(1) Robot Mouse Race

Performance measure : destination, time, efficent, rate, error

Environment : the maze, start. end

Autuators : accelerator, brake. display

Sensors : accelerometers, motor sensors, Direction sensors

(2) Robothespian

P : telling language, movement., Grammar, correctness

E : space

A : horn, speaker, display. machine about ~~robot~~ body, translator

S : video, hearing sensor, space sensor

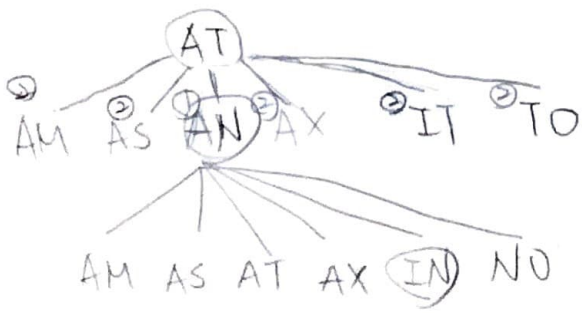
2.

(a) {AT AM, AS, AT, AX, IT., IN}

(b) hamming distance 代表2單詞具不同字母的位置

而假如相差一字母最少也需要一次搜尋 還是在第一次就找到的情況下，而2個字母在 BFS 中也要先找完一個字母的差異才往下找，所以永遠不會高估，i.i admissible heuristic #

(c)



(跟IN差最小的優先)

3. $X = Y^2 \quad X = Z^3$

$X \to Y \quad D_x = \{0, 1, 4, 9\} \quad D_y = \{0, 1, 2, 3\}$

$X \to Z \quad D_x = \{0, 1, 8\} \quad D_z = \{0, 1, 2\}$

$X \to Y, Z \quad D_x = \{0, 1\} \Rightarrow D_y = \{0, 1\}, D_z = \{0, 1\}$

Con

4.

$$\begin{array}{r} \cancel{F}IVE \\ -\ \cancel{F}OUR \\ \hline ONE \end{array}$$

Variables : F, I, V, E, O, U, R, N,

Domains = {0, 1, 2, 3, 4, 5, 6, 7, 8, 9}

Constraint : If(F > 0)

Backtracking

alldiff(F, I, V, E, O, U, R, N)

F - F = 0 不用看

$E > R$ $\qquad\qquad$ $E < R$

$E - R = E \quad R = 0$ or $10 + E - R = E \quad R = 10$, impossible

$V - U = N$ or $10 + V - U = N$

$I - O = O, \ I = 2O$

$$\begin{array}{r} \cancel{FIVE} \\ +\ \cancel{ONE} \\ \hline \end{array} \qquad \begin{array}{r} FOUR \\ +\ ONE \\ \hline FIVE \end{array}$$

$\to F > 0$

$C_1, C_3 = 0$

$R = 0$

$C_2 = 0$

$\Rightarrow O = 0 \to I = 0$ 但 $O \neq I$, ∴ back

$\Rightarrow O = 1 \to 2 + C_2 = I = 2$

$\to U + N + C_2 \cdot 10 = V$

2 3 5

$\cancel{U + N = V}$

3 ~~5~~ ~~8~~

F = 若意數 = 4

E = 任意數 = 6

~~+130~~

+

$$\begin{array}{r} \cancel{FOUR}\ FIVE \\ 4256 \\ +\ 136\ ONE \\ \hline 4120\ FOUR \end{array}$$

$$\begin{array}{r} FIVE \\ -\ FOUR \\ \hline \end{array} \qquad \begin{array}{r} 4256 \\ -\ 4120 \\ \hline 136 \end{array}$$

4. FIVE − FOUR = ONE ⇒ FOUR + ONE = FIVE

Variable: F, O, U, R, N, E, I, V
C_1, C_2, C_3

除了 C_1, C_2, C_3 Domain {0, 1}
其它 {0 ~ 9}

(a) constraints

alldifferent (F, O, U, R, N, E, I, V)

$F > 0$

$R + E = E + 10 \times C_1$

$U + N + C_1 = V + 10 \times C_2$

$O + O + C_2 = I + 10 \times C_3$

$F + C_3 = F$

⇒

$F > 0$

$R = 0$ $0 + E = E$, $C_1 = 0$

$U + N = V + 10 \times C_2$

$O + O + C_2 = I$

$F + 0 = F$

$C_1 = 0$, $C_3 = 0$

剩下 Domain {1 ~ 9}; R = 0

(b) $C_2 = 0$ or $C_2 = 1$

↳ $O + O = I$

→ 若 O = 1, 則 I = 2 Domain {3 ~ 9}

→ U + N = V

設 U = 3, N = 4, 則 V = 7

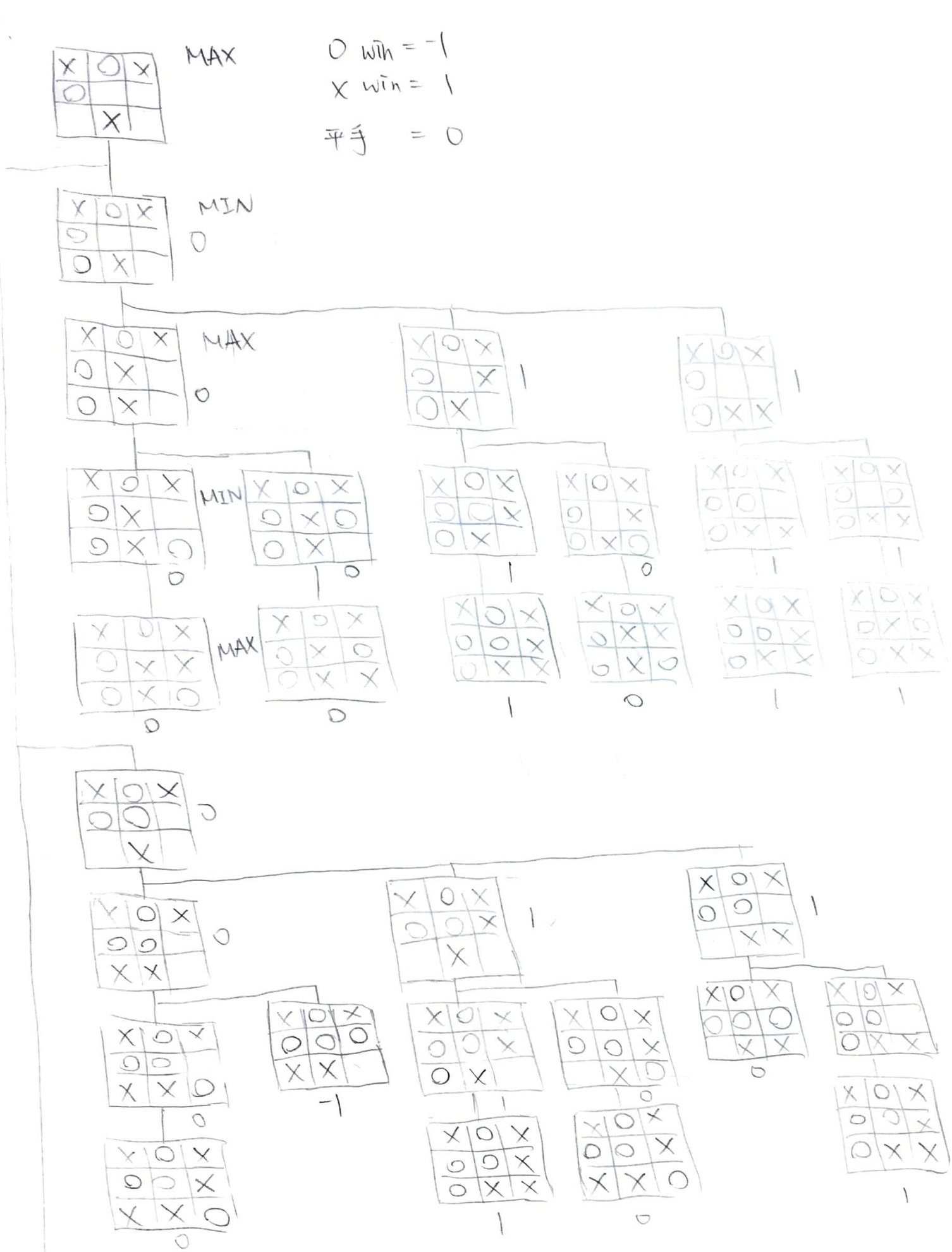
→ F = 5 (or 6, 8, 9)

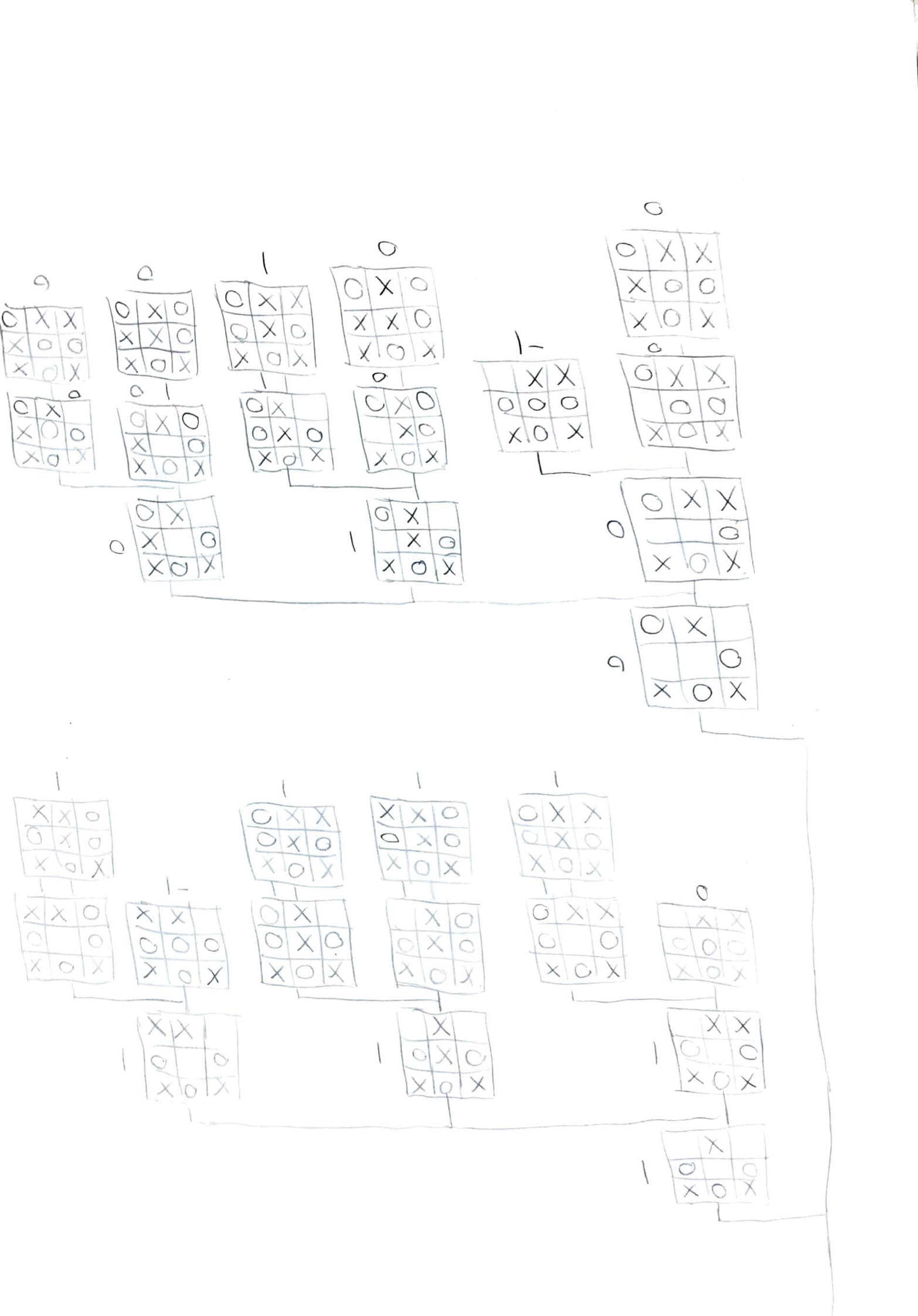
→ E = 6 (or 8, 9)

得解: F = 5, O = 1, U = 3, R = 0, N = 4, E = 6, I = 2, V = 7

$$\begin{array}{r} FIVE \\ -FOUR \\ \hline ONE \end{array} \Rightarrow \begin{array}{r} 5276 \\ -5130 \\ \hline 146 \end{array}$$

#


MAX
O win = -1
X win = 1
平手 = 0
MIN
MAX
MIN
MAX



6. Convert into CNF

(a) A . B

$(\neg P \vee Q) \wedge (\neg Q \vee P)$

$(\neg L \vee \neg M \vee P)$

$(\neg L \vee \neg B \vee M)$

$(\neg A \vee \neg B \vee L)$

$(\neg A \vee \neg P \vee L)$

$\Rightarrow A \wedge B \wedge (\neg P \vee Q) \wedge (\neg Q \vee P) \wedge (\neg L \vee \neg M \vee P) \wedge (\neg L \vee \neg B \vee M)$

$\wedge (\neg A \vee \neg B \vee L) \wedge (\neg A \vee \neg P \vee L)$

(b) $\dfrac{A, B, (\neg A \vee \neg B \vee L)}{L}$

$\dfrac{B, L, (\neg L \vee \neg B \vee M)}{M}$

$\dfrac{L, M, (\neg L \vee \neg M \vee P)}{P}$

$\Rightarrow$

$\dfrac{P, (\neg P \vee Q)}{Q}$ $(P \wedge \neg P) = \phi$