



UTM
UNIVERSITI TEKNOLOGI MALAYSIA

FACULTY OF ENGINEERING

SCHOOL OF COMPUTING

SESSION 2020/2021 SEMESTER 2

SCSJ3203 THEORY OF COMPUTER SCIENCE
SECTION 04

TUTORIAL 4
FINITE AUTOMATA (FA)

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Due Date : 11th April 2021

TCS Tutorial 4: Finite Automata Part 1.

1. Draw finite automata for the following language,

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

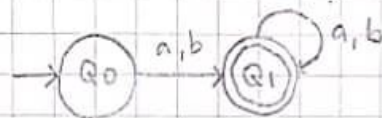
a) All strings

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



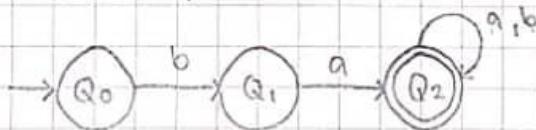
b) All strings except empty strings.

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



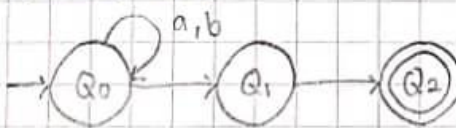
c) All strings starting with ba .

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



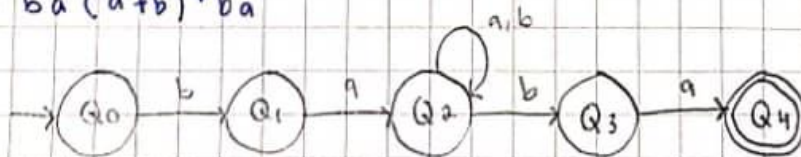
d) All string ending with ba .

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



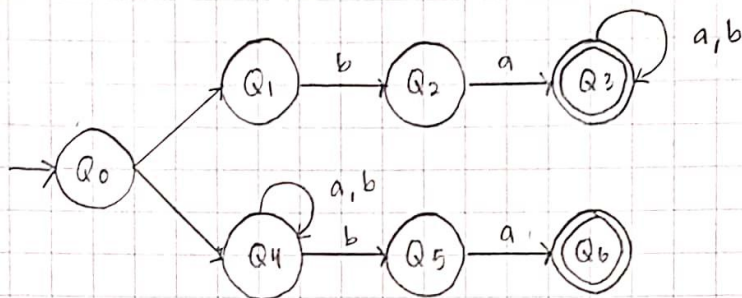
e) All strings that begin AND end with ba .

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



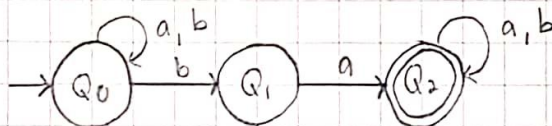
f) All strings that begin OR end with ba.

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



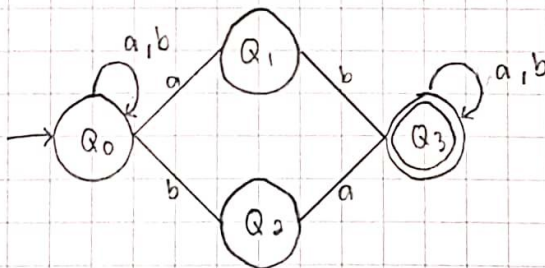
g) All strings that contains the substring ab

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



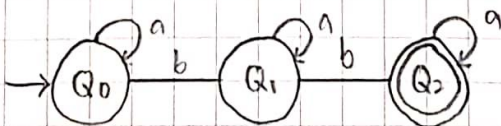
h) All strings that contain the substring ab or ba

$$= (a+b)^* (ab+ba) (a+b)^*$$



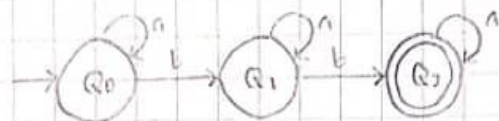
i) All strings containing exactly 2 b's.

$$= a^* b a^* b a^*$$



j) All strings containing at least 2 b's.

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



2. Let M be a finite automaton defined by

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

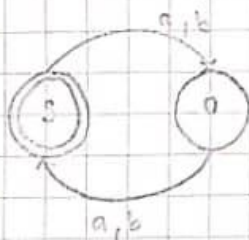
$$\Sigma = \{a, b\};$$

$$Q_0 = Q_0;$$

$$F = \{Q_0\}$$

δ	a	b
Q_0	Q_1	Q_1
Q_1	Q_0	Q_0

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



b) Trace the computations that process the strings abbb, baa and baba.

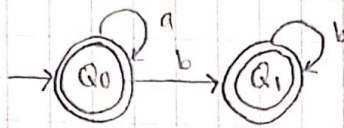
$$\begin{aligned}
 [Q_0, abbb] &\vdash [Q_1, bbb] & [Q_0, baa] &\vdash [Q_1, aa] \\
 &\vdash [Q_0, bb] & &\vdash [Q_0, a] \\
 &\vdash [Q_1, b] & &\vdash [Q_1, \lambda] \\
 &\vdash [Q_0, \lambda]
 \end{aligned}$$

$$\begin{aligned}
 [Q_0, baba] &\vdash [Q_1, aba] \\
 &\vdash [Q_0, ba] \\
 &\vdash [Q_1, a] \\
 &\vdash [Q_0, \lambda]
 \end{aligned}$$

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

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

3. Let M be the FA with state diagram



a) Construct the transition table for M .

δ	a	b
Q_0	Q_0	Q_1
Q_1	-	Q_1

b) Which of the strings $abb, aab, abab, aaaaab$ are accepted by M ?

abb, aab and $aaaaab$ are accepted by M .

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

a^*b^*