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.

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

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

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

**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.

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

  2.

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

  3.

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

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

4.

$$G = (V, T, S, P)$$
$$V = \{0, 1, A, B, S\}$$
$$T = \{0, 1\}$$
$$P = \{S \to AB, A \to B0, B \to A1, A \to \lambda, B \to \lambda\}$$

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

**Solution.**

1.

$$G = (V, T, S, P)$$
$$V = \{0, 1, A, S\}$$
$$T = \{0, 1\}$$
$$P = \{S \to 0A, A \to 11A, A \to \lambda\}$$

2.

$$G = (V, T, S, P)$$
$$V = \{0, 1, S\}$$
$$T = \{0, 1\}$$
$$P = \{S \to 0S11, S \to \lambda\}$$

3.

$$G = (V, T, S, P)$$
$$V = \{0, 1, A, S\}$$
$$T = \{0, 1\}$$
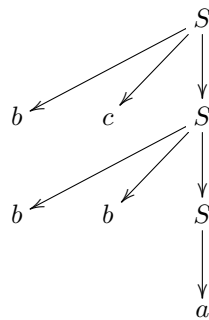$$P = \{S \to 0S0, S \to A, S \to \lambda, A \to \lambda, A \to 1A\}$$

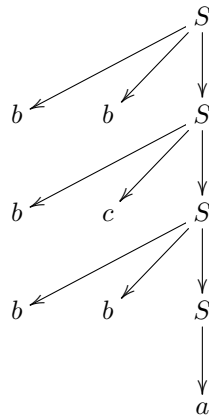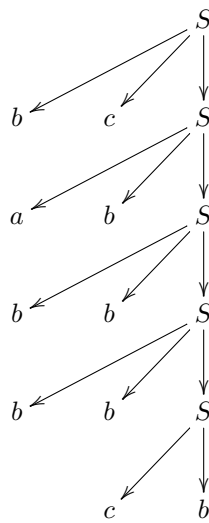**Problem 5.** (10 points) Section 13.1, Exercise 24, page 857

**Solution.**

1.

Results in *bcbba*

2.



Results in *bbbcbba*

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 |

4

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

**Solution.**

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

**Solution.**

**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?