16.11.2021

Seminar 8 – CFG, Recursive Descendent Parser

1. Given the CFG grammar below, give a leftmost/rightmost derivation for w .

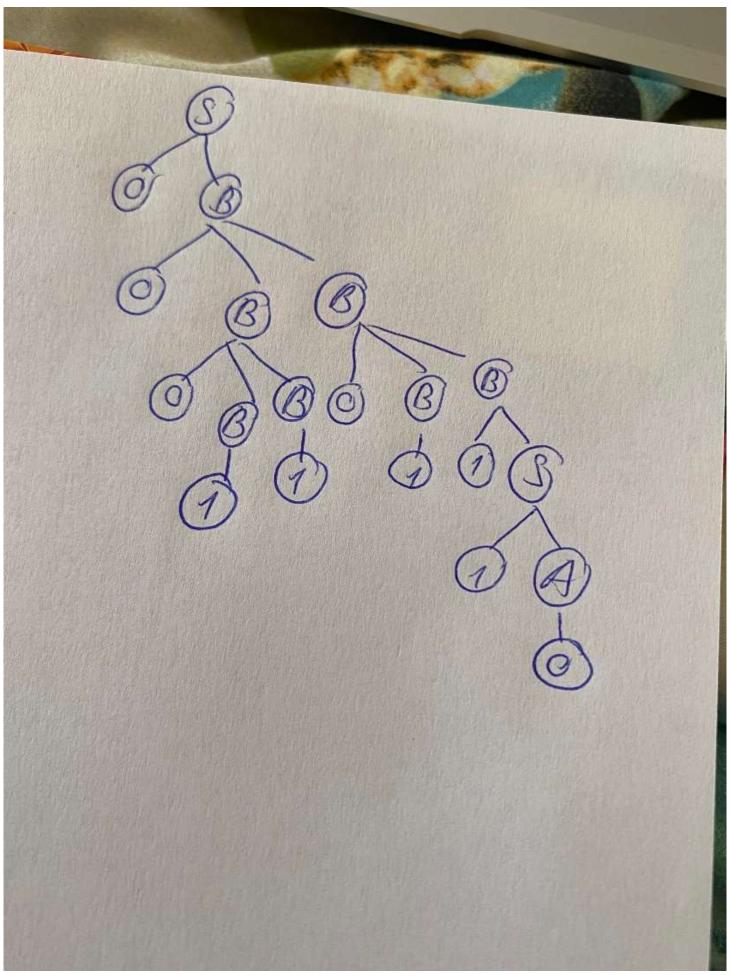
a. $G = (\{S, A, B\}, \{0, 1\}, \{S \to 0B \mid 1A, A \to 0 \mid 0S \mid 1AA, B \to 1 \mid 1S \mid 0BB\})$,
$w = 0001101110$

@B Andrada T.

Leftmost:1886686723

S=>0B=>00BB=>000BBB=>0001BB=>00011B=>000110BB=>0001101B=>00011011S=> 000110111A=>0001101110

#IW Andrada T.



Rightmost:1872387166

S=>0B=>00BB=>00B1S=>00B11A=>00B110=>000BB110=>000B1S110=>000B10B110=>
000B101110=>0001101110

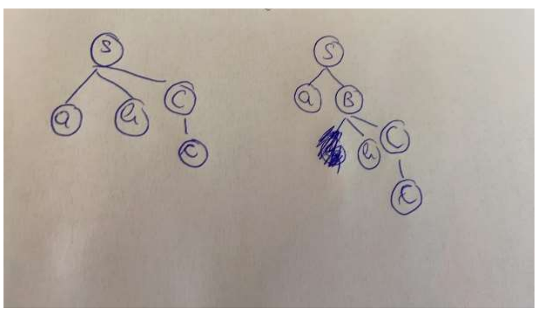
HW – parse tree as graph

b. $G = (\{E, T, F\}, \{a,+,*, (,)\}, \{E \rightarrow E + T \mid T, T \rightarrow T * F \mid F, F \rightarrow (E) \mid a\})$
$w = a * (a + a)$ – HW

2. Prove that the following grammars are ambiguous

a. $G_1 = (\{S, B,C\}, \{a, b, c\}, \{S \rightarrow abC \mid aB, B \rightarrow bC, C \rightarrow c\}, S)$

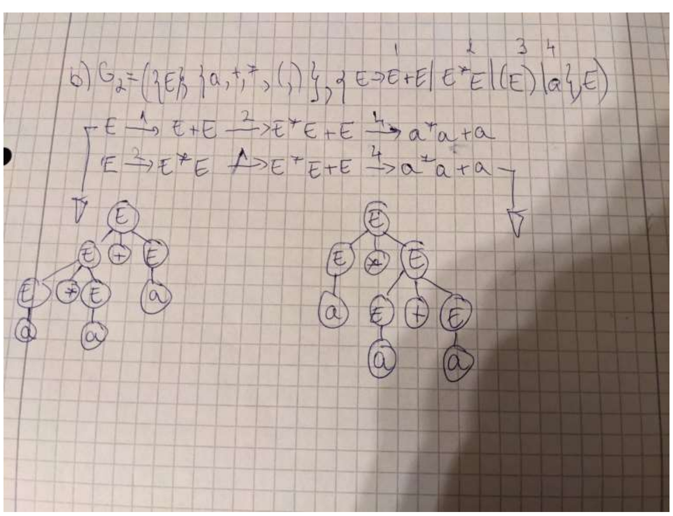
#IW Andrada T.
w=abc



b. $G_2 = (\{E\}, \{a,+,*, (,)\}, \{E \rightarrow E + E \mid E * E \mid (E) \mid a\}, E)$

#IW Alexandra T. David T, Andrada T., Liviu V.

w = a*a+a



3. Given the CFG G = ({S}, {a, b, c}, {S → aSbS | aS | c}) , parse the sequence w = aacbc using rec. desc. parser.

(S_1) : S –> aSbS

(S_2) : S –> aS

(S_3) : S –> c

#VA Alin T.

(q, 1, ϵ, S) |-exp (q, 1, S_1, aSbS) |-adv (q, 2, S_1a, SbS) |-exp (q, 2, S_1aS_1, aSbSbS) |-adv

(q, 3, S_1aS_1a, SbSbS) |-exp (q, 3, S_1aS_1aS_1, aSbSbSbS) |-mi (b, 3, S_1aS_1aS_1, aSbSbSbS) |-at

(q, 3, S_1aS_1aS_2, aSbSbS) |-mi (b, 3, S_1aS_1aS_2, aSbSbS) |-at (q, 3, S_1aS_1aS_3, cbSbS) |-adv

(q, 4, S_1aS_1aS_3c, bSbS) |-adv (q, 5, S_1aS_1aS_3cb, SbS) |-exp (q, 5, S_1aS_1aS_3cbS_1, aSbSbS) |-mi

(b, 5, S_1aS_1aS_3cbS_1, aSbSbS) |-at (q, 5, S_1aS_1aS_3cbS_2, aSbS) |-mi (b, 5, S_1aS_1aS_3cbS_2, aSbS) |-at

(q, 5, S_1aS_1aS_3cbS_3, cbS) |-adv (q, 6, S_1aS_1aS_3cbS_3c, bS) |-mi (b, 6, S_1aS_1aS_3cbS_3c, bS) |-bk

(b, 5, S_1aS_1aS_3cbS_3, cbS) |-at (b, 5, S_1aS_1aS_3cb, SbS) |-bk (b, 4, S_1aS_1aS_3c, bSbS) |-bk

(b, 3, S_1aS_1aS_3, cbSbS) |-at (b, 3, S_1aS_1a, SbSbS) |-bk (b, 2, S_1aS_1, aSbSbS) |-at

(q, 2, S_1aS_2, aSbS) |- … |- (q, 6, S_1a$S_2aS_3cbS_3c$, ϵ) |-succ (f, 6, S_1a$S_2aS_3cbS_3c$, ϵ)

Parse tree: $S_1S_2S_3S_3$