B. Engg. CSE 8th Semester (43) 304

14 October 2014 (Morning)

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
Department of Computer Science and Engineering (CSE)

SEMESTER FINAL EXAMINATION — SUMMER SEMESTER, 2013-2014

DURATION: 3 Hours — FULL MARKS: 150

CSE 4801: Compiler Design

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **8 (eight)** questions. Answer any **6 (six)** of them.

Figures in the right margin indicate marks.

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a) Discuss on *Error Detection and Reporting* strategy during phase-wise compilation process. 9

b) Give a comparative statement on *single-pass* and *multi-pass* compilers in terms of simplicity, efficiency and portability. 9

c) Classify grammars and define each of them with example. 7

d) The syntax of programming language can be described by context-free grammar. Explain its advantages for both language designers and compiler writers. 8

e) Explain the position and role of a *lexical analyzer* in a multi-phase compiler model. 7

f) In a string of length n, how many of the followings are there? 2x5

i. prefixes
ii. suffixes
iii. substrings
iv. proper prefixes
v. subsequences

g) Consider the grammar 3+5+5

$S \rightarrow (L) \mid a$
$L \rightarrow L, S \mid S$

i. What are the terminals, nonterminals, and start symbol?
ii. Find the parse trees for the sentences- *(a,(a,a))* and *(a,((a,a),(a,a)))*.
iii. Construct a leftmost derivation for each of the sentences in (ii).

h) Consider the grammar 3+4

$S \rightarrow aSbS \mid bSaS \mid \epsilon$

i. Show that this grammar is ambiguous.
ii. Construct the corresponding rightmost derivation for the sentence $abaab$.

i) What is the set of *FIRST* for a grammar symbol? Write down the generalized algorithm to find the set of FIRST for a grammar symbol. 5

4. a) Consider the following grammar

$E \rightarrow E + T \mid T$
$T \rightarrow T F \mid F$
$F \rightarrow F^* \mid (S) \mid a$

Construct the SLR parser table for this grammar.

b) Give the *Translation Scheme* for checking the type of following statements

$S \rightarrow id = E$
$S \rightarrow if\ E\ then\ S_1$
$S \rightarrow while\ E\ do\ S_1$
$S \rightarrow S_1; S_2$

5. a) Write short notes on the followings-
Annotated parse tree, L-attributed definitions, depth first visit

b) Consider the grammar

E → E+ T | E – T | T
T → (E) | id | num

Give the syntax-directed definition for constructing a syntax tree for an expression. Use the functions *mknode(op,left,right), mkleaf(id.entry), mkleaf(num.entry)*to create nodes of the syntax tree.

c) Explain bottom-up evaluation of *s-attributed definitions* using parser stack.

6. a) Design ***syntax-directed definitions*** to generate three-address codes for the following productions-

i. $S \rightarrow if\ E\ then\ S_1\ else\ S_2$
ii. $S \rightarrow do\ S_1\ while\ E$
iii. $S \rightarrow id = E$

b) State common three-address statements.

c) Explain various methods of implementing ***three-address codes***.

7. a) What is an activation record? Discuss in brief.

b) Explain various storage allocation strategies for run-time function activations.

c) Discuss on access to nonlocal names with respect to blocks of statements.

8. a) List four names for each group of animals' ***domestic, bird, fish and wild***. Write a ***lex*** program to read a line of text containing animal names and print the group of each word of that line. Also notify if a word is not in any of the lists.

b) Write a multi-file word counting program (like *wc* in linux) using lex. Comma separated file names will be given to the program as command line argument. Then the program will show number of characters, words, and lines in a line for each of the file. At the end accumulated statistics of all of the files will be shown in a line. 13+2

Also, write down the commands to compile the lex program in linux system.