Theory Of Automata

Spring 2021 retake Solution

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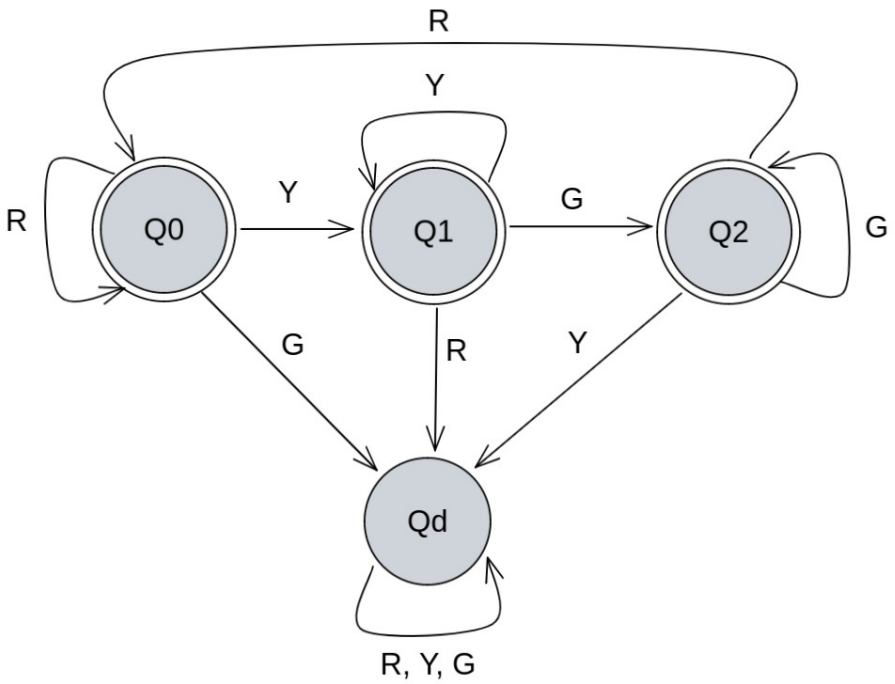
Question 1

A most common exam example for the finite automation can be related to the traffic lights. The traffic lights have three states namely red, yellow and green. Here the light starts from the red signal, then it comes to yellow and then finally it moves to green. There are two transitions from one state either it would remain at same state or it would move to different state, but it should follow the sequence. Design a DFA and transition table for the above problem, identify initial and final states.



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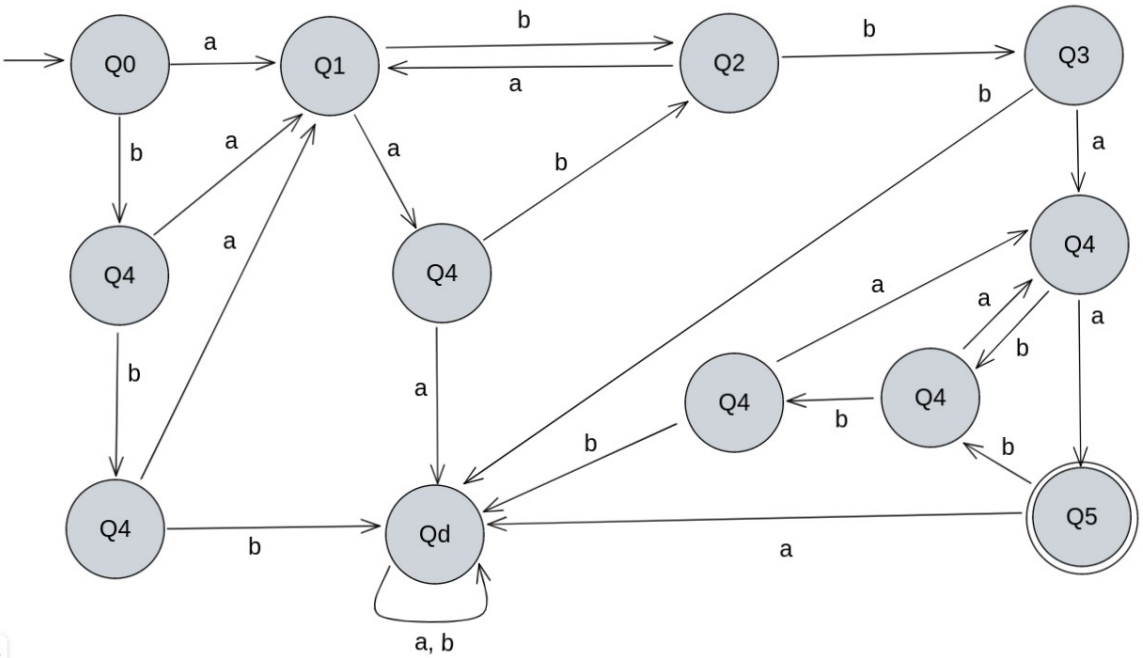
Question 2a

Find the DFA for the language L of string which contains the substring abb but not bbb and aaa and ends with aa.



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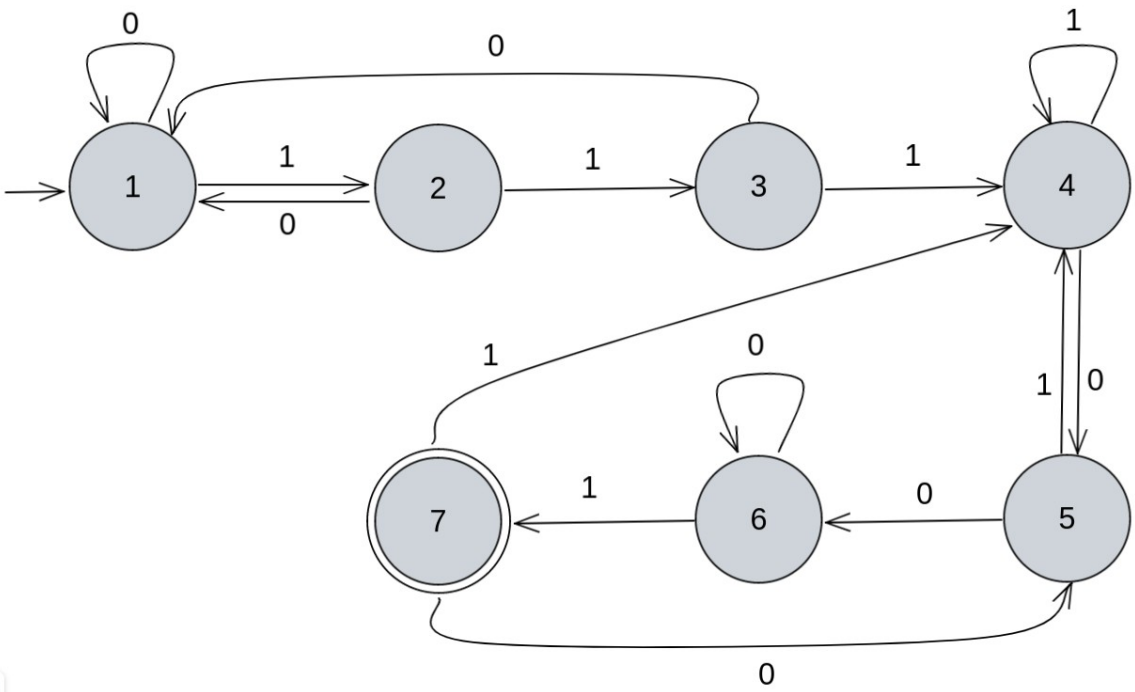
Question 2b

Construct the FA for the following regular expression.
(0+1)*111+(0+1)*001



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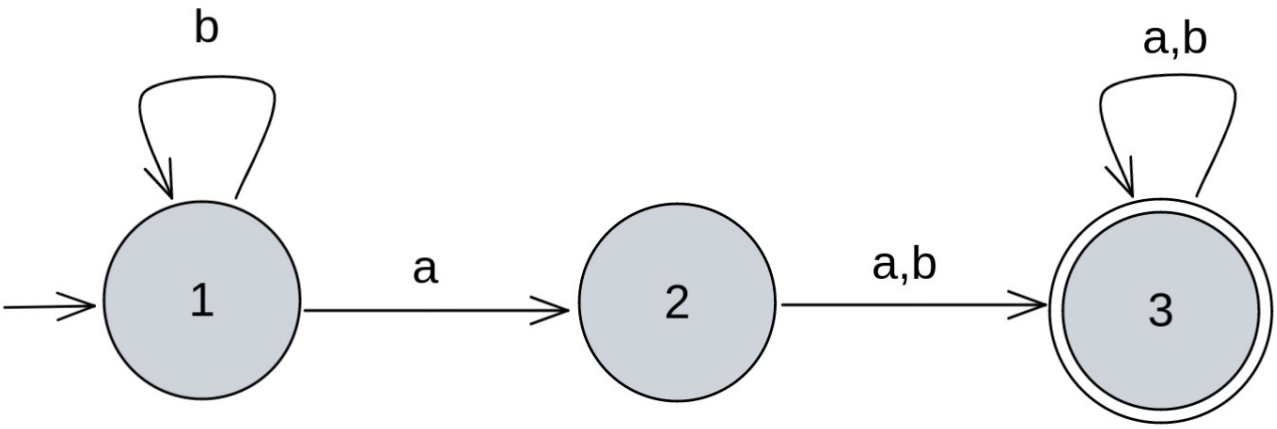
Question 2c

Find the DFA for the language L of string which contains the substring aa or ab.



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Question 3

Express each of these languages over using a regular expression.

a) $L_1 = \{a^n b^m : n \geq 4, m \leq 3\}$

$a^4 a^*(\lambda + b + b^2 + b^3)$

b) $L_2 = \{a^n b^m : n < 4, m \leq 3\}$

$(\lambda + a + a^2 + a^3)(\lambda + b + b^2 + b^3)$

c) The complement of L_1

$n < 4 , m > 4 \quad \rightarrow \quad (\lambda + a + a^2 + a^3)\, b^4 b^*$

d) The complement of L_2

$n \geq 4 , m > 3 \quad \rightarrow \quad a^4 a^*\, b^{4*}$

e) The set of strings upon S={0,1}, of one or more 0s followed by a 1

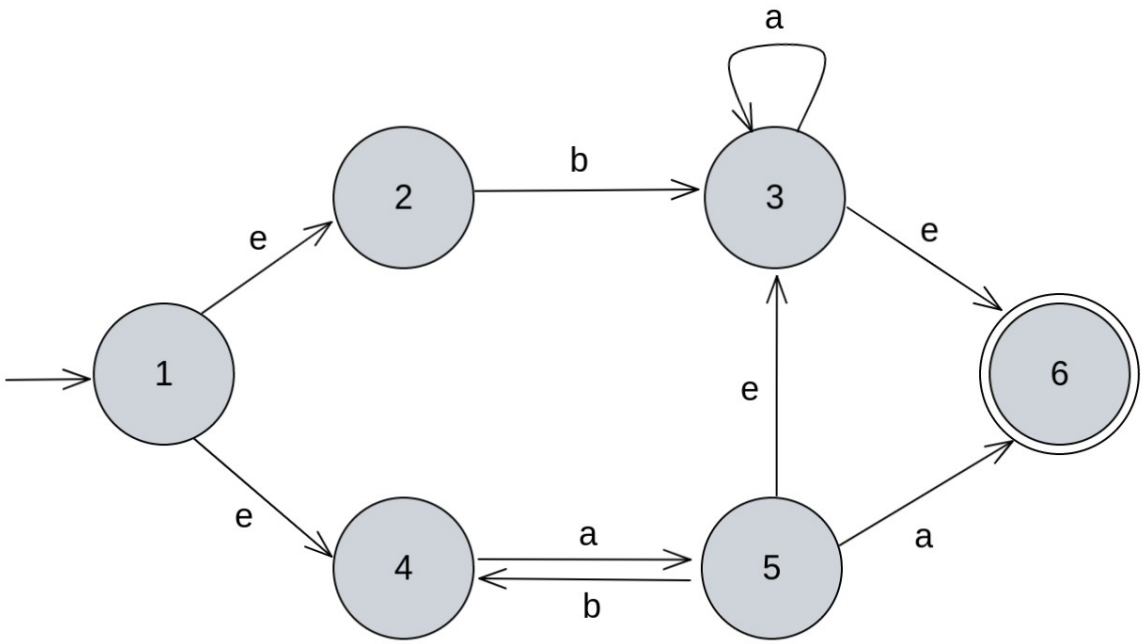
00^*1

f) The set of strings with either no 1 preceding a 0 or no 0 preceding a 1

$0^* + 1^*$

Question 4

Construct the DFA from the given Epsilon NFA

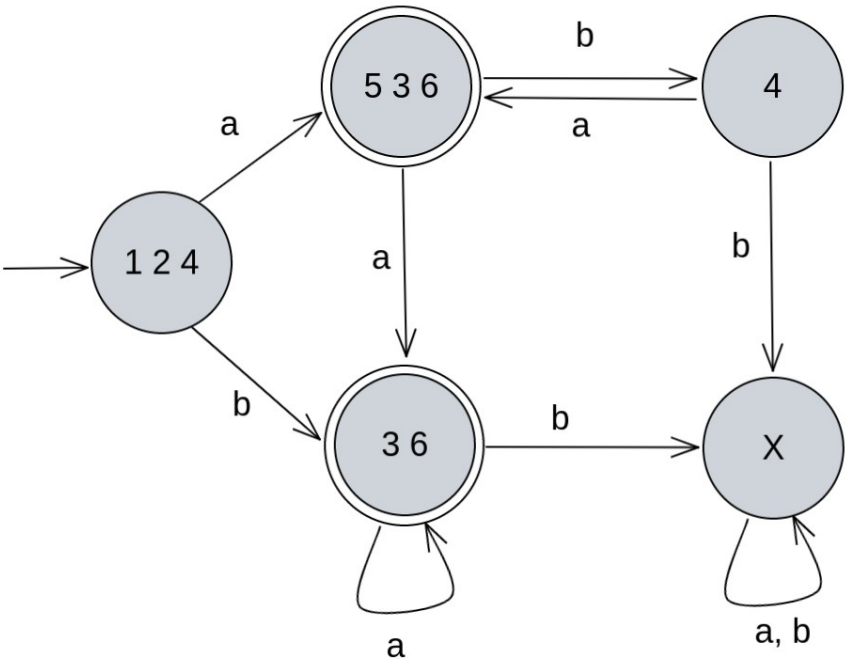


€ - Closure Table:

Q	λ-transition
1	1 2 4
2	2
3	3 6
4	4
5	3 6 5
6	6

Transition Table:

Q	a	b
1 2 4	5 3 6	3 6
5 3 6	3 6	4
3 6	3 6	-
4	5 36	-



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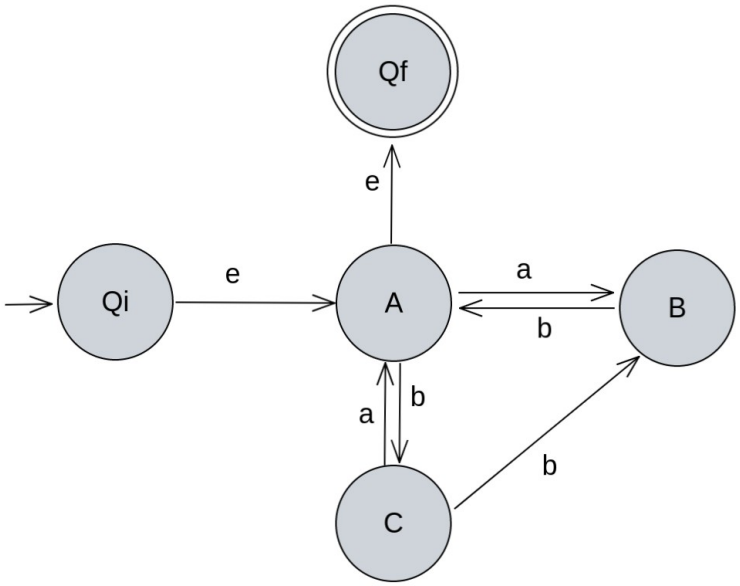
Question 5

Find the regular expression of the DFA given in figure, using state elimination method.



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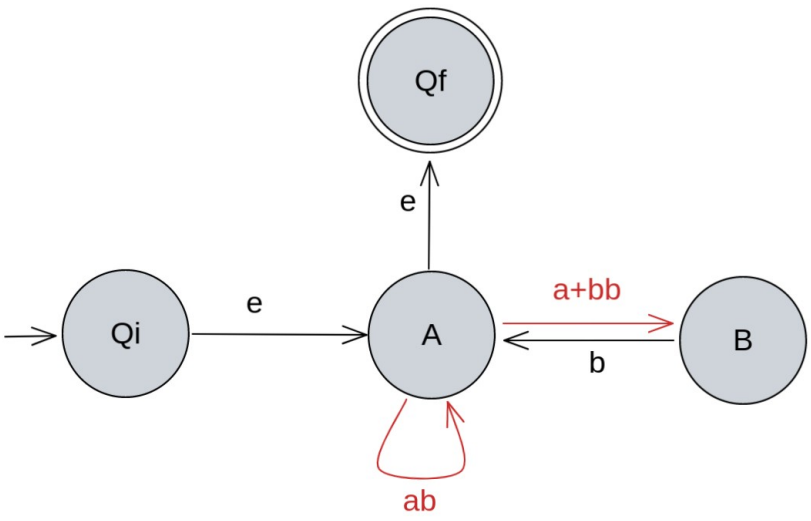

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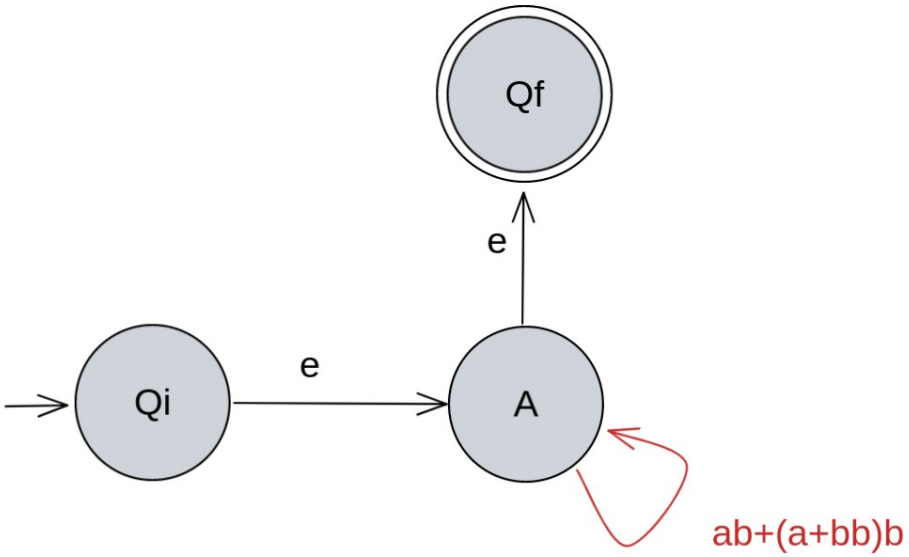

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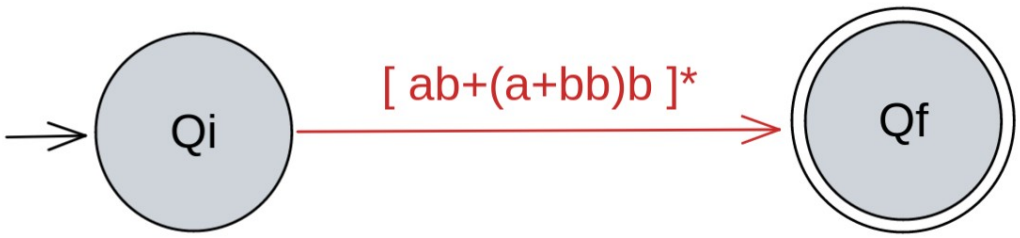

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