EXERCISES ABOUT TURING MACHINES

1 Turing Machines

a) Draw a TM that recognizes the language of palindromes over the alphabet {0,1}.

b) What is the computation when the input on the tape is 01110?

c) Was the pushdown automata studied for this language deterministic or not? What about this TM?

2 Turing Machine

d) Project a TM that recognizes the language of strings with an even number of 0s and an even number of 1s.

e) What is the computation when the input on the tape is 011110?

f) What is the relation between the TM you obtained and the DFA for the same language?

3 Turing Machine

a) Project a TM that recognizes the language $\{a^n b^n a^n\}$.

b) What is the computation when the input on the tape is *aabbaa*?

c) What category does this language belong to?

4 Turing Machine

d) Project a TM that recognizes the language of string in the format 0^n, where n is a power of 2.

e) What is the computation when the input on the tape is 0000?

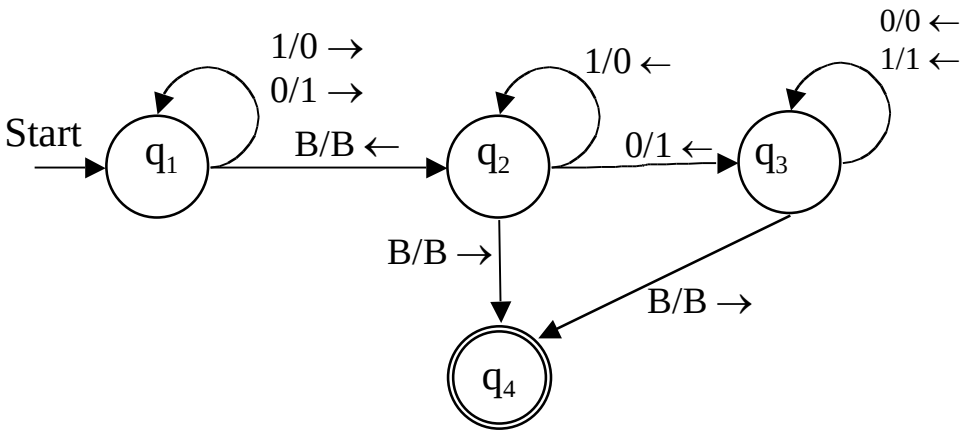
5 Turing Machine

a) Draw a Turing machine whose input is the binary representation of two numbers, in the format =n1+n2, and whose output contains their respective sum, placed on the left of the =, being irrelevant what remains to its right. Briefly explain the general idea of the workings of the machine.

b) Show the sequence of instantaneous descriptions of the machine when the input is the string =01+10.

6 Turing Machine

Consider the following Turing machine, that calculates the two's complement of a binary number, ignoring an eventual *overflow*. This machine can be seen as executing a computation and producing a result that remains in the tape.



a) Project, based on the machine shown above, a TM that works on the paradigm of language recognition. In this case, the accepted strings are in the format [n1,n2] where n2 is the two's complement of n1.

b) What is the computation when the input on the tape is [10,10].