# ECE374 SP23 HW1

Ziyuan Chen – ziyuanc3

Zhirong Chen – zhirong4

## Problem 2

2: (a). <u>Base.</u>  $00 \in L$.
   <u>Induction.</u> For $\forall a \in \Sigma$, $x \in L$, $w = ax \in L$. **0 vii L**
   <u>Explanation.</u> Four in binary is 100. Its multiples also end with 00.
   <u>Regex.</u> $(0+1)^* 00$. **+ 0**    **Note that 0 is also a multiple of 4.**

(b). Flatten the board into 1 dimension.
   $L_O$ denotes strings in which $O$ wins, $L_X$ $X$ wins, and $L_D$ draws.
   $000??????$, $???000???$, $??????000$, $0???0???0$,
   $0??0??0??$, $?0??0??0?$, $??0??0??0$, $??0?0?0??$  $\in L_O$.
   $XXX??????$, ...... $\in L_X$. All other combinations $\in L_D$.

## Problem 2(a), reworked

2: (a). A language that attaches a checking result to
        EVERY string, instead of only including the
        multiples of 4, should be formulated as follows:

   <u>Base.</u>  $00|T$, $10|F$, $1|F \in L$.
   <u>Induction.</u> For $\forall a \in \Sigma$, $x \in L$, $w = ax \in L$, $\boxed{0|T \in L}$
   <u>Regex.</u> $(0+1)^* 00|T + (0+1)^* 1(\varepsilon + 0 + 1)|F + 0|T$.

   <u>Notes.</u> ①. The one-digit "0" is a special case.
             However, "0|T ∈ L" does NOT appear in the
             base case, since multiples of 2 —
             aka. $(0+1)^* 10$ — would be included.
         ②. The "|" character separates input & output.