

1996 Paper 10 Question 4

Compiler Construction

Describe what is meant by a *phrase structured grammar* and a *context free grammar*.
[3 marks]

Describe an algorithm to calculate the set $L_T(P)$ of all terminal symbols that can start a string derived from the non-terminal P using one or more productions of a given context free grammar. Illustrate your answer by calculating L_T sets for the following grammar:

$$S \rightarrow UV$$

$$V \rightarrow +UV \mid \epsilon$$

$$U \rightarrow XW$$

$$W \rightarrow *XW \mid \epsilon$$

$$X \rightarrow (S) \mid n$$

[6 marks]

Describe an algorithm to calculate the set $\text{FOLLOW}(P)$ of terminal and non-terminal symbols for a given context free grammar, where

$$\text{FOLLOW}(P) = \{ X \mid S \xRightarrow{*} \dots PX \dots \}$$

i.e. all symbols that can follow P in a sentential form derived from the sentence symbol S . Illustrate your answer by calculating the FOLLOW sets for the grammar given above.
[6 marks]

Outline possible ways in which the space used by the Action and Goto matrices of an SLR(1) parser can be reduced.
[5 marks]