CSMTSP: Past Exam Questions

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The following is a list of past exam questions taken from the course Combinatorial Algorithms on Words (CSAC31) (1995–1997). Please note that these questions merely reflect the common syllabus between the two courses, they do **NOT** reflect the overall syllabus of the CSMTSP course.

One item in the list is equivalent to one question in the exam.

1. Describe in pseudo-code the Boyer-Moore (BM) algorithm. Give an example demonstrating the basic strategies employed by the BM algorithm.

2. (a) Describe in pseudo-code the construction of the *KMP_next* array and the Knuth-Morris-Pratt (KMP) algorithm.

   (b) Compute the *KMP_next* array of the string *abaabaaabaababababa*.

3. (a) Construct the suffix tree for the string 01010101011\$. Show the suffix tree in each step of the construction: the skeleton tree and the refinement steps.

   (b) Construct the dictionary matching automaton using failure links for the strings

   $$ababab, abaaaba, ababaababababab, abaaaababababa$$

4. (a) Describe in pseudo-code the construction of the *KMP_next* array used in the Knuth-Morris-Pratt (KMP) pattern matching algorithm.

   (b) Design a String Matching Automaton $SMA(abbabababababb)$.

(c) Does the above String Matching Automaton depend on the alphabet ? Justify your answer.

5. (a) Construct the suffix tree for the string $aabaabba\$$. Show the suffix tree in each step of the construction: the skeleton tree and the refinement steps.

   (b) Analyse the above construction, showing the space and time requirements.

6. (a) Give an example of the "match shift": good suffix rule used by the Boyer-Moore (BM) string matching algorithm. Describe using pseudo-code the construction of the good suffix table D.

   (b) Give an example of the "occurrence shift": bad character rule used by the Boyer-Moore (BM) string matching algorithm. Describe using pseudo-code the construction of the bad-character table DA.

   (c) Describe the Boyer-Moore (BM) algorithm using pseudo-code. State it's "worst-case" time complexity.