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10CS63

Sixth Semester B.E. Degree Examination, Jan./Feb. 2021
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. List the phases of a Compiler. Describe the analysis part and synthesis part of the compiler. (05 Marks)
b. Write a note on Compiler Construction tools. (05 Marks)
c. Draw the transition diagram for relation operators in C : < , > , < = , > = , = = , ! = . (05 Marks)
d. Explain the concept of Input buffering scheme. (05 Marks)
2. a. Enlist the error recovery strategies in parser and briefly explain any three recovery strategies in parser. (06 Marks)
b. Construct FIRST and FOLLOW set for the following grammar :
 $D \rightarrow T \text{ id} ; D \mid \epsilon$
 $T \rightarrow BC \mid \text{Struct id } \{D\}$
 $B \rightarrow \text{int} \mid \text{float} \mid \text{char}$
 $C \rightarrow [\text{num}] C \mid \epsilon$. (06 Marks)
c. Write down the algorithm for construction of predictive parsing table and also construction the parsing table for the given grammar.
 $E \rightarrow T E' \quad E' \rightarrow + T E' \mid \epsilon \quad T \rightarrow \text{id}(E)$. (08 Marks)
3. a. Construct LR(0) automaton using CLOSURE and GOTO functions for the grammar given below. Check whether the grammar is in SLR. Justify your answer.
 $S \rightarrow L = R \mid R$
 $S \rightarrow * R \mid \text{id}$
 $R \rightarrow L$. (08 Marks)
b. Figure out different types of conflicts occur during shift reduce parsing. Discuss the situations in which these conflicts occur. (04 Marks)
c. Write down the algorithms for constructing SLR parsing table and LR parsing for the given input. (08 Marks)
4. a. What are the limitations of SLR parser? How do you overcome these limitations? Write down the method to calculate look ahead token for canonical items. (06 Marks)
b. Construct the canonical LR(1) items and the GOTO graph as well as canonical LR(1) parsing table for the following grammar $S \rightarrow (S) S \mid \epsilon$. (10 Marks)
c. Build LALR automaton or parsing table for the grammar given in Q4(b). (04 Marks)

PART - B

5. a. Explain the concept of Syntax directed definition and translation. Define synthesized and inherited attributes. Mention the types of attributes used in bottom up and top down parsers. (08 Marks)

- b. Write down the Syntax directed definition for simple calculator. Construct annotated parse tree and the Syntax tree for the input string $5 * 6 + 2 * 7$. (06 Marks)
- c. Give semantic rules for declaration of data types and Syntax directed translation for the same using the given grammar.
 $T \rightarrow B C$ $B \rightarrow \text{int} \mid \text{float}$
 $C \rightarrow [\text{num}] C \mid \epsilon$. (06 Marks)
- 6 a. Demonstrate the concept of three address code, quadruples. Translate the arithmetic expression $f = a - (b + c) * d$ into i) Quadruples ii) Triples iii) Indirect triples. (08 Marks)
- b. Describe the Syntax directed translation for switch statement. (08 Marks)
- c. Justify the role of control statements in programming language. Write down the Syntax directed definition for flow of control statements. (04 Marks)
- 7 a. Describe the structure of activation record with neat diagram. (05 Marks)
- b. List out the functions and properties of memory manager, a subsystem of heap management. (05 Marks)
- c. Mention the steps involved in calling a function and returning from a function with the diagram. (05 Marks)
- d. Using the below given code for finding n^{th} Fibonacci number, build activation tree for finding 5^{th} Fibonacci number.

```
int fib (int n)
{if (n < 2) return 1 ;
 else return (fib (n-1) + fib (n-2));}
```

 (05 Marks)
- 8 a. For the following program
For I = 1 to 10 do
For J = 1 to 10 do
A[I, J] = 0
For I = 1 to 10 do
A = [I, I] = 1. (10 Marks)
- b. Explain the concept of dead code elimination and finding local common sub expressions with examples. (10 Marks)
