

Assignment 2

Due: 21st November 2019

COMP 3602

Instructions:

1. This assignment can be done in groups comprising 1 student - 3 students
2. Each student must attach a signed plagiarism declaration to their submission
3. One submission per group
4. Write legibly or (preferably) typeset your assignment using \LaTeX

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1. Consider the alphabet $\Sigma = \{0, 1, +\}$. Define Context-free grammars for the following languages:

- $\{1^n 0^{\frac{n}{2}} \mid n \geq 2, n \text{ is even}\}$
- $\{+w + w^R + \mid w \in \{0, 1\}^+\}$
- $\{w + v \mid w, v \in \{0, 1\}^*, w^R \text{ is the prefix of } v\}$

[10]

2. Draw the Pushdown automata for each language in 1 [10]

3. Show that the union of two context free language is closed on the set of context free languages. [10]

4. Show that Kleene star of a context free grammar is a context free languages. [10]

5. Consider the following CFG

$$\begin{aligned} R &\rightarrow XRX \mid S \\ S &\rightarrow aTb \mid bTa \\ T &\rightarrow XTX \mid X \mid \epsilon \\ X &\rightarrow a \mid b \end{aligned}$$

- (a) What are the non-terminals of the above grammar?
- (b) What are the terminals of the above grammar?
- (c) Show the parse tree for the string aba
- (d) Show the derivation of the string bba

[15]