53 (IT 603) CPDG

2014

COMPILER DESIGN

Paper : IT 603

Full Marks : 100

Time : Three hours

**The figures in the margin indicate full marks
for the questions.**

*Answer **any five** questions out of seven.*

1. *(a)* Explain with neat diagram, the various phases of a compiler. Mention the input and output for each phase. 6+4

   (b) Explain the token generators and token recognizers, with a simple example. 3+3

   (c) What is the role of parser in Compilation Process ? 4

2. *(a)* Define   3×3

      (i) left most derivation

      (ii) right most derivation

      (iii) parse tree

  (b) You are given the grammar :   4

$$S \to a \mid b \mid (L)$$

$$L \to L, S \mid S$$

Give left-most derivation for the sentence $((a,b),a)$.

  (c) Define ambiguity and show that the grammar below is ambiguous for the statement

$$id + (id) + id * id.$$

The grammar is $E \to E + E/E * E \mid (E) \mid id$

                                    2+5

3. *(a)* Write down the differences between top-down and bottom-up parsing method.   4

  (b) Explain left recursion and show how it is eliminated. Eliminate left recursion from the following grammar   2+2+4

$$E \to E + T \mid T$$

$$T \to T * F \mid F$$

$$F \to (E) \mid id$$

(c) Define LL(1) grammar. Give conditions for a grammar to be LL(1) based on FIRST and FOLLOW. Check whether the above grammar (question no. 3(b)) is LL(1) or not.

2+3+3

4. (a) Obtain the directed acyclic graph for the expression $a + a * (b - c) + (b - c) * d$. Also give the sequence of steps for constructing the same.

4+4

(b) Translate the arithmetic expression $a + - (b + c)$ into quadruples, triples and indirect triples.

6

(c) Explain how stack implementation of shift reduce (SR) parsing is done considering the following grammar

$$E \rightarrow E + E$$

$$E \rightarrow E * E$$

$$E \rightarrow (E)$$

$$E \rightarrow id$$

the input string is $id_1 + id_2 + id_3$.

6

5. *(a)* What is handle purning ? Explain with the help of the grammar $S \rightarrow SS+ \mid SS* \mid a$ and input string $aaa*a++$. Give a bottom-up parse of the given input string. 2+4+4

(b) What are the advantages and disadvantages of LALR parsing ? 4

(c) Differentiate between L-attributed and S-attributed grammar. 3+3

6. *(a)* What is DAG ? 2

(b) Consider the following grammar ? 4+6

$$S \rightarrow AS \mid b$$
$$A \rightarrow SA \mid a$$

Construct the SLR parse table for the grammar. Show the actions of the parser for the input string '$abab$'.

(c) "A grammar containing left recursion cannot be LL(1), therefore a grammar containing right recursion cannot be LR(1)", comment on the statement and justify your answer. 8

7. *(a)* Consider the grammar below and construct the LALR parsing table   8

$$S \rightarrow S$$
$$S \rightarrow CC$$
$$C \rightarrow cC$$
$$C \rightarrow d$$

(b) Explain SDD with an example.   6

(c) "Every LR(0) grammar is SLR(1), but Vice Versa need not necessary be true". Comment on the statement and justify your answer.   6

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