

13.12.08
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B.E. 7th semester Examinations, 2007.

Subject: Compiler Construction
Subject Code: CST 701

Full Marks:100

Time: 3Hrs

Answer any five questions.

1. Consider the grammar

$A \rightarrow BCx \mid y$

$B \rightarrow yA \mid \epsilon$

$C \rightarrow Ay \mid x$

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|-------|---|-----|
| (i) | Compute FIRST and FOLLOW sets for each nonterminal. | 6+6 |
| (ii) | Draw predictive parsing table. | 4 |
| (iii) | Tell whether the grammar is LL(1) or not. | 1 |
| (iv) | Parse the string yyxyx with the help of the table. | 3 |

2. Consider the grammar

$E \rightarrow E+T \mid T$

$T \rightarrow TF \mid F$

$F \rightarrow F^* \mid a \mid b$

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|-------|---|---|
| (i) | Construct LR(0) finite control. | 8 |
| (ii) | Compute the follow of all non-terminal symbols. | 6 |
| (iii) | Construct the SLR parsing table. | 6 |

3. Construct the operator precedence parser for the following grammar.

$S \rightarrow (L) \mid a$

$L \rightarrow L,S \mid S$

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|-------|---|-----|
| (i) | Compute Leading & Trailing of all nonterminal symbols. | 4+4 |
| (ii) | Compute precedence relations prevailing between terminal symbols of the grammar. Put those relations in operator precedence matrix in the order mentioned below:
() a , \$ (special terminal symbol). | 8 |
| (iii) | Show the parsing of the string (a,(a,a)) using the table constructed. | 4 |

- 4.
- (i) Write context-free grammars to detect the strings over the alphabet $\{a,b\}$ such that every a is immediately followed by b. Is it ambiguous? 4+2
 - (ii) What is the effect of left-recursion in top-down parsing method? How is it eliminated? 3+3
 - (iii) Write down the regular expression for a sentence (something that begins with a capital letter and ends with a full stop.) 4
 - (iv) What is the formal definition of regular expression? 4

5. Show the annotated parse tree and intermediate code generation process for the following arithmetic expressions $a + (b(-c) * d)$ using the grammar: 20

$E \rightarrow E + E$

$E \rightarrow E * E$

$E \rightarrow -E$

$E \rightarrow (E)$

$E \rightarrow id$

6. (a) What is DAG? What are the applications of DAG in compiler design process. 2 + 2

(b) What are data flow equations for available expression data flow property? Explain it. Write an algorithm for computing available expressions for all basic blocks. 4 + 2 + 4

© What is common sub-expression elimination? Specify the necessary conditions to be satisfied for common sub-expression elimination. 2 + 4

7. (a) Write and explain semantic actions for 4 + 4

- (i) while-do loop
- (ii) if-then-else structure

(b) Write intermediate code for 4

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while a>b do
begin
    if x = y then c=a+b;
    a=b+c;
end;

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© Assuming single register available, write a syntax directed code generation scheme in order to generate target code for an expression. Use the example $a + b + c$ for generation of target code.