2018

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 the input buffering strategy, used in the lexical analysis phase. 5

(b) Draw the transition diagram to recognize the token relop (relational operator language) ? 5

(c) Explain with a neat diagram, the various phases of a compiler and explain how different phases of compilation will operate on the following statement : 6+4

Position = initial + rate * 60,

assuming datatype of rate is float.

2. (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.
4+6

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

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

3. (a) Define the following term :

Lexeme, Lexical analyze and Token.
6

(b) Compute the FIRST( ) and FOLLOW( ) Symbols for the following grammar :
6

$$E \rightarrow TE'$$
$$E' \rightarrow +TE' \mid \varepsilon$$
$$T \rightarrow FT'$$
$$T' \rightarrow *FT' \mid \varepsilon$$
$$F \rightarrow (E) \mid id$$

(c) Define LL (1) Grammar. Under what conditions a grammar is called LL (1) ? Check whether the above grammar (question no. 3(a) is LL (1) or not.
2+3+3

4. (a) Obtain the set of canonical LR(0) items for the grammar :

$$S \rightarrow L = R$$
$$S \rightarrow R$$
$$L \rightarrow *R$$
$$L \rightarrow id$$
$$R \rightarrow L$$

Is the grammar is SLR (1) or not ? Give reasons.
8

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

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

and input string $aa + *aa +$.

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

5. (a) Construct a SLR (1) parsing table for the following grammar :
8

$$S \rightarrow xAy \mid xBy \mid xAz$$
$$A \rightarrow aS$$
$$B \rightarrow q$$

(b) Show with the help of an example "no left recursive grammar can be LL (1)".
4

(c) Make left and right most derivation using top-down and bottom-up strategy to derive a statement w, where $w = id + (id + id) * id$ using the following grammar :

$$E \rightarrow E + E$$
$$E \rightarrow E * E$$
$$E \rightarrow (E)$$
$$E \rightarrow id$$

check whether grammar is ambiguous or not. 6+2

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

$$E \rightarrow 5 + T \mid 3 - T$$
$$T \rightarrow V \mid V * V \mid V + V$$
$$V \rightarrow a \mid b$$

(b) Explain how stack implementation of shift reduce (SR) parsing is done considering the following grammar : 2+2+4

$$E \rightarrow E + E$$
$$E \rightarrow E * E$$
$$E \rightarrow (E)$$
$$E \rightarrow id$$

the input string is $id + (id) + id * id$. 8

(c) What is syntax-directed translation and why is this important ? 2+2

7. (a) Consider the following grammar and construct the LALR parsing table. Consider the augmented grammar G'.

$$S' \rightarrow S$$
$$S \rightarrow aAd \mid bBd \mid aBC \mid bAc$$
$$A \rightarrow C$$
$$B \rightarrow cb$$

10

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

(c) Construct the transition diagram for the following regular expression : 3+3

(i) $((a \mid b)c^*)^*$

(ii) $(a \mid b)^* abb$

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