

2001 Paper 10 Question 4

Compiler Construction

A *regular grammar* is a grammar whose rules are in one of the two following forms (where A and B are non-terminal symbols and a is a terminal):

$$\begin{aligned}A &\rightarrow a \\ A &\rightarrow aB\end{aligned}$$

- (a) Give a regular grammar which generates floating point numbers of exactly the following form:

$$(0|1)^+.(0|1)^*[e(0|1)^+]$$

where “ $()$ ” indicates grouping, “[$]$ ” indicates optional item, “ ρ^+ ” indicates one or more repetitions of ρ and “ ρ^* ” indicates zero or more repetitions of ρ .

[8 marks]

- (b) Give a non-regular grammar with fewer productions than your answer to (a) but which generates the same set of strings. [4 marks]

- (c) Determine, with justification, for the following grammars

(i) whether S generates strings not generated by T ; and

(ii) whether T generates strings not generated by S .

$$\left\{ \begin{array}{l} S \rightarrow aaS \\ S \rightarrow Sc \\ S \rightarrow d \end{array} \right\} \text{ and } \left\{ \begin{array}{l} T \rightarrow aTc \\ T \rightarrow d \end{array} \right\}$$

[4 marks]

- (d) What is the significance for the compilation process of the idea of “strings which can be generated by regular grammars”? Your answer should explain where such a module recognising such strings would appear in a compiler and a possible external interface (functions, variables and/or objects) it might present to the rest of the compiler. [4 marks]