

Theory of Computation

Solutions to Homework 1

Problem 1. Describe a Turing machine that accepts a string $x \in \{0, 1\}^*$ if and only if x contains an odd number of 0's. You do not need to specify the exact states and state transitions of the Turing machine. Just sketch the idea in pseudo code.

Solution. The Turing machine has an initial state q_0 , an accepting state q_1 and no other states. It keeps reading the bits from the input and alternates its state between q_0 and q_1 whenever a 0 is read. The machine halts when the input bits have all been read. \square

Problem 2. Let $L \subseteq \{0, 1\}^*$ be a non-recursive language. Does there exist an $L' \subseteq L$ that is recursive? Justify your answer.

Solution. Taking $L' = \emptyset$ meets all requirements. \square