

2019-1

## 오토마타 및 형식언어(COMP315)

### Homework 1

**Due date:** 29/3/2019

**Late submission:** 10% deduction per day

**How to submit:** Upload the answers as one PDF file to LMS

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#### Q1, 5점) Chapter 1.2, Exercise 15 (pg. 29)

Give a simple description of the language generated by the grammar with productions:

(다음 production rules에 맞는 언어  $L$  을 구하시오)

$$S \rightarrow aaA,$$

$$A \rightarrow bS,$$

$$S \rightarrow \lambda$$

$$S \rightarrow aaA \\ \downarrow \\ bS$$

$$aaA$$

$$aabS$$

$$aabaA$$

$$aabaaS. \lambda.$$

$$\lambda, aab, aabaab, \dots$$

**Solution:**  $L = \{(aab)^n : n \geq 0\}$

#### Q2, 5점) Chapter 1.2, Exercise 18 (pg. 29)

Let  $\Sigma = \{a\}$ .

Find a grammar (production rules) for each language below:

(다음 각 언어( $L_1, L_2$ )에 대한 grammar(production rules)를 구하시오)

(a)  $L_1 = \{w : |w| \bmod 3 > 0\}$

Hint: Break down the problem into two cases,  $|w| \bmod 3 = 1$  and  $|w| \bmod 3 = 2$ .

Production rules for  $L_1$ :

$$S \rightarrow S_1 | S_2$$

$$S_1 \rightarrow aaaS_1 | a$$

$$S_2 \rightarrow aaaS_2 | aa$$

$$a, aaaa, aaaaaa, \dots$$

$$1 \quad 4 \quad 7.$$

$$aa, aaaaa, \dots$$

$$2 \quad 5$$

(b)  $L_2 = \{w: |w| \bmod 3 = 2\}$

Production rule(s) for  $L_2$ :

$S \rightarrow aaaS \mid aa$

**Q3, 5점) Chapter 2.1, Exercise 14 (pg. 50)**

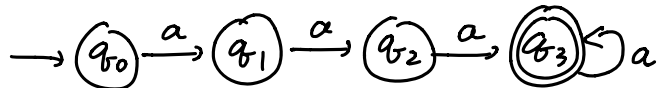
Show that  $L = \{a^n: n \geq 3\}$  is regular.

$aaa, aaaa, \dots$

(언어  $L = \{a^n: n \geq 3\}$ 이 regular 하다는 것을 보이시오)

Hint: A language  $L$  is regular if you can construct a DFA for it.

$L(M)$ 을 만족하는 DFA  $M$ 에 대해



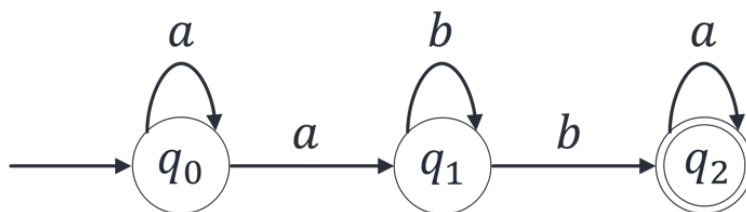
$Q = \{q_0, q_1, q_2, q_3\}, \Sigma = \{a\}, q_0 = q_0, F = \{q_3\}$

$\delta(q_0, a) = q_1, \delta(q_1, a) = q_2, \delta(q_2, a) = q_3, \delta(q_3, a) = q_3$  인  $M$ 을 만들 수 있다.

$\therefore L$ 은 regular하다.

**Q4, 5점) What are the three production rules for the NFA below?**

(아래 NFA를 나타내기 위한 3개의 production rule을 구하시오)



$a^n b^m a^k$

$S \rightarrow aS \mid aS_1$

$S_1 \rightarrow bS_1 \mid bS_2$

$S_2 \rightarrow aS_2 \mid a$