

## 1992 Paper 4 Question 9

### Formal Languages and Automata

- (a) Let  $L$  be the set of all words over the alphabet  $\{a, b\}$  that end in  $b$  and do not contain the word  $aa$ . Describe, with justification, a finite deterministic automaton accepting  $L$ . [6 marks]

Which, if any, of the following regular expressions denotes  $L$ ? Justify your answer in each case.

(i)  $(ab|bb|ba)^*b$

(ii)  $(b|ab)^*b$

(iii)  $(b|ab)^+$

[6 marks]

- (b)  $L$  and  $F$  are languages over an alphabet  $\Sigma$ , and  $F$  is finite. Prove that  $L$  is regular if and only if the union  $L \cup F$  is regular. You may use any well-known results provided you state them clearly. [8 marks]