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53 (IT 603) COMD

2015

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.

1. (a) Explain with neat diagram, the various phases of a compiler. Mention the input and output for each phase. 8
- (b) What are the common conflicts that can be encountered in shift-reduce parser. 6
- (c) Explain input buffering strategy, used in lexical analysis phase. 6
2. (a) Draw the transition diagram to recognize the relop (relational operator of a language) 5

Contd.

(b) Define the following : 3×3

(i) Parse tree

(ii) left most derivation

(iii) Right most derivation.

(c) Give left and right most derivation to derive a statement $W.W = id + (id) + id * id$ by using the following grammar 4+2

$$E \rightarrow E + E \mid E * E$$

$$E \rightarrow (E)$$

$$E \rightarrow id$$

Check whether the grammar is ambiguous for the above statement or not.

3. (a) Draw the DAG for the following expression

$$a + a * (b - c) + (b - c) * d$$

also translate the above expression into 3-address code, quadruples and triples.

10

(b) Differentiate between L-attribute and S-attribute grammar. 6

(c) What do you mean by boot strapping process ? What is the advantage of using this process ? 2+2

4. (a) What is syntax directed translation and why are they important ? 2+2

(b) Consider the context free grammar below

$$S \rightarrow EN$$

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

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

$$F \rightarrow (E) \mid \text{digit}$$

$$N \rightarrow ;$$

(i) Obtain SDD for the above grammar. 8

(ii) Construct the parse tree, syntax tree and annotated parse tree for the input string $3 * 5 + 4 ;$ 8

(c) Obtain postfix SDT for the grammar in Q.4 (b) and illustrate the corresponding parser stack implementation. 8

5. (a) Eliminate left recursion from the grammar below 6

$$S \rightarrow Sd | Se | aB | aC$$

$$B \rightarrow bBc | f$$

$$C \rightarrow g$$

- (b) Define LL(1) grammar? Under what conditions a grammar is called LL(1)? Check whether the above grammar (Q. 5(a)) is LL(1) or not. 2+3+3

- (c) Compute FIRST and FOLLOW of the above grammar (Q. 5(a)). 6

6. (a) Obtain the set of canonical LR(0) items for the grammar 8

$$S \rightarrow L = R | R$$

$$L \rightarrow R | *R | id$$

$$R \rightarrow L$$

Is the grammar SLR (1) or not? Give reasons.

- (b) What is handle pruning? Explain with the help of the grammar 2+4

$$S \rightarrow SS+ | S * S | a$$

and input string "aa+*aa+".

(c) Explain in detail different storage allocation strategies. 6

7. (a) What do you mean by left factoring? What is its use in parsing? Do the left factoring the following grammar

$$E \rightarrow 5 + T \mid 3 - T$$

$$T \rightarrow V \mid V * V \mid V + V$$

$$V \rightarrow a \mid b \quad 2+2+4$$

(b) Explain how stack implementation of Shift-Reduce (SR) parsing is done considering the following grammar

$$E \rightarrow E + E \mid E * E$$

$$D \rightarrow (E) \mid id$$

8

the input string is $id + (id) + id * id$.

(c) Describe the concept of register allocation. 4

8. (a) Consider the following grammar given below and construct LALR parsing table. Consider the augmented grammar

$$S' \rightarrow S$$

$$S \rightarrow Aa \mid dAb \mid dca$$

$$S \rightarrow cb$$

$$A \rightarrow c$$

10

- (b) What are the advantages and disadvantages of LALR parsing technique? 3+3

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