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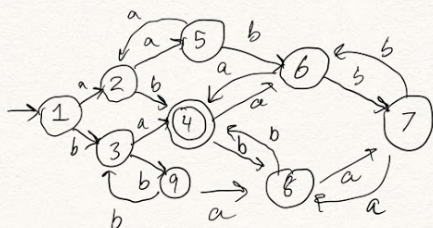
CS 334 Problem Set 3

"I pledge my Honor that I have abided by the Stevens Honor System."

Problem 1a:

a) minimize the DFA using the algorithm, show the matrix of distinguishable states after each iteration of the loop

DFA A:



	1	2	3	4	5	6	7	8	9
1		✓	✓	✓		✓		✓	
2			✓	✓	✓	✓	✓		✓
3				✓	✓		✓	✓	✓
4					✓	✓	✓	✓	✓
5						✓		✓	
6							✓	✓	✓
7								✓	
8									✓
9									

$$\{1, 5, 7, 9\} = [q_1]$$

$$\{2, 8\} = [q_2]$$

$$\{3, 6\} = [q_3]$$

$$\{4\} = [q_4]$$

Transition Table

	a	b
1	2	3
2	5	4
3	4	9
*4	6	8
5	2	6
6	4	7
7	8	6
8	7	4
9	8	3

Step 2: 4 distinguishable from 1, 2, 3, 5, 6, 7, 8, 9

Step 3: 1 distinguishable from 2, 3, 6, 8

2 distinguishable from 3, 5, 7, 9

3 distinguishable from 5, 7, 8, 9

5 distinguishable from 6, 8

6 distinguishable from 7, 8, 9

7 distinguishable from 8

8 distinguishable from 9

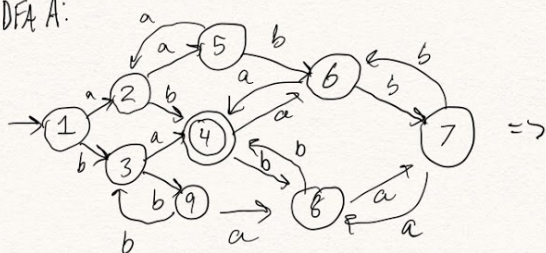
No more pairs can be marked

Unmarked pairs are equivalent

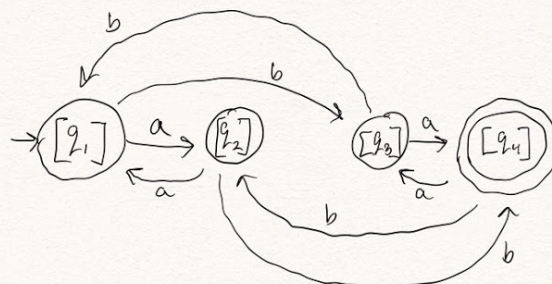
$[]$	a	b
$[q_1]$	$\{1, 5, 7, 9\}$	$\{2, 3, 8\}$
$[q_2]$	$\{2, 8\}$	$\{5, 7\}$
$[q_3]$	$\{3, 6\}$	$\{4, 4\}$
$[q_4]$	$\{4\}$	$\{6, 8\}$

$[]$	a	b
$[q_1]$	$[q_2]$	$[q_3]$
$[q_2]$	$[q_1]$	$[q_4]$
$[q_3]$	$[q_4]$	$[q_1]$
$[q_4]$	$[q_3]$	$[q_2]$

DFA A:



DFA A' (Minimal):

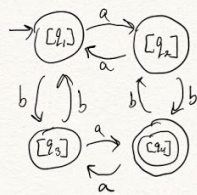


Problem 1b:

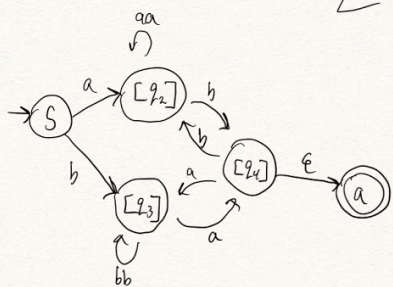
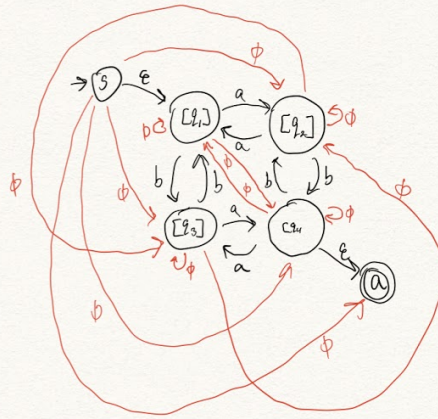
Regular expression: $a(aa)^*ubub(bb)^*a(bb)^*(aa)^*$

b) Give a regular expression for the language of the DFA in part (a). Show the GNFA at each iterative step

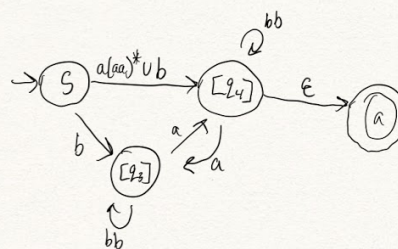
DFA A' :



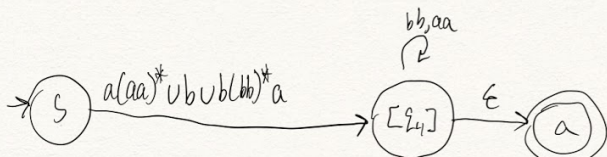
GNFA conversion \Rightarrow



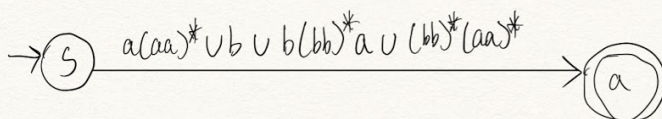
\Rightarrow



\Rightarrow



\Downarrow



Regular Expression for DFA: $a(aa)^*ubub(bb)^*a(bb)^*(aa)^*$