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10CS63

Sixth Semester B.E. Degree Examination, June/July 2023
Compiler Design

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Explain with a diagram, the phases of Compiler. **(08 Marks)**

b. Write the transition diagram for the following :
i) Identifier ii) Unsigned number. **(06 Marks)**

c. Write a program for look ahead code with sentinels. **(06 Marks)**

2 a. Describe an algorithm used for eliminating the left recursion. Eliminate left recursion from the grammar : $S \rightarrow Aa \mid b \quad A \rightarrow Ac \mid Sd \mid a$. **(06 Marks)**

b. 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)**

c. What are the key problems with top down parse? Write a recursive descent parser for the grammar : $S \rightarrow cAd \quad A \rightarrow ab \mid a$. **(08 Marks)**

3 a. Given the grammer :
$S \rightarrow aABb$
$A \rightarrow c \mid \in$
$B \rightarrow d \mid \in$
i) Compute FIRST and FOLLOW sets.
ii) Construct the predictive parsing table
iii) Show the moves made by predictive parser on the input ; acdb. **(10 Marks)**

b. Explain with a neat diagram, the model of a table driven predictive parser. **(05 Marks)**

c. What is handle pruning? Give a bottom – up parse for the input : aaa * a++ and grammar : $S \rightarrow SS+ \mid SS* \mid a$. **(05 Marks)**

4 a. Construct the canonical LR(1) Item sets for the following grammar :
$S \rightarrow AA$
$A \rightarrow aA \mid b$. **(10 Marks)**

b. Construct LALR parsing table for the grammar shown in Q4 (a) using LR(1) items. **(10 Marks)**

PART – B

5 a. Define Inherited and Synthesized attributes. Give examples. **(06 Marks)**

b. Give the SDD for simple desk calculator and draw dependency graph for expression, $1*2*3*(4+5)n$. **(10 Marks)**

c. Write SDD that generates either a basic type or an array type. **(04 Marks)**

6 a. Translate the arithmetic expression : a + - (b + c) into quadruples, triples and indirect triples. **(06 Marks)**

b. Give a semantic action for : $S \rightarrow$ if (B) S_1 else S_2. **(06 Marks)**

c. Develop SDD to produce directed a cyclic graph for an expression. Show the steps for constructing the directed acyclic graph for the expression : $a + a * (b - c) + (b - c) * d$. **(08 Marks)**

7 a. With a neat diagram, describe the general structure of an activation record. **(06 Marks)**

b. Explain in the strategy for reducing fragmentation in leap memory. **(08 Marks)**

c. Explain briefly the performance metrics to be considered while designing a garbage collector. **(06 Marks)**

8 a. Explain the main issues in code generation. **(10 Marks)**

b. For the following program segment:

```
for i = 1 to 10 do
    for j = 1 to 10 do
        a[i, j] = 0 . 0
    for i = 1 to 10 do
    a[i, i] = 1.0
```

Generate intermediate code and identify basic blocks. **(10 Marks)**

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