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

b.
A=: 0
B=: 1
C=: $\{0, 1\}$
D=: 2
E=: 1
F=: $\{0, 2\}$

Answer for Q2

a. We can use the algorithm used to compute the language of a finite automaton.

b. Different than the usual algorithm, we should initialize an explicit set to store outputs while traversing between states, and then we return this set as output language.

c. We start with q_0, and traverse till get the output C, which is the transition $(q_2, a/C, q_0)$:
First, $(q_0, a/A, q_0)$ gives A^*,
Then, there move to q_1 by $(q_0, b/B, q_1)$,and there is a loop-like structure $(q_1, a/A, q_0)$ and $(q_0, a/A, q_0)$ and $(q_0, b/B, q_1)$which gives $B(AA^*B)^*$,
When we are out of this loop we will be at q_1, in order to get a new path $(q_1, b/B, q_2)$ is necessary, which gives B,
There is another self-loop $(q_2, b/B, q_2)$ giving B^*,
Finally, transition $(q_2, a/C, q_0)$ gives C.
By concatenating all, we have $A^*B(AA^*B)^*BB^*C$,
We need repetition of this regex one or more times, so the answer is: $(A^*B(AA^*B)^*BB^*C)^+$.

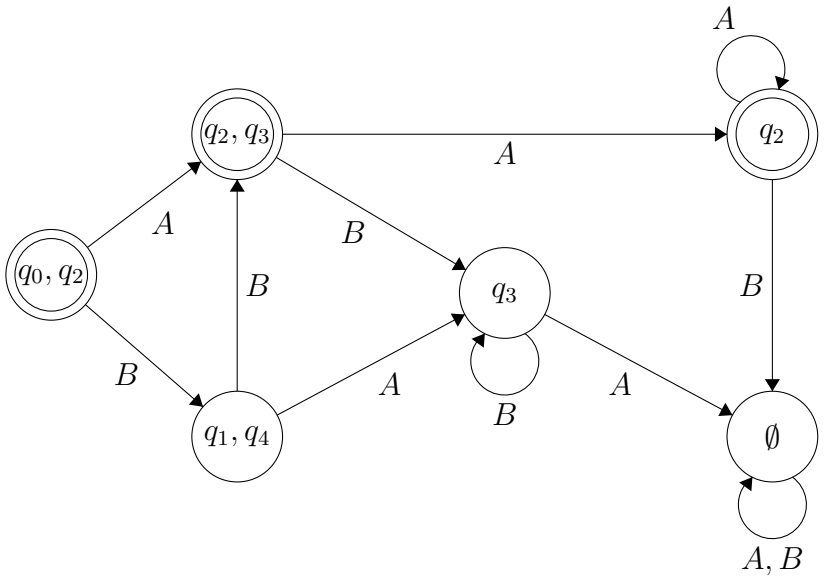
Answer for Q3

Basically, I converted the N_2 and N_3 to DFA in order to find what they accept or reject.

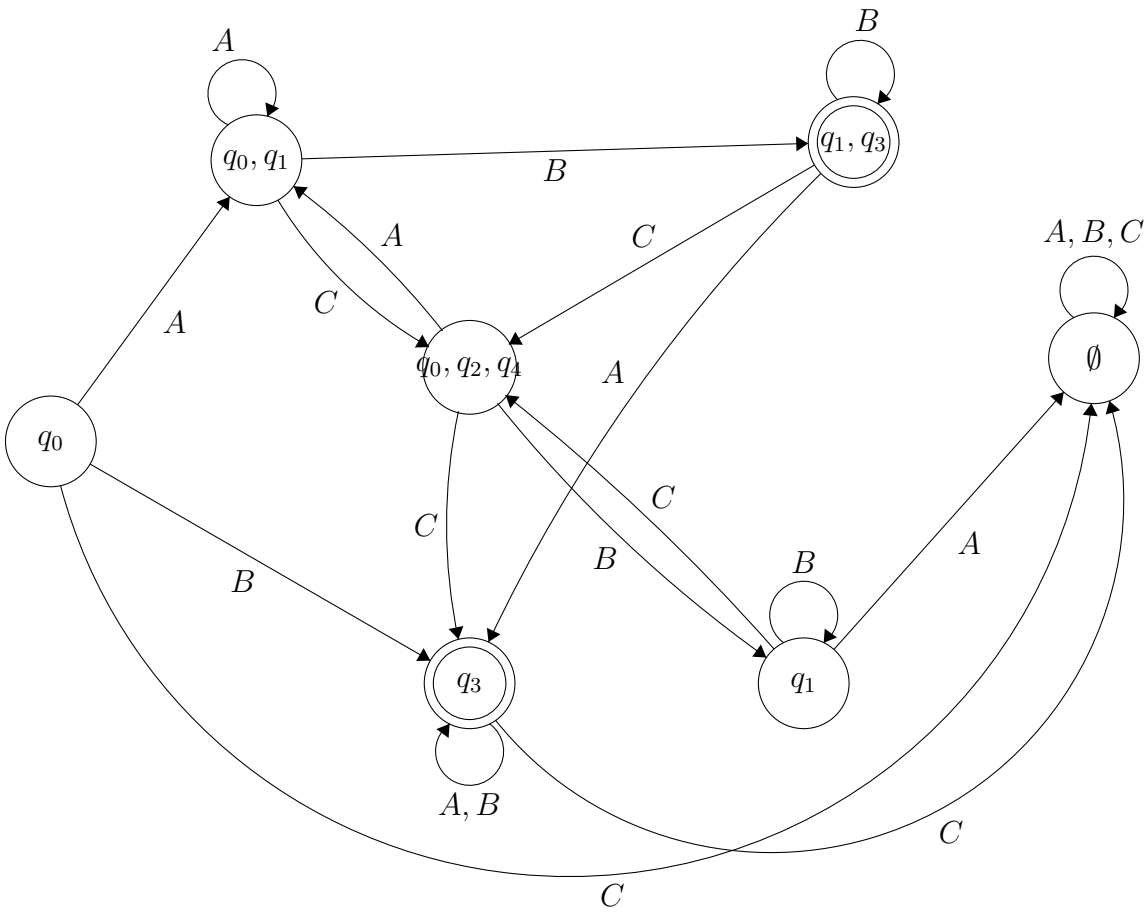
Afterwards, I checked the Mealy Machine's (P) outputs and compared them with the converted DFA's. Combining the machines, I created a trap state to reject the outputs which cannot be generated by the Mealy Machine.

To sum up, the machine evaluates the inputs recognized by P, and decides to accept or reject, according to N_2 and N_3.

DFA version of N_2:



DFA version of N_3:



DFA for whole system: