

1991 Paper 3 Question 8

Formal Languages and Automata

- (a) Explain what is meant by a *context-free grammar* and the language generated by it. Write down a context-free grammar over the alphabet with symbols

$$a \ b \ c \ (\) \ \emptyset^* \ |$$

which generates the set of all regular expressions over the alphabet $\{a, b, c\}$.

- (b) What does it mean for a context-free grammar to be *regular*? Given a regular grammar, show how to construct a finite non-deterministic automaton accepting the language generated by it. Illustrate your answer by considering the regular grammar with productions

$$\begin{aligned} I &\rightarrow J \\ J &\rightarrow abI \\ I &\rightarrow bc \end{aligned}$$

where a, b, c are terminals, I, J are non-terminals and I is the start symbol.