CS323 Assignment 5

1 Requirements

You are expected to complete all exercises. For submission, please put all your answers in a PDF file and submit it. The name of the file should follow the format **"studen-tID_ assignmentNumber"** (e.g., 30003554_assignment2). **The submission deadline is 11: 55 PM, Nov 26.**

2 Required Exercises (100 points)

Exercise 1: For the SDD in Figure 1, give annotated parse trees for the following expressions:

1. $(3+4)*(5+6)\mathbf{n}$ [20 points]
2. $1*2*3*(4+5)\mathbf{n}$ [20 points]
3. $(9+8*(7+6)+5)*4\mathbf{n}$ [20 points]

	PRODUCTION	SEMANTIC RULES
1)	$L \to E\ \mathbf{n}$	$L.val = E.val$
2)	$E \to E_1 + T$	$E.val = E_1.val + T.val$
3)	$E \to T$	$E.val = T.val$
4)	$T \to T_1 * F$	$T.val = T_1.val \times F.val$
5)	$T \to F$	$T.val = F.val$
6)	$F \to (\ E\ )$	$F.val = E.val$
7)	$F \to \mathbf{digit}$	$F.val = \mathbf{digit}.\text{lexval}$

Figure 1: Syntax-directed definition of a simple desk calculator

Exercise 2: What are all the topological sorts for the dependency graph of Figure 2? One sort mentioned during lecture is $1, 2, 3, \ldots, 9$ (slide #16 of Chapter 4). [20 points]

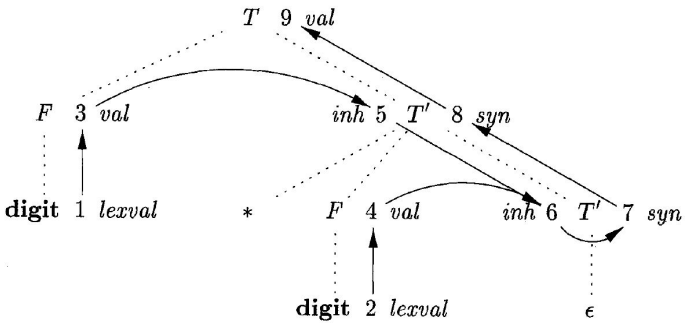

Figure 2: A dependency graph

Exercise 3: Below is a grammar for expressions involving operator + and integer or floating-point operands. Floating-point numbers are distinguished by having a decimal point. Give an SDD to determine the type of each term T and expression E. [20 points]

$$E \to E + T \mid T$$
$$T \to \mathbf{num} \cdot \mathbf{num} \mid \mathbf{num}$$