Theory of Computation

Homework 2

Qing-Cheng Li
R01922024

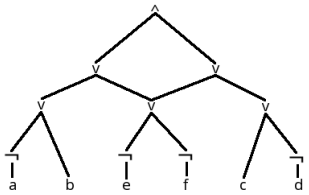
October 21, 2012

1 Problem 1

1.1 CNF

$$\begin{aligned}\phi &\equiv ((a \wedge \neg b) \vee (\neg c \wedge d)) \Rightarrow (e \Rightarrow \neg f) \\ &\equiv ((a \wedge \neg b) \vee (\neg c \wedge d)) \Rightarrow \neg(e \wedge f) \\ &\equiv \neg(((a \wedge \neg b) \vee (\neg c \wedge d)) \wedge (e \wedge f)) \\ &\equiv (\neg a \vee b \vee \neg e \vee \neg f) \wedge (c \vee \neg d \vee \neg e \vee \neg f)\end{aligned}$$

1.2 Boolean Circuit



2 Problem 2

Given question "$M; x \in H$", we can construct a machine $M'(y)$: **If** $y = x$ **then** $M(x)$ **else** "no". If $y = x$, run M on x, if M halts on state "yes", M' accepts y, if M halts on "no", M' rejects y. If $y \neq x$, M' rejects y. So M' is a TM that accepts some input. We know that H is undecidable, so L is undecidable.