

Sub: Compiler Construction

Class: BE 3/4 Sec I, II, III CSE sem II 20

1. Translate the given statements explaining in detail all the phases of compilation along with the data structures.
 - (a) $p = i + r * 60$ where p, i, r are float.
 - (b) $a = b * c / d - e + 20$ where a, d, e are float, b, c are int.
2. Distinguish between the following.
 - (a) pass and phase
 - (b) front end and backend
 - (c) Analysis and Synthesis
 - (d) Top down & Bottom up parsing.
3. Eliminate Left recursion from the given CFGs. Why is it required to be done?

(a) $S \rightarrow Aa b$ $A \rightarrow Ac Sd e$	(b) $A \rightarrow Aa Ab c d$	(c) $E \rightarrow E + T T$ $T \rightarrow T * F F$ $F \rightarrow id num$
---	-------------------------------------	--
4. Left factor the given CFGs. Why should grammars be left factored?
 - (a) $if_stat \rightarrow if(exp) statement | if(exp) statement else statement$
 - (b) $S \rightarrow iETS | iETSeS | a, E \rightarrow b$
5. Define the given grammars and differentiate between them.

LL(1), LR(0), SLR(1), LR(1), LALR(1)
6. Give short notes on the following:

(a) Bootstrapping (with T diagrams) (b) Porting (") (c) LEX (d) YACC (e) Input Buffering (f) Ambiguous grammars with example (g) Syntax errors and Recovery procedure (h) Error Recovery in Top Down/Bottom up parsing	(i) Recursive descent parsing. (j) Shift Reduce parsing. (k) Conflicts in Shift Reduce parsing (l) Handle, Viable Prefix with examples (m) tokens, patterns, lexemes with examples. (n) Common errors in phases of a compiler. (o) Why is bootstrapping required to generate cross compilers. (p) Predictive parsers.
---	--

7. Trace Brute force parsing for the given grammar and the given input "id + id * id".

$$\begin{aligned}
 E &\rightarrow TE' \\
 E' &\rightarrow +TE' \mid \epsilon \\
 T &\rightarrow FT' \\
 T' &\rightarrow *FT' \mid \epsilon \\
 F &\rightarrow (E) \mid id
 \end{aligned}$$

8. Show the moves made by the parser ^{using a stack} on the given input string a) for a predictive parser. Use the grammar and input instmrig of problem 7. Is the grammar of prob 7 LL(1)? Construct the parsing table.

b) Is the grammar LL(1)? Construct parsing table.

$$S \rightarrow iEtS \mid iEtSeS \mid a, E \rightarrow b$$

9. a) Give rules to construct FIRST and Follow sets. (text kenneth) b) Construct FIRST and FOLLOW sets for the given grammars.

Why are they required? Is the grammar LL(1)?

(i) $E \rightarrow E+T \mid T$	(ii) $S \rightarrow iEtSS' \mid a$	(iii) $S \rightarrow AaBD$
$T \rightarrow T * F \mid F$	$S' \rightarrow eS \mid \epsilon$	$A \rightarrow c \mid \epsilon$
$F \rightarrow (E) \mid id$	$E \rightarrow b$	$B \rightarrow b \mid \epsilon$
		$D \rightarrow d \mid \epsilon$

(iv) $S \rightarrow SS+ \mid SS* \mid a$

10. a) Is the given grammar LR(0) / SLR? Why? Construct parsing table.

(i) $S \rightarrow L=R \mid R$	(ii) $E \rightarrow E * B \mid E + B \mid B$	(iii) $A \rightarrow (A)$
$L \rightarrow *R \mid id$	$B \rightarrow 0 \mid 1$	
$R \rightarrow L$		

11. Is the given grammar LR(1) / LALR? Why? Construct parsing table

(i) $S \rightarrow CC$	(ii) $S \rightarrow L = R \mid R$	(iii) $S \rightarrow id \mid V := E$
$C \rightarrow cC \mid d$	$L \rightarrow *R \mid id$	$V \rightarrow id$
	$R \rightarrow L$	$E \rightarrow V \mid n$

12. Give Regular Expressions and LEX to identify: (a) valid identifiers and digits (b) floating pt. numbers.