

CPSC 323, Assignment No.2

(CFG of some statements in C++)

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50 points

Name

1. (8 points) Consider the following grammar:

$S \rightarrow aSbB \mid A \mid c$

$A \rightarrow cA \mid c$

$B \rightarrow d \mid A$

Trace the grammar to determine which of the following words are accepted or rejected?

- i. accbc (use parse tree)    ii. acccdd (use left-most-derivation)

2. (8 points) Given the following CFG:

$S \rightarrow I = E$

$E \rightarrow E + T \mid E - T \mid T$

$T \rightarrow T * F \mid T / F \mid F$

$F \rightarrow ( E ) \mid I$

$I \rightarrow a \mid b$

Use parsing tree to trace the grammar and decide which of the following statements are accepted or rejected.

- i.  $a = a * (b - a * a)$     ii.  $b = a * b - b * (a + b)$

3. (8 points) Find the language of the following grammars:

a.  $S \rightarrow aS \mid bB \mid aA \mid \lambda$

$B \rightarrow bB \mid aA$

$A \rightarrow aA \mid bA \mid \lambda$

b.  $S \rightarrow aS \mid bA \mid \lambda$

$A \rightarrow aA \mid bX \mid \lambda$

$X \rightarrow aX \mid bX \mid \lambda$

4. (9 points) Find a CFG for each of the following languages

- (i)  $L = a^* + b^*$     (ii)  $L = a^*b^*c^*$     (iii)  $L = ab^* + ba^* + c$

Programming assignment

(17 points) Write a program to find the value of a postfix expression. Variables are one or more characters each. We might have some integer numbers as part of the expression. (Hint. Read each part of the expression as a token of type string, if the first character of the token is a letter that indicates the token is a variable name, push its value in stack. If the token is an integer number use the predefined function stoi (member of <string> library) to return its numeric value of the token.

Sample I/O:

Enter a postfix expression with a \$ at the end:

20 jerry 45 + tom - \* \$

Enter the value of jerry: 10

Enter the value of tom: 5

Expression's value is 1000

CONTINUE(y/n)? y

Enter a postfix expression with a \$ at the end:

myscore yourscore 45 + 100 + \* \$

Enter the value of myscore: 3

Enter the value of yourscore: 5

Expressions value is 450

CONTINUE(y/n)? n

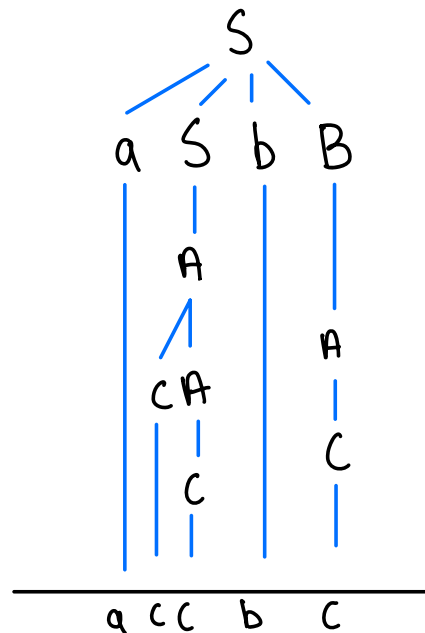
As input, please use the given expressions and the given values

$$\textcircled{1} S \rightarrow aSbB / A / c$$

$$A \rightarrow cA / c$$

$$B \rightarrow d / A$$

$\textcircled{1i}$  accbc



accbc is  
accepted

$\textcircled{1ii}$  acccd

$$S \rightarrow a \underline{S} b B$$

$$\Rightarrow a c \underline{A} b B$$

$$\Rightarrow a c c \underline{A} b B$$

$$\Rightarrow a c c c b B$$

stop no rule to start with b  
acccd is rejected

② Given the following CFG:

$$S \rightarrow I = E$$

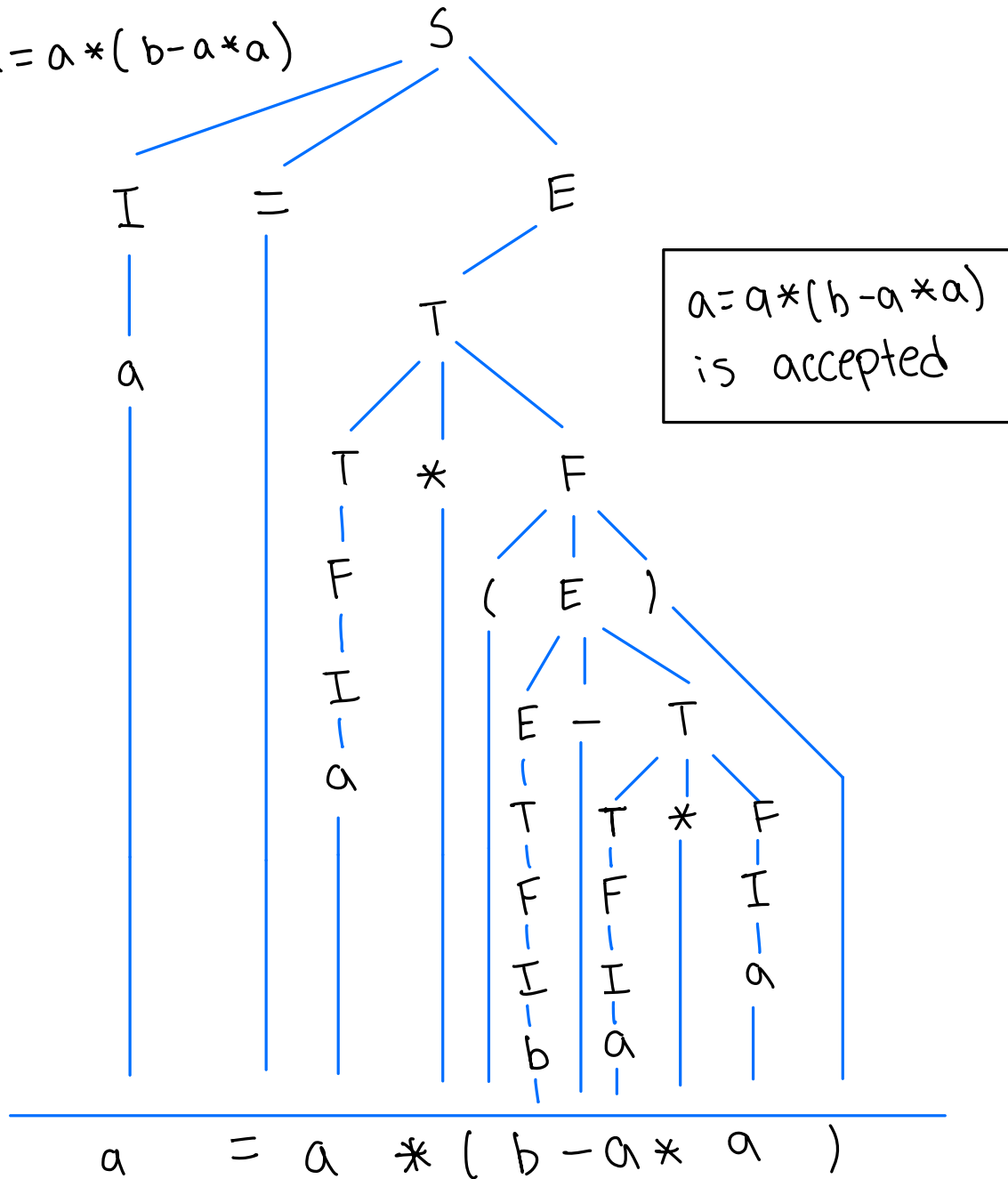
$$F \rightarrow (E) \mid I$$

$$E \rightarrow E + T \mid E - T \mid T$$

$$I \rightarrow a \mid b$$

$$T \rightarrow T * F \mid T / F \mid F$$

②i)  $a = a * (b - a * a)$



$a = a * (b - a * a)$   
is accepted

②:  $b = a * b - b * (a + b)$

$b = a * b - b * (a + b)$   
is accepted

