Eindhoven University of Technology
Department of Mathematics and Computer Science

TU/e

Exam *Generic Language Thechnology* (2IS15) 1st of November 2012, 09:00-12:00.

This exam consists of 3 questions.
You are allowed to use all distributed material, slides, books, papers, and laptop.
You need to give a concise motivation for all the answers.

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1. Basic technology

   (a) What are the typical products of generic language technology research?

   (b) How would you classify the languages $L_0 = \{a^k b^l c^m | k, l, m > 0\}$, $L_1 = \{a^k b^l c^k | k, l > 0\}$, and $L_2 = \{a^k b^k c^k | k > 0\}$?

   (c) In what phase of the translation of a regular expression into a minimal DFA is the subset construction used? Motivate your example if possible by an example.

   (d) How does (F)lex solve the lexical disambiguation rule ”prefer keywords”? What are other lexical disambiguation rules?

   (e) What is left/right most derivation? What property/characteristic do the production rules of context-free grammar need to have in order to produce the same left-most and right-most derivation?

   (f) What are the drawbacks of left recursion elimination and left factorization?

   (g) Is the SLR(1) parse table for an LL(1) grammar always conflict free? Motivate your answer.

   (h) Why is the argument of the closure computation a nonterminal and not a terminal? Relate this to what an item set (state in the (S)LR table represents.

   (i) What is a graph structured stack?

2. Grammar and syntaxn

   (a) What is the advantage of defining the abstract syntax of a (programming) language? What are the mechanims/formalisms to describe the abstract syntax?

   (b) What is consequence of the fact that the reference model of a metameta-model the metameta-model itself is?

(c) Xtext and EMFtext are both based on ANTLR. What are the consequences for both tools? Describe two aspects where Xtext and EMFtext fundamentally differ?

(d) Production rules have the same form in SDF. What is the distinction between a lexical and context-free rule in SDF?

(e) What is the relation between the nonterminal in the left hand side and the nonterminals occuring in the right hand side in an Xtext production rule and the corresponding meta-model? Illustrate this by an example.

(f) What is the effect of the ``?='' assignment in Xtext? Illustrate by an example.

(g) Why is the cross reference mechanism in Xtext in a grammar formalism like SDF or YACC?

3. Semantics

(a) What is the lifetime of a variable?

(b) What is the difference between a scope and a block? Are these syntactical or semantical notions?

(c) Is type checking always done at compile time? Motivate your answer with an example.

(d) What is the difference between a function and procedure? Illustrate this by an example?

(e) What is overloading? What is the effect of overloading on the identificaton phase?

(f) Why is it necessary to have a precise definition of the dynamic semantics of a language? How can the dynamic semantics be defined?

Grading of exercises

1			2			3		
	a	10		a	10		a	10
	b	10		b	10		b	10
	c	10		c	10		c	10
	d	10		d	10		d	10
	e	10		e	10		e	10
	f	10		f	10		f	10
	g	10		g	10			
	h	10						
	i	10						