342 Assignment : cfg

March 28, 2021

Total points: 36
Due Date: Mar 27 2021
Julian Garcia
Caleb Carnathan

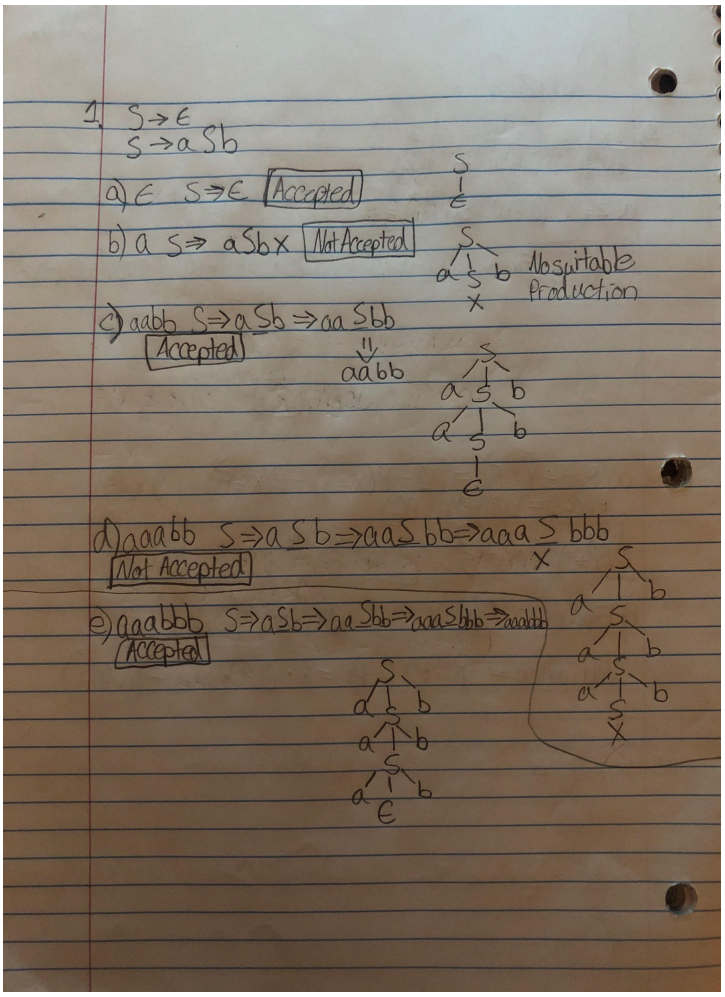
6 points for each question.

1. • Consider the following grammar.

   – Terminals : "a", "b"
   – Non-terminals : S
   – Start Symbol: S
   – Production rules:
     * $S \rightarrow \epsilon$
     * $S \rightarrow aSb$

   For each of the strings, state whether the grammar accepts it or not, and whether or not it accepts, try to give a parse tree. if the grammar does not accept it, you wont be able to make a full parse tree - do this till however much you can and show where it fails

   (a) ϵ
   (b) a
   (c) $aabb$
   (d) $aaabb$
   (e) $aaabbb$



2. • Consider the following grammar.

   – Terminals : "a", "b"
   – Non-terminals : S
   – Start Symbol: S
   – Production rules:
     * $S \rightarrow aSb$

   For each of the strings, state whether the grammar accepts it or not, and whether or not it accepts, try to give a parse tree. if the grammar does not accept it, you wont be able to make a full parse tree - do this till however much you can and show where it fails

   (a) ϵ

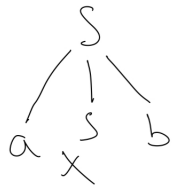
(b) a
(c) $aabb$
(d) $aaabb$
(e) $aaabbb$

2.) $S \rightarrow aSb$

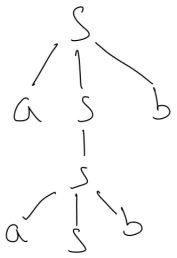
a.) ε $S \rightarrow aSb$ X NOT Accepted

No Suitable Production

b.) a $S \rightarrow aSb$ X NOT Accepted

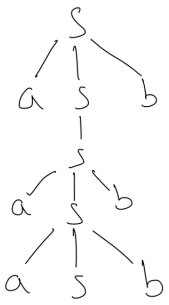


c.) aabb $S \rightarrow aSb \rightarrow aaSbb$ Accepted



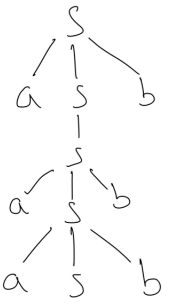
d.) aaabbb $S \to aSb \to aaSbb \to aaaSbbb$ ✗

NOT Accepted



e.) aaabbb $S \to aSb \to aaSbb \to aaaSbbb$

Accepted



- What is the language accepted by this grammar?

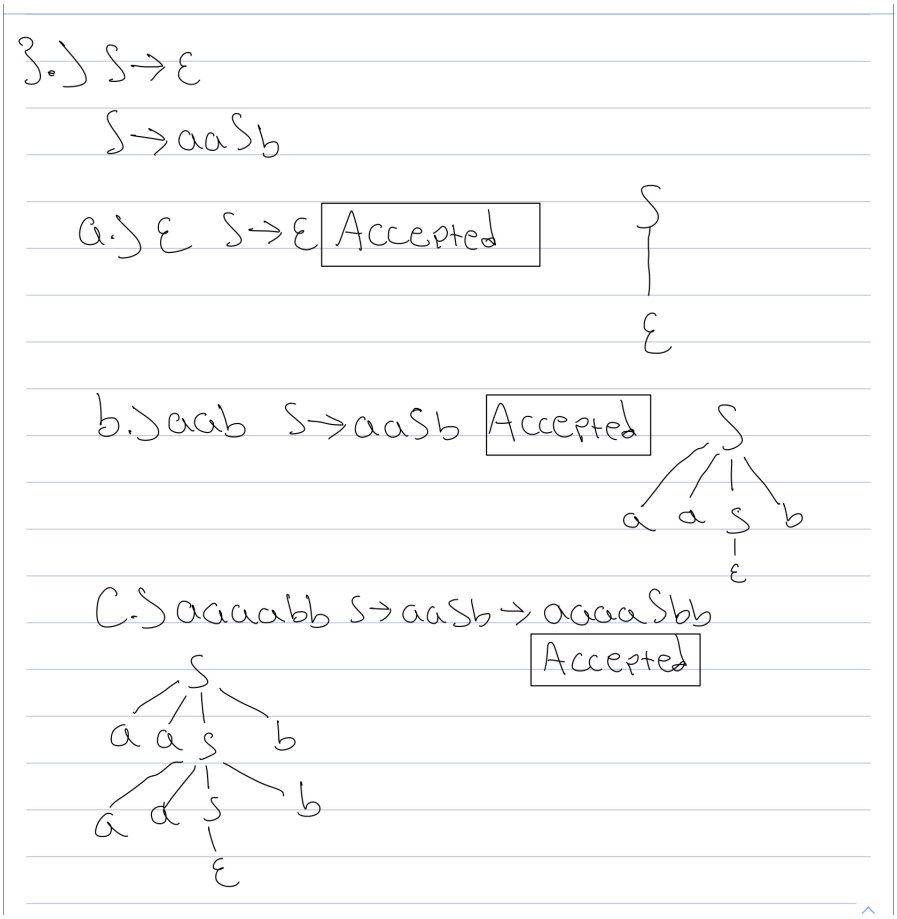
3. • Consider the following grammar.

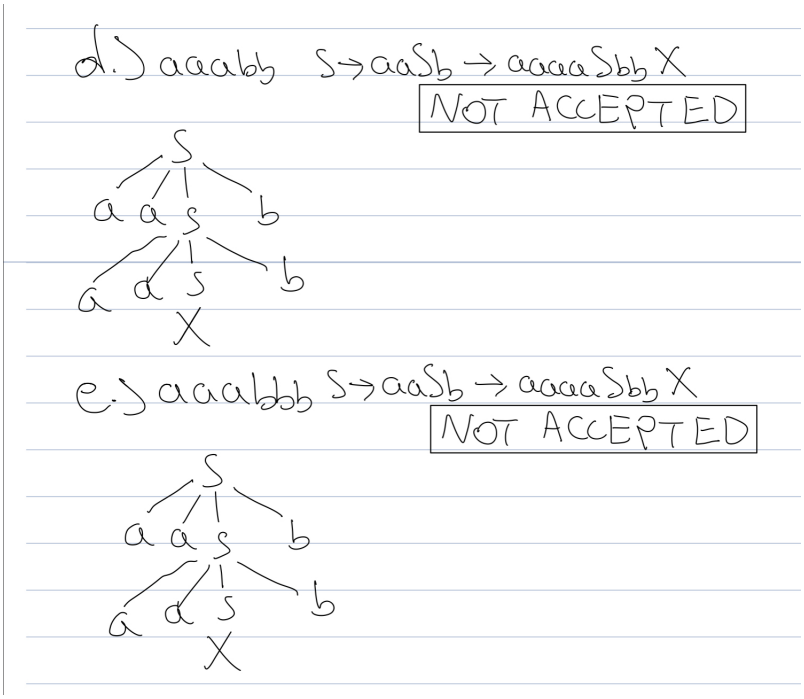
   – Terminals : "a", "b"
   – Non-terminals : S
   – Start Symbol: S
   – Production rules:
     * $S \to \epsilon$
     * $S \to aaSb$

   For each of the strings, state whether the grammar accepts it or not, and whether or not it accepts, try to give a parse tree. if the grammar

does not accept it, you wont be able to make a full parse tree - do this till however much you can and show where it fails

- ϵ
- aab
- $aaaabb$
- $aaabb$
- $aaabbb$





- What is the language accepted by this grammar?

4. • Consider the following grammar.

   – Terminals : "a", "b"
   – Non-terminals : S, A
   – Start Symbol: S
   – Production rules:
     * $S \rightarrow A$
     * $S \rightarrow aSb$
     * $A \rightarrow a$
     * $A \rightarrow Aa$

   For each of the strings, state whether the grammar accepts it or not, and whether or not it accepts, try to give a parse tree. if the grammar does not accept it, you wont be able to make a full parse tree - do this till however much you can and show where it fails

   – ϵ
   – a
   – $aabb$
   – $aaabb$

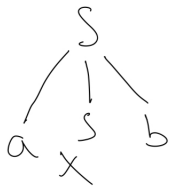
– *aaaaabbb*

2.) $S \to aSb$

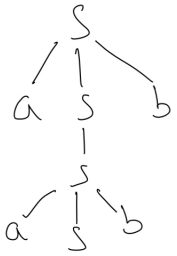
a) ε $S \to aSb$ X NOT Accepted

No Suitable Production

b.) a $S \to aSb$ X NOT Accepted

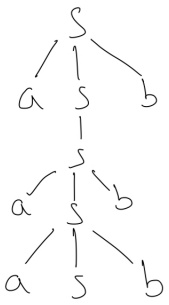


c.) aabb $S \to aSb \Rightarrow aaSbb$ Accepted



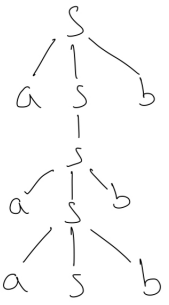
d.) aaabbb $S \to aSb \to aaSbb \to aaaSbbb$ ✗

NOT Accepted



e.) aaabbb $S \to aSb \to aaSbb \to aaaSbbb$

Accepted



- What is the language accepted by this grammar?

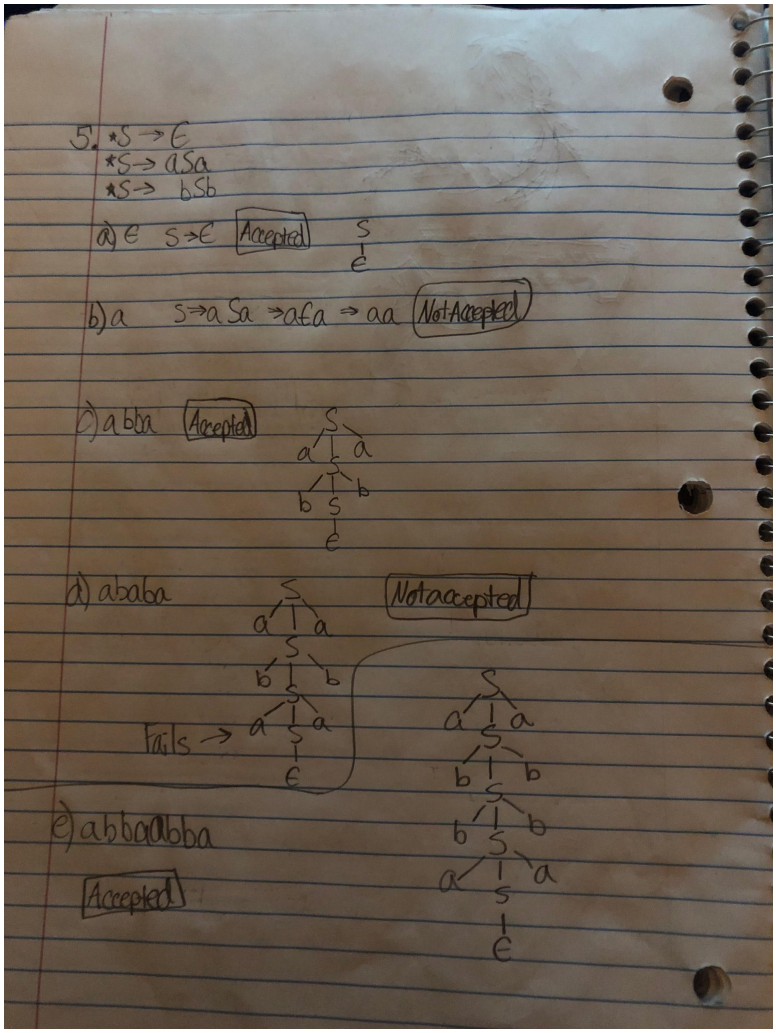
5. • Consider the following grammar.

   – Terminals : "a", "b"
   – Non-terminals : S, A
   – Start Symbol: S
   – Production rules:
     * $S \to \epsilon$
     * $S \to aSa$
     * $S \to bSb$

For each of the strings, state whether the grammar accepts it or not, and whether or not it accepts, try to give a parse tree. if the grammar does not accept it, you wont be able to make a full parse tree - do this till however much you can and show where it fails

- ϵ
- a
- $abba$
- $ababa$
- $abbaabba$

- What is the language accepted by this grammar?



6. Give a grammar for the following languages. You only need to attempt

this. For all of these the alphabets (terminals) are {a, b} and the start state is S.

(a) $L = \{s \mid s$ number of a's in s ¿ number of b's in s $\}$

(b) $L = \{s \mid s$ s is odd-lengthed palindromes $\}$

(c) $L = \{s \mid s$ number of a's in s is three times number of b's in s and all the a's come before b's $\}$