



UTM
UNIVERSITI TEKNOLOGI MALAYSIA

FACULTY OF ENGINEERING

SCHOOL OF COMPUTING

SESSION 2020/2021 SEMESTER 2

SCSJ3203 THEORY OF COMPUTER SCIENCE
SECTION 04

TUTORIAL 5
FINITE AUTOMATA (FA) PART 2

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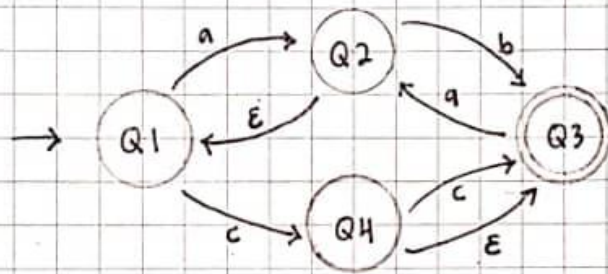
Matrics : B19EC0006

Lecturer : DR ZALMIYAH ZAKARIA

Due Date : 26th April 2021

TCS Tutorial 5: FA Part 2.

1. Consider the following NFA. Determine whether the following strings are IN or NOT IN the language by putting / writing them in the right column in Table 2.

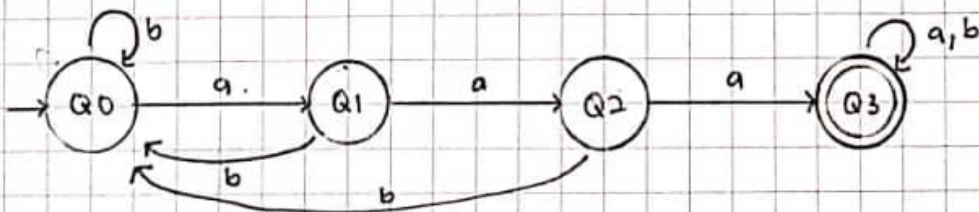


a, b, c, ab, ac, bc, aab, acc, acab, ca, cb, abab, abaab, cc, cab, caab, caa, ccab, ccac, abacab

IN = c, ab, ac, acc, acab, abab, abaab, cc, cab, caab, ccab, ccac, abacab.

NOT IN = a, b, bc, ca, cb, caa.

2. Let M be the FA with state diagram.



- a) Construct the transition table of M. Is this a deterministic FA or not?

$Q = \{Q_0, Q_1, Q_2, Q_3\};$

$\Sigma = \{a, b\};$

$Q_0 = Q_0;$

$F = \{Q_3\}$

δ	a	b
Q_0	Q_1	Q_0
Q_1	Q_2	Q_0
Q_2	Q_3	Q_0
Q_3	Q_3	Q_3

= Yes, it is a DFA.

b) Trace the computations of M that processes the strings aaa , aab and $baaab$.

$[Q_0, aaa] \vdash [Q_1, aa]$
 (accepted) $\vdash [Q_2, a]$
 $\vdash [Q_3, \lambda]$

$[Q_0, aab] \vdash [Q_1, ab]$
 (rejected) $\vdash [Q_2, b]$
 $\vdash [Q_0, \lambda]$

$[Q_0, baaab] \vdash [Q_0, aaab]$
 (accepted) $\vdash [Q_1, aab]$
 $\vdash [Q_2, ab]$
 $\vdash [Q_3, b]$
 $\vdash [Q_2, \lambda]$

c) Which of the strings from (b) are accepted by M ?

aaa and $baaab$

d) Give a regular expression for $L(M)$

$(a+b)^* aaa (a+b)^*$

3. Let M be a finite automaton defined by

$Q = \{Q_0, Q_1, Q_2\}$
 $\Sigma = \{a, b\}$
 $Q_0 = Q_0;$
 $F = \{Q_2\}$

δ	a	b
Q_0	Q_1	-
Q_1	Q_2	Q_1
Q_2	-	-

a) Give a state diagram (FA) for this state table.

This is an NFA.

b) Trace the computations that process the strings aa , bb and $abba$.

$[Q_0, aa] \vdash [Q_1, a]$
 (accepted) $\vdash [Q_2, \lambda]$

$[Q_0, bb] \vdash -$
 (rejected)

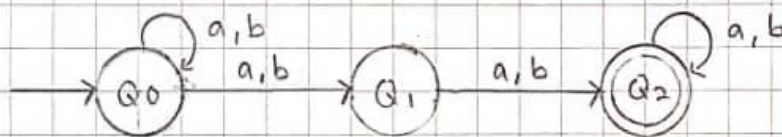
$[Q_0, abba] \vdash [Q_1, bba]$
 (accepted) $\vdash [Q_1, ba]$
 $\vdash [Q_1, a]$
 $\vdash [Q_2, \lambda]$

c) Give a regular expression for the language accepted by M.

ab^*a

4. Write a regular expression and finite automata for $L_1 = \{wuw : |w| = 2; w, u \in \Sigma^*\}. \Sigma = \{a, b\}$.

RE = $(a+b)^*((a+b)(a+b))(a+b)^*$



5. Consider the languages in Table 2. Match them with the RE from Table 3 and FA from Table 4. The alphabet is $\Sigma = \{a, b\}$.

Table 3	Table 4
5	4
6	12
7	13
1	10
2	15
3	5
4	6
12	7
13	1
14	2
15	3
8	11
9	8
10	9
11	14