Sixth Semester B.E. Degree Examination, Jan./Feb. 2023
Complier Design

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions, selecting atleast TWO questions from each part.*

PART – A

1 a. With a neat diagram, explain various phases of complier. **(10 Marks)**
   b. Write the look ahead code with sentinels for input buffering strategy used in lexical analysis phase. **(05 Marks)**
   c. Construct a transition diagram for recognizing unsigned numbers. **(05 Marks)**

2 a. Define left-recursive grammar. Eliminate left recursion from the following grammar:
      $E \rightarrow E + T \mid T$
      $T \rightarrow T * F \mid F$
      $F \rightarrow (E) \mid id.$ **(05 Marks)**
   b. Given the grammar
      $S \rightarrow AaAb \mid BbBa$
      $A \rightarrow \in$
      $B \rightarrow \in$
      i)   Compute First( ) and Follow( ) functions.
      ii) Construct predictive parsing table.
      iii) Parse the input string w = ab. **(09 Marks)**
   c. Show that the following grammar is ambiguous $E \rightarrow E + E \mid E * E \mid (E) \mid id$, write an equivalent unambiguous grammar for the same. **(06 Marks)**

3 a. Write an algorithm to construct a predictive parsing table. Construct the predictive parsing table, considering the grammar :
      $E \rightarrow E + T/T$
      $T \rightarrow T * F/F$
      $F \rightarrow (E) /id$ **(08 Marks)**
   b. Explain the working of a shift reduce parser. **(04 Marks)**
   c. Explain the conflicts of shift reduce parsing with suitable examples. **(08 Marks)**

4 a. Write a schematic of LR parser. Write the canonical collection of set of LR(0) items and SLR parsing table for the following grammar:
      $E \rightarrow E + T / T$
      $T \rightarrow T * F / F$
      $F \rightarrow (E)/id$ **(14 Marks)**
   b. Construct LR(1) goto graph for below grammar:
      $X \rightarrow YZ/a$
      $Y \rightarrow bZ/ \in$
      $Z \rightarrow \in$ **(06 Marks)**

PART – B

5 a. Explain the concept of syntax directed definition. (04 Marks)

b. Consider the context free grammar given below:

$S \rightarrow EN$
$E \rightarrow E + T \mid E - T \mid T$
$T \rightarrow T * F \mid T \mid F \mid F$
$F \rightarrow (E) \mid digit$
$N \rightarrow ;$

    i) Obtain SDD for the above grammar.

    ii) Annotated parse tree for the input string $5 * 6 + 7$; (10 Marks)

c. Define:

    i) Synthesized attribute

    ii) Inherited attribute. (06 Marks)

6 a. Obtain the directed acyclic graph for the expression :

$a + a * (b - c) + (b - c) * d$. (06 Marks)

b. List any four common three address instruction forms. (04 Marks)

c. Write syntax directed definition for flow of control statements. (10 Marks)

7 a. Write the possible activations and activation tree corresponding to quick sort call quicksort $(1, 9)$. (06 Marks)

b. What are the basic functions and properties of memory management? Explain locality in program in detail. (08 Marks)

c. What is garbage collection? What are the performance metric that must be considered when designing a garbage collector? (06 Marks)

8 a. Discuss the various issues in the design of a code generator. (10 Marks)

b. What are basic blocks and flow graphs? Write an algorithm to partition the three address instructions into basic blocks. (06 Marks)

c. Explain code optimization methods:

    i) Local common subexpressions

    ii) Dead code elimination. (04 Marks)

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