FU08 - Automata and Languages
Exercise 7

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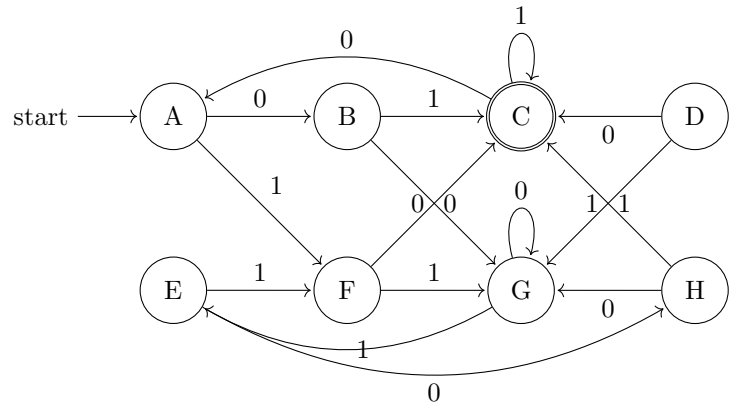
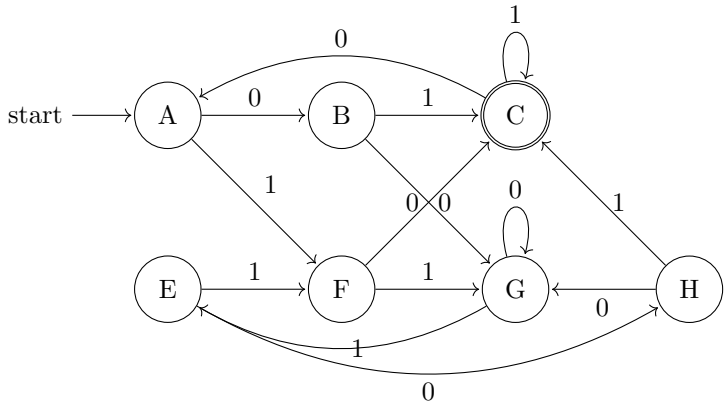
Question 1: Minimizing the following DFA



Solution:
Removing the useless state D. We reconstruct the DFA as.

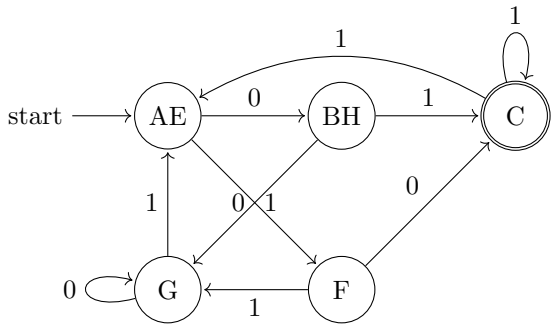


Using the DFA, we can construct a distinguishable table.

B	F					
C	F	F				
E	T	F	F			
F	F	F	F	F		
G	F	F	F	F	F	
H	F	T	F	F	F	F
state	A	B	C	E	F	G

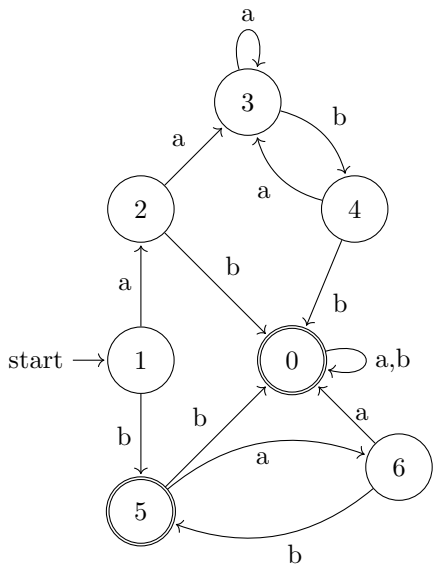
Table 1: distinguishable table of the automaton

Note: T is True, F is False.



Note that $\delta(\text{AE}, 1)$= F; $\delta(\text{BH}, 0)$= G. The automaton is minimal.

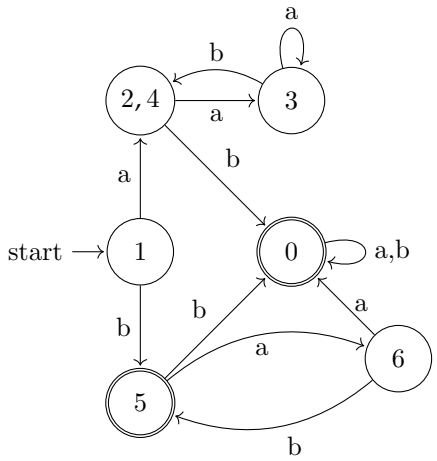
Question 2: Minimize the following DFA



Solution:

Since there is no useless state in the DFA.

Immediately, we notice that: 2 and 4 are equivalent.



Since there are no obvious sign of equivalency, we construct a distinguishable table.

Note: T is True, F is False.

1	F				
2,4	F	F			
3	F	F	F		
5	F	F	F	F	
6	F	F	F	F	F
state	0	1	2,4	3	5

Table 2: distinguishable table of the automaton

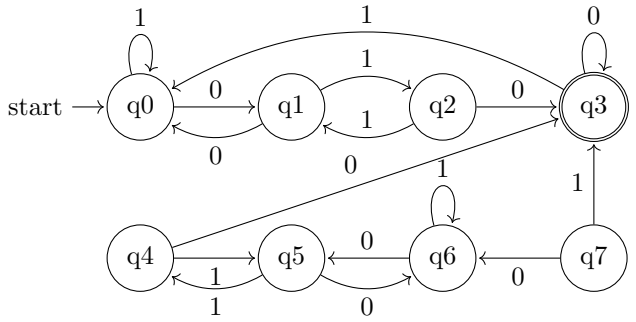
From this table, we agree that the automaton is indeed minimal.

Question 3: Minimize the DFA

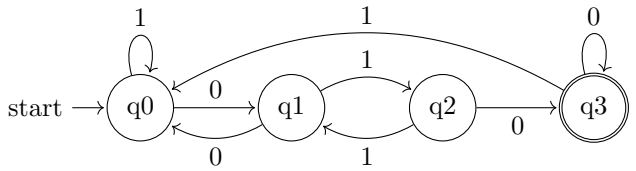
$M = (Q, \sum, \delta, q_0, F)$ with
$Q = \{q_0, q_1, q_2, q_3, q_4, q_5, q_6, q_7\}$
$\sum = \{0, 1\}$
$F = \{q_3\}$, and δ is defined by

δ	0	1
q_0	q_1	q_0
q_1	q_0	q_2
q_2	q_3	q_1
q_3	q_3	q_0
q_4	q_3	q_5
q_5	q_6	q_4
q_6	q_5	q_6
q_7	q_6	q_3

Solution:
From the above transition table, we construct a DFA out of it.



Immediately, we notice the useless state q4,q5,q6,q7. Removing the useless states. We reconstruct the DFA as.



From the DFA, we construct a distinguishable table for the automaton.

1	F		
2	F	F	
3	F	F	F
state	0	1	2

Table 3: distinguishable table of the automaton

We conclude that the automaton is minimal.