

Module 3: Assignment 1

April 13, 2022

1. Given two positive integers 'x' and 'y'. Design a Turing machine that computes x-y
2. Given two positive integers 'x' and 'y'. Design a Turing machine that computes x+y
3. Design a Turing machine that computes $1^n \cdot 1^m$ (multiply 1^n with 1^m).
4. Let x and y be two positive integers represented in unary notation. Construct a Turing machine that will halt in final state q_y if $x \geq y$ and that will halt for non-final state q_n if $x < y$. More precisely, the machine is to perform the computation
$$q_0 w(x) 0 w(y) \vdash *q_y w(x) 0 w(y) : \text{if } x \geq y$$
$$q_0 w(x) 0 w(y) \vdash *q_n w(x) 0 w(y) : \text{if } x < y$$
5. Construct a Turing machine to compute the function: $F(w) = w^R$, where $w \in \{0, 1\}^+$
6. Design a Turing Machine that can accept $L = \{a^n b^n | n \geq 1\}$
7. Design a Turing Machine that can accept $L = \{a^n b^n c^n | n \geq 1\}$
8. Design a LBA that can accept $L = \{a^n b^n | n \geq 1\}$
9. Design a LBA that can accept $L = \{a^n b^n c^n | n \geq 1\}$