\}$ is valid by any example string of your choice

CACb would create ambiguity while parsing

Question # 3 (5+5 Points)

Write down the RE for following languages.

Note: w is already >3

a) $\{aawaa: |w| \geq 3, w \in \{aa\{a, b\}^*bb\}\}$
 $aaaa(a+b)^*bbbb$

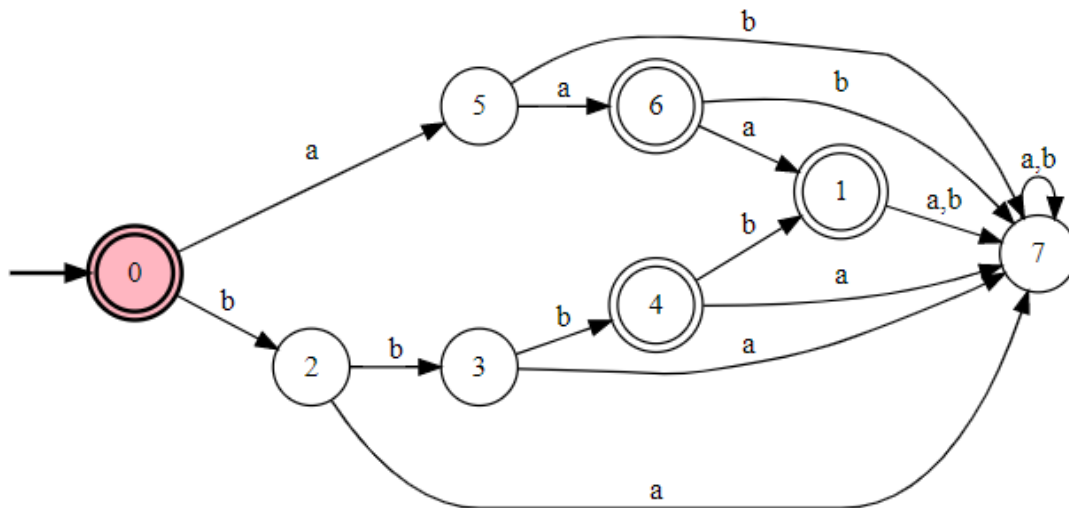
b) Language of the words that **start and end with different double letters** and have **aaa** as a substring.

$$aa(a+b)^*aaa(a+b)^*bb + aaabb + aaaabb + bb(a+b)^*aaa(a+b)^*aa + bbaaa + bbaaaa$$

Question # 4 (5+5 Points)

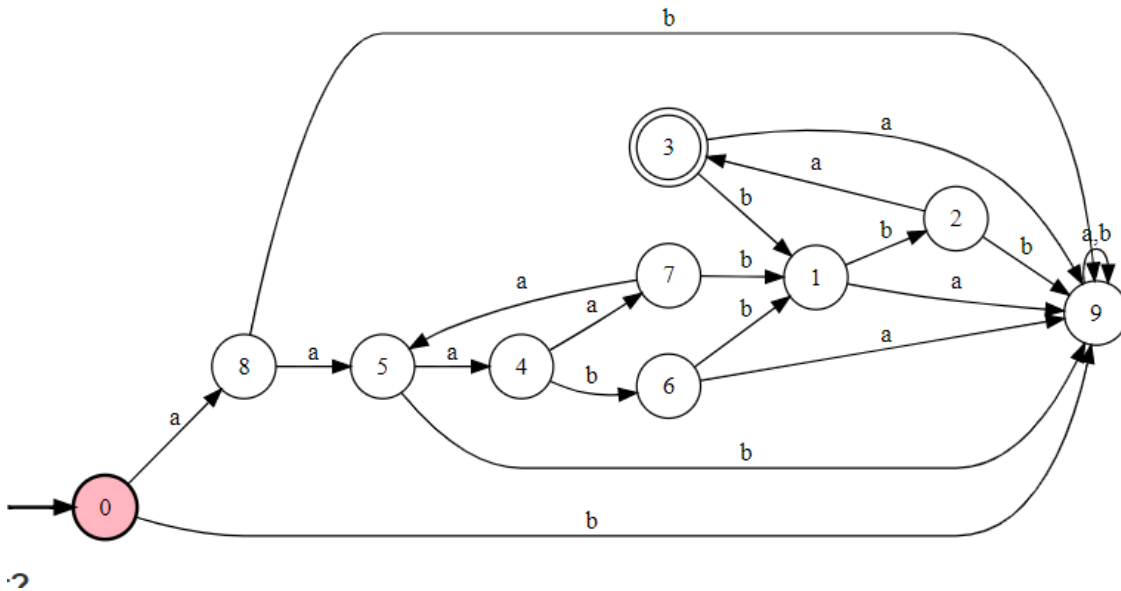
Design the FA for following languages

a. $L = \{aaa, bbb, aa, bbbb, \lambda\}$



b. $L = \{vwz: |w| = 1, v \in \{aaa\}^+, z \in \{bba\}^*, w \in \{a, b\}^*\}$

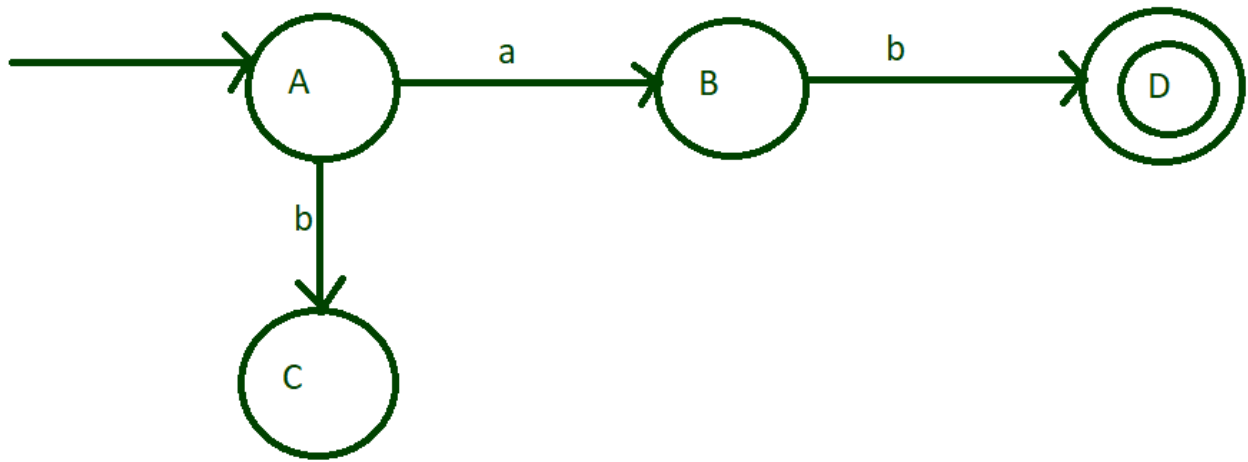
$$(aaa)^+(a + b)(bba)^*$$



Question # 5 (5 Points)

Convert the following NFA to DFA.

Send the missing transition to the dead state it would become DFA



Question # 1 (5 Points)

Prove or Disprove the following alphabet

$\Sigma = \{B, Bcc, BC, ab\}$ is valid by any example string of your choice

BccB would create ambiguity for lexical analyser

Question # 3 (5+5 Points)

Write down the RE for following languages.

c) $\{awa : |w| \leq 2, w \in \{a\{a, b\}^*b\}\}$

$$aa(a + b)^*ba$$

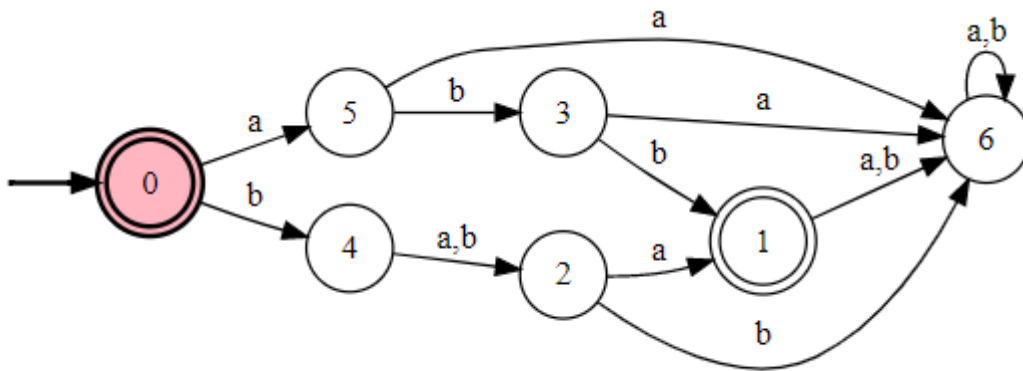
d) Language of the words that **start and end with same double letters** and have **abb** as a substring.

$$aabbbaa + aa(a + b)^*abb(a + b)^*aa + bb(a + b)^*abb(a + b)^*bb$$

Question # 4 (5+5 Points)

Design the FA for following languages

c. $L = \{abb, baa, \lambda, bba, bba\}$

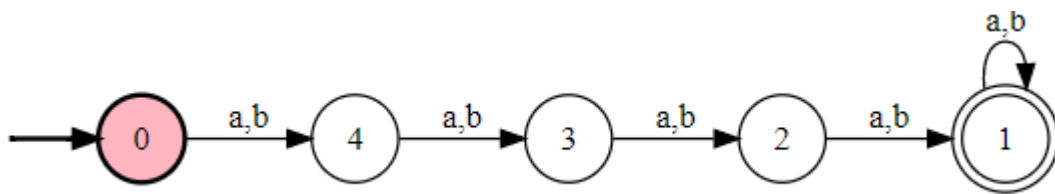


d. $L = \{vwz: |w| = 3, v \in \{a, b\}^+, z \in \{a, b\}^*, w \in \{a, b\}^+\}$

$$(a + b)^+(a + b)(a + b)(a + b)(a + b)^*$$

Or

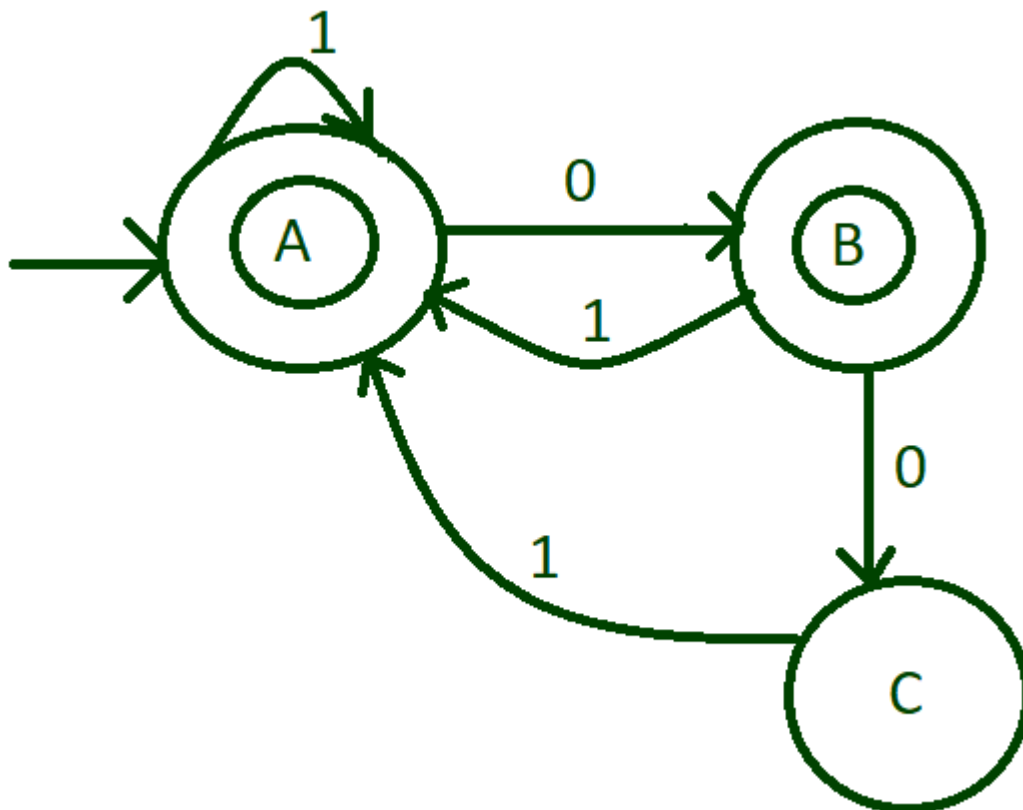
$$(a + b)(a + b)(a + b)(a + b)(a + b)^*$$



Question # 5 (5 Points)

Convert the following NFA to DFA.

Send the missing outgoing transitions to dead state the NFA would be converted to DFA



Question # 1 (5 Points)

Prove or Disprove the following alphabet

$\Sigma = \{D, Dbb, BC, abc\}$ is valid by any example string of your choice

Question # 3 (5+5 Points)

Write down the RE for following languages.

e) $\{awa : |w| \leq 4, w \in \{b\{a, b\}^*b\}\}$

$$ab(a + b)^*ba$$

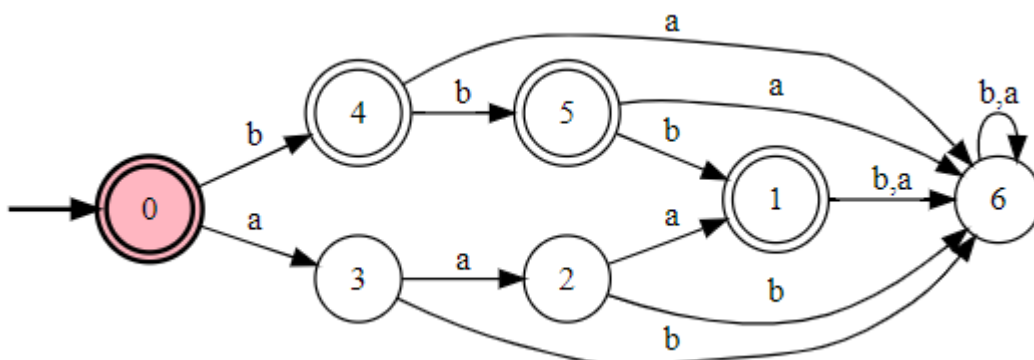
f) Language of the words that **start with ab** and **end aa** and have **baa** as a substring.

$$abaa + abaaa + ab(a + b)^*baa(a + b)^*aa$$

Question # 4 (5+5 Points)

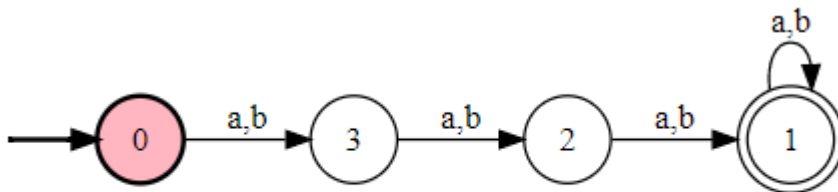
Design the FA for following languages

e. $L = \{bbb, aaa, \lambda, b, bb\}$



f. $L = \{zwv : |w| = 1, v \in \{a, b\}^+, z \in \{a, b\}^*, w \in \{a, b\}^+\}$

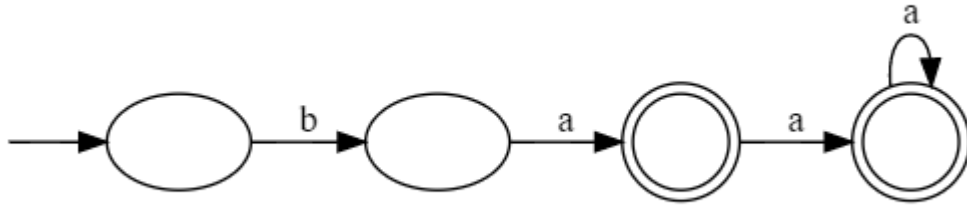
$$(a + b)(a + b)(a + b)^+$$



Question # 5 (5 Points)

Convert the following NFA to DFA.

If _____ alphabet _____ is _____ $\Sigma =$
 $\{a\}$ then this is DFA already, if you take alphabet $\Sigma\{a, b\}$ then send b from every state to dead state it
 It would converted to DFA



Question # 1 (5 Points)

Prove or Disprove the following alphabet

$\Sigma = \{A, ABC, BC, ab\}$ is valid by any example string of your choice

ABCA would create an ambiguity so its invalid

Question # 3 (5+5 Points)

Write down the RE for following languages.

$$\text{g) } \{awb: |w| \leq 3, w \in \{a\{a, b\}^*a\}\}$$

$$aa(a + b + \lambda)ab$$

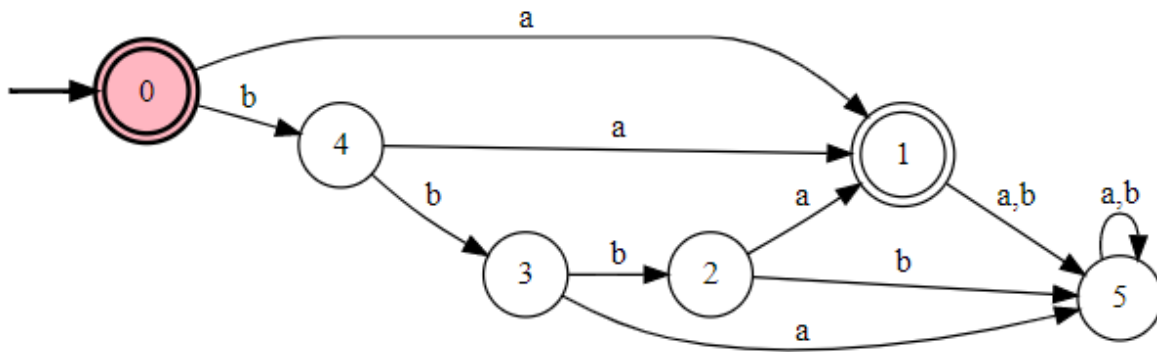
h) Language of the words that **start and end with different double letters** and have **aba** as a substring.

$$aababb + aa(a + b)^*aba(a + b)^*bb + bb(a + b)^*aba(a + b)^*aa$$

Question # 4 (5+5 Points)

Design the FA for following languages

$$\text{g. } L = \{a, ba, \lambda, bbba\}$$



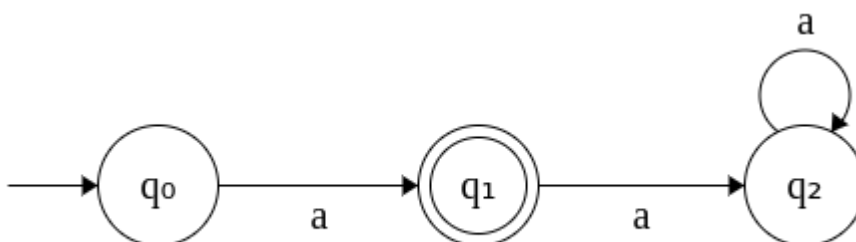
h. $L = \{vwz : |w| = 2, v \in \{a, b\}^*, z \in \{a, b\}^+, w \in \{a, b\}^+\}$

$$(a + b)(a + b)(a + b)(a + b)^*$$

Question # 5 (5 Points)

Convert the following NFA to DFA.

If alphabet is $\Sigma = \{a\}$ then this is DFA already, if you take alphabet $\Sigma = \{a, b\}$ then send b from every state to dead state it would converted to DFA



Question # 1 (5 Points)

Prove or Disprove the following alphabet

$\Sigma = \{Cd, C, Ca, cc\}$ is valid by any example string of your choice

Question # 3 (5+5 Points)

Write down the RE for following languages.

i) $\{awb: |w| \leq 4, w \in \{bb\{a, b\}^*b\}\}$
 $abb(a + b)^*bb$

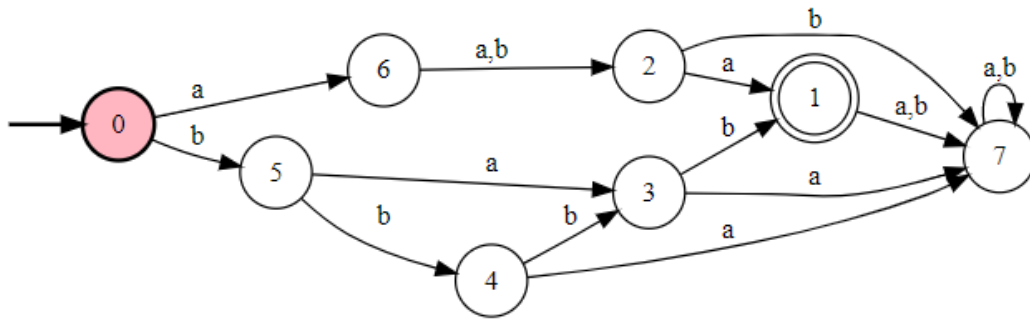
- j) Language of the words that **start with bb and end aa with** and have **baa** as a substring.

$$bbaa + bbaaa + bb(a + b)^*baa(a + b)^*aa$$

Question # 4 (5+5 Points)

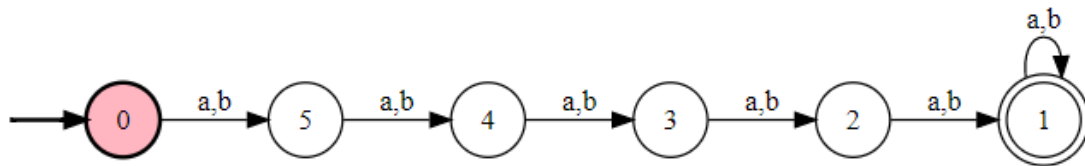
Design the FA for following languages

i. $L = \{aba, bab, bbbb, aaa\}$



j. $L = \{vwz: |v| = 4, v \in \{a, b\}^*, z \in \{a, b\}^+, w \in \{a, b\}^*\}$

$(a + b)(a + b)(a + b)(a + b)(a + b)^+$



Question # 5 (5 Points)

Convert the following NFA to DFA.

Draw the outgoing transition of **b** from c to dead state. This would become DFA

