IA Regular Languages and Finite Automata "multi-part" questions

For 1 mark

1995.2.19 Give a finite deterministic automaton with alphabet of input symbols $\{a, b\}$ that accepts the language denoted by the regular expression a^*.

1995.2.20 If L is a regular language over an alphabet Σ, explain why the complement $\{w \in \Sigma^* | w \notin L\}$ is also a regular language.

1996.2.1(i) Describe in words the strings represented by the regular expression $(aa^*b)^*a^*$.

1996.2.1(j) State the Pumping Lemma for regular languages.

1996.2.1(k) Give a regular grammar that generates the language consisting of even length strings of symbols from the alphabet $\{a, b, c\}$.

1997.2.1(q) Describe the way in which Regular Expressions are constructed.

1998.2.1(s) Give a finite deterministic automaton with alphabet of input symbols $\{a, b\}$ which accepts the language consisting of just the null string ε and the letter a.

1999.2.1(s) What are the differences, if any, between the languages determined by the three regular expressions $\emptyset^*$, $\emptyset(\emptyset^*)$ and $(\emptyset^*)^*$?

For 4 marks

2000.2.1(b) Draw a picture of a deterministic finite automaton which accepts the language of strings matching a^*ba.

2001.2.1(d) Draw a picture of a deterministic finite automaton with set of input symbols $\{a, b\}$ whose language of accepted strings consists of all strings containing an odd number of occurrences of the symbol a.

2002.2.1(d) Give a context-free grammar generating the language $\{a^m b^n | m \leq n\}$.

2003.2.1(d) If a deterministic finite automaton accepts any strings at all, why does it accept one whose length is less than the number of states in the automaton?

2004.2.1(d) Draw a state diagram for a deterministic finite automaton that accepts $w \in \{a, b\}^*$ if, and only if, w either begins with a and is of odd length or begins with b and is of even length.