Exercise sheet 5

Theory of Computation, IDC204

1. Design a Turing machine over the alphabet $\{0, 1\}$, that accepts a string if it has an even number of 1s and rejects a string if it has an odd number of 1s.

2. Design a Turing machine over the alphabet $\{0, 1\}$, that shifts any string that is provided as input on the tape, one character to the right.

3. Given a finite state automaton that recognizes a language, how will you design a Turing machine that accepts each string that belongs to the language and rejects each string that does not belong to the language. As usual, the string is entered as input by writing it on the tape.

4. Given a Turing machine that accepts all strings in the languge L and rejects all strings that are not in it, how will you design a Turing machine that accepts the complement of the language?

5. Given a Turing machine T_1 that accepts all strings in a language L_1 and rejects all strings that are not in it and a Turing machine T_2 that accepts all strings in a language L_2 and rejects all strings that are not in it, how will you design a Turing machine that accepts strings in $L_1 \cup L_2$ and rejects all the strings that are not it.

6. Design a Turing machine that takes a natural number represented in binary as input and replaces that input on the tape with the binary representation of the number obtained by adding 1 to it.