

CSCE 222 [Sections 502, 503] Discrete Structures for Computing  
Spring 2017 – Hyunyoung Lee

**Problem Set 10**

**Due dates:** Electronic submission of *yourLastName-yourFirstName-hw10.tex* and *yourLastName-yourFirstName-hw10.pdf* files of this homework is due on **Tuesday, 5/2/2017 before the beginning of class** on <http://ecampus.tamu.edu>. You will see two separate links to turn in the .tex file and the .pdf file separately. Please do not archive or compress the files. A signed paper copy of the pdf file is due on **Tuesday, 5/2/2017** at the beginning of class. **If any of the three submissions are missing, your work will not be graded. Late submissions of any form will not be accepted.**

**Name:** Joseph Martinsen

**Section:** 503

**Resources.** (All people, books, articles, web pages, etc. that have been consulted when producing your answers to this homework)

On my honor, as an Aggie, I have neither given nor received any unauthorized aid on any portion of the academic work included in this assignment. Furthermore, I have disclosed all resources (people, books, web sites, etc.) that have been used to prepare this homework.

**Signature:** \_\_\_\_\_

In this problem set, you will earn total  $100 + 5$  (extra credit) points.

**Problem 1.** (10 points) Section 13.1, Exercise 4, page 856

**Solution.**

1.

$$\begin{aligned} S &\rightarrow 1S \\ &\rightarrow 11S \\ &\rightarrow 11100S \\ &\rightarrow 111000 \end{aligned}$$

2. 111001 does not belong in the language because the only production that terminates with a terminal is  $S \rightarrow 0$  which results in every member in the language must end with 0, which 111001 does not.

3.

$$L(G) = \{1^n 0^m \mid n \geq 0, m \geq 3\}$$

**Problem 2.** (10 points) Section 13.1, Exercise 6 a), b), c), and d), page 856

**Solution.**

a)

$$L(G) = \{abbb\}$$

b)

$$L(G) = \{aba, aa\}$$

c)

$$L(G) = \{abb, abab\}$$

d)

$$L(G) = \{a^{2n} | n \geq 2\} \cup \{b^n | n \geq 1\}$$

**Problem 3.** (16 points) Section 13.1, Exercise 14, page 856

**Solution.**

1.

$$\begin{aligned} G &= (V, T, S, P) \\ V &= \{0, 1, S\} \\ T &= \{0, 1\} \\ P &= \{S \rightarrow 10, S \rightarrow 01, S \rightarrow 101\} \end{aligned}$$

2.

$$\begin{aligned} G &= (V, T, S, P) \\ V &= \{0, 1, A, S\} \\ T &= \{0, 1\} \\ P &= \{S \rightarrow 00A1, A \rightarrow AA, A \rightarrow 0, A \rightarrow 1\} \end{aligned}$$

3.

$$\begin{aligned} G &= (V, T, S, P) \\ V &= \{0, 1, A, B, S\} \\ T &= \{0, 1\} \\ P &= \{S \rightarrow A0, B \rightarrow \lambda, A \rightarrow 11B, A \rightarrow 1B1, A \rightarrow B11, B \rightarrow 0B\}^* \end{aligned}$$

\*0 is not even because you can not divide up 0 objects into two groups

4.

$$G = (V, T, S, P)$$

$$V = \{0, 1, A, B, S\}$$

$$T = \{0, 1\}$$

$$P = \{S \rightarrow AB, A \rightarrow B0, B \rightarrow A1, A \rightarrow \lambda, B \rightarrow \lambda\}$$

**Problem 4.** (12 points) Section 13.1, Exercise 18, page 856

**Solution.**

1.

$$G = (V, T, S, P)$$

$$V = \{0, 1, A, S\}$$

$$T = \{0, 1\}$$

$$P = \{S \rightarrow 0A, A \rightarrow 11A, A \rightarrow \lambda\}$$

2.

$$G = (V, T, S, P)$$

$$V = \{0, 1, S\}$$

$$T = \{0, 1\}$$

$$P = \{S \rightarrow 0S11, S \rightarrow \lambda\}$$

3.

$$G = (V, T, S, P)$$

$$V = \{0, 1, A, S\}$$

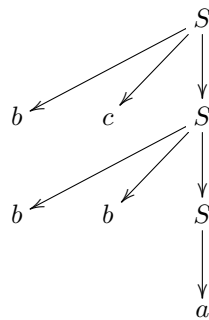
$$T = \{0, 1\}$$

$$P = \{S \rightarrow 0S0, S \rightarrow A, S \rightarrow \lambda, A \rightarrow \lambda, A \rightarrow 1A\}$$

**Problem 5.** (10 points) Section 13.1, Exercise 24, page 857

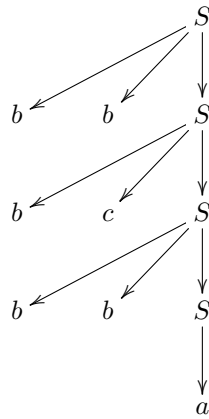
**Solution.**

1.



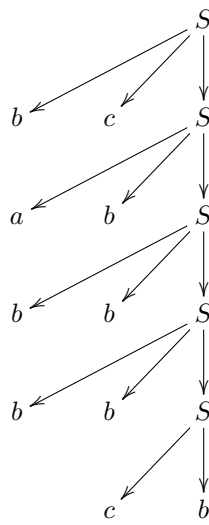
Results in *bcbbba*

2.



Results in *bbbcbbba*

3.



Results in *bcabbbbbcb*

**Problem 6.** (6 points) Section 13.2, Exercise 2 a), page 864

**Solution.**

State	f		g	
	Input		Input	
	0	1	0	1
$s_0$	$s_1$	$s_2$	1	0
$s_1$	$s_0$	$s_3$	1	0
$s_2$	$s_3$	$s_0$	0	0
$s_3$	$s_1$	$s_2$	1	1

**Problem 7.** (6 points) Section 13.2, Exercise 4, page 864

**Solution.**

**Problem 8.** (12 points) Section 13.3, Exercise 8, page 875

**Solution.**

1. Let  $A = \{a\}$ . This results in  $A^2 = \{aa\}$ .  $\{a\} \not\subseteq \{aa\}$  which disproves the statement.
- 2.
3.  $A\{\lambda\}$  concatenated results in simply  $A$  because  $\lambda$  is the empty set. This results in  $A\{\lambda\} = A$  which is the given statement.
- 4.
5.  $A^*$  contains  $A^0$ .  $A^*A \rightarrow A^0A = A^{0+1} = A^1 = A \neq A^0 \leftarrow A^*$ . Therefore the given statement is false.
6. Let  $A = \{\lambda, 1\}$  which results in  $A^2 = \{\lambda, 1, 11\}$ .  $|A^2| = 3$  and  $|A| = 2$  which results  $|A|^2 = 4$  which is not 3 resulting in the given statement being false.

**Problem 9.** (12 points) Section 13.3, Exercise 10, page 875

**Solution.**

**Problem 10.** (5 points) Section 13.3, Exercise 16, page 876

**Solution.**

**Problem 11.** (6 points) Section 13.3, Exercise 28, page 876

**Solution.**

**Checklist:**

- ☐ Did you type in your name and section?
- ☐ Did you disclose all resources that you have used?  
(This includes all people, books, websites, etc. that you have consulted)
- ☐ Did you sign that you followed the Aggie honor code?
- ☐ Did you solve all problems?
- ☐ Did you submit both the .tex and .pdf files of your homework separately to the correct link on eCampus?
- ☐ Did you submit a signed hardcopy of the pdf file in class?