Middle East Technical University | Department of Computer Engineering

CENG 280

Formal Languages and Abstract Machines

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Homework 2

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Answer for Q1

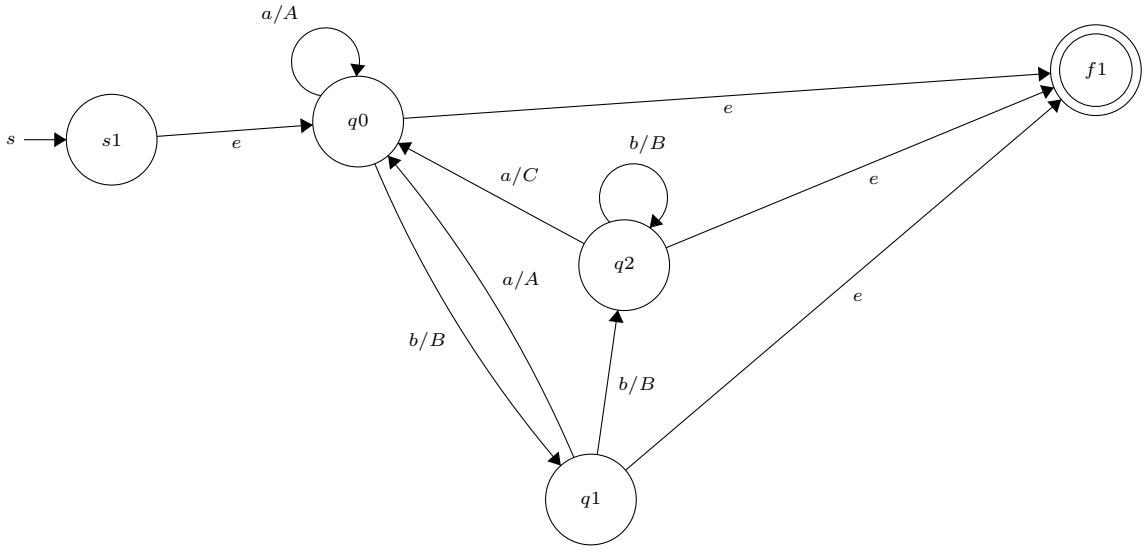
a. $(a(b+c)^*a+b+aa)(a+b)^*$

b.
A= 0:
B= 1:
C= 0,1:
D=2:
E=1:
F=0,2:

Answer for Q2

a. We should use state elimination algorithm to find the output language.

b. We pick q_0 as starting state and Final states as $[q_0, q_1, q_2]$, then we create a new start state (s_1) and connect it to q_0 with an empty transition. After that, we create a final state (f_1) and connect all final states to f_1 with empty transitions and make final states non-final. Now, after these updates, we are ready to use our algorithm. Also, we should change the output strings as given input-output pattern. Our new alphabet is $\Sigma = [A, B, C]$ It will look like this:



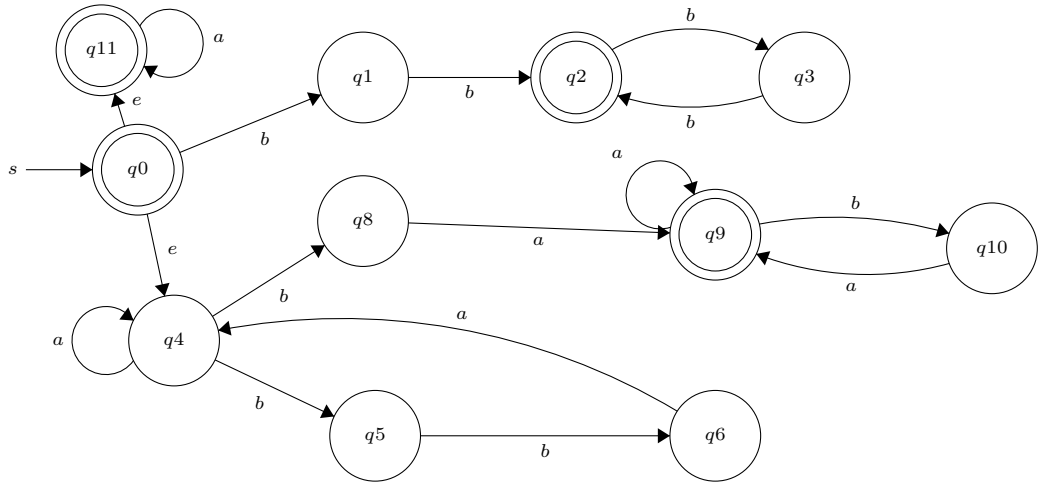
c.After making the changes in part 2, we can construct the desired part of the language which ends with C. We will follow the path q_0, q_1, q_2, q_0 path to reach the strings that end with C. We first eliminate the q_0. $A^*(BA)^*$ is the way of reaching q_1 considering the loops. To reach q_2 from q_1 we have only one option b/B. To reach q_0 from q_2 we can form B^*C strings and it is the desired final state. Putting it all together, our output language is $(A^*(BA)^*BBB^*C)^+$

Answer for Q3

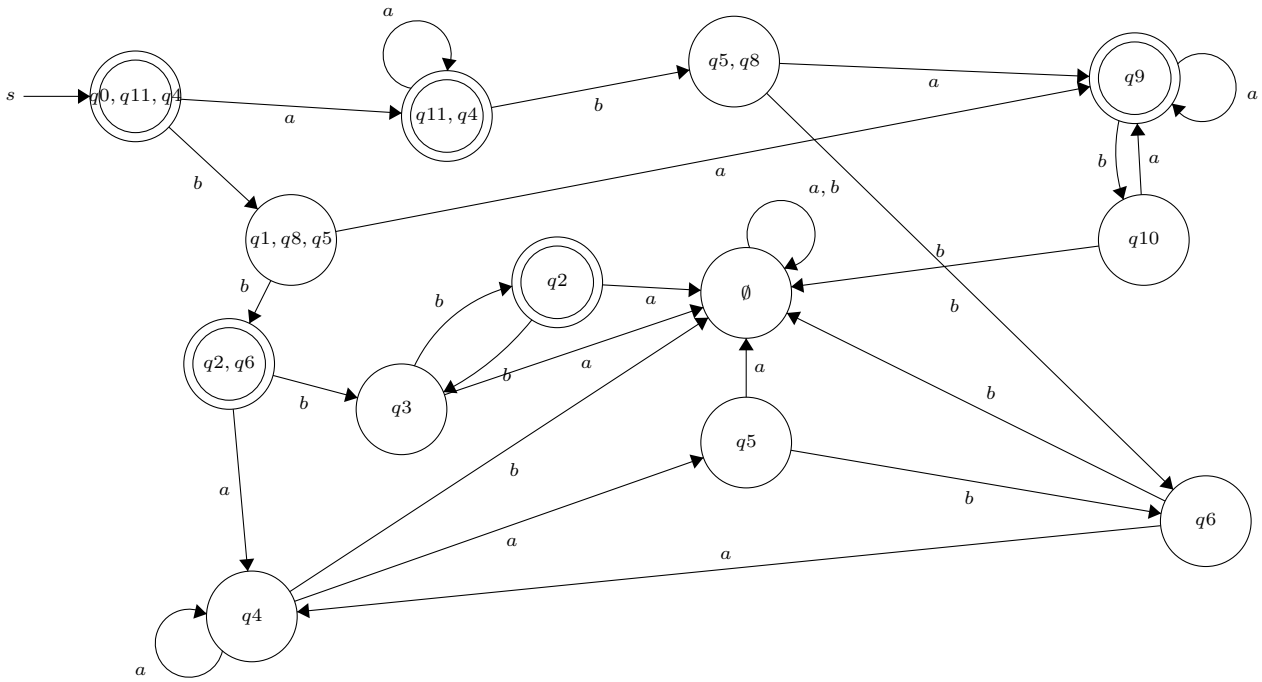
We first find a regular expression both we can get by the given regular expression and can be accepted by one of the NFA's.

Checking N_2, we can eliminate the upper loop (namely q_0, q_4, q_3 and q_0, q_3)since we cannot reach the final state from this loop since it ends with a trap state. Also, we can eliminate the q_0, q_1, q_2 path since our output regular expression does not contain strings with "BBA^*". Only string sequence can reach the final state of N_2 is A^* and BB.

Now let's look at N_3. In this NFA, we can eliminate the state q_4 since there is no way to go through it, no strings end with "CC". Also we can eliminate q_1 and q_2 since we cannot reach the final state using this path. And the only way to reach the final state is possible with q_0, q_3 since our RE can generate it. For the q_0, q_3 path, we can pass by using $(A + BBA)^*BA(A + BA)^* + (BB)^*$ path. Getting all together and in combination with N_1 our final RE is $(A + BBA)^*BA(A + BA)^* + (BB)^* + A^*$. NFA for the given system is:



We will create a DFA according to this NFA. Using the algorithm we learned in class;



is the DFA