CSE 422

Assignment 1

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Sec: 12

Answer to the q no - 1

ⓐ $g(n)$ = distance of node 'n' from start

$h(n)$ = manhattan distance

$f(n) = g(n) + h(n)$

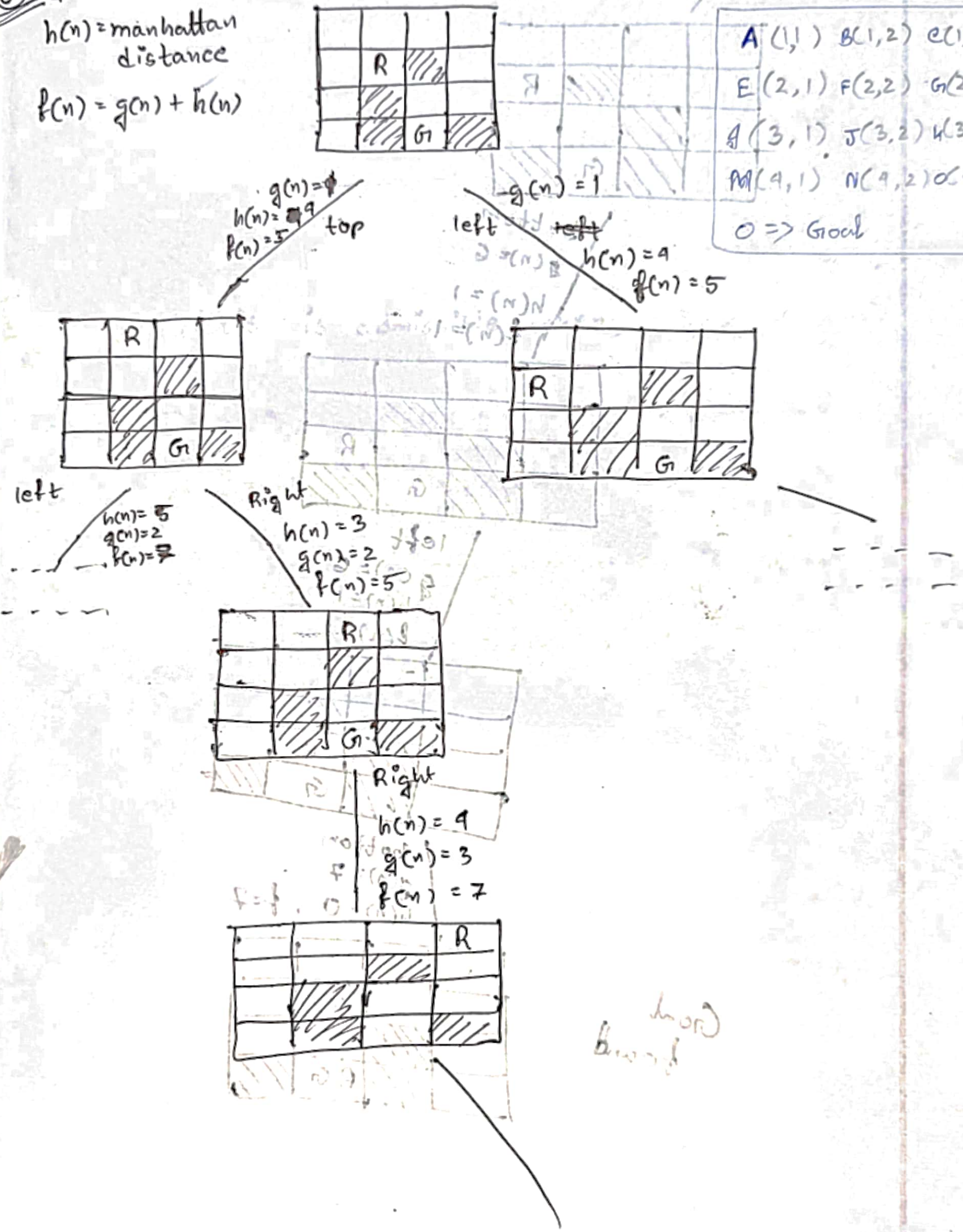
A(1,1) B(1,2) C(1,3) D(1,4)

E(2,1) F(2,2) G(2,3) H(2,4)

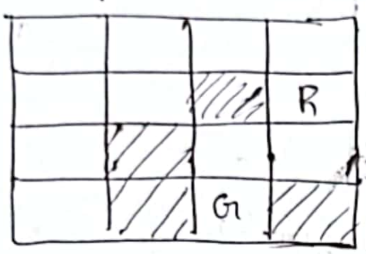
I(3,1) J(3,2) K(3,3) L(3,4)

M(4,1) N(4,2) O(4,3) P(4,4)

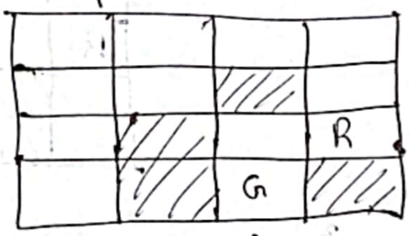
O => Goal



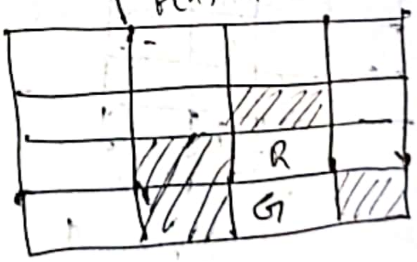
~~Right~~ bottom
$h(n) = 2$
$g(n) = 5$
$f(n) = 7$



bottom
$g(n) = 6$
$h(n) = 1$
$f(n) = 1$

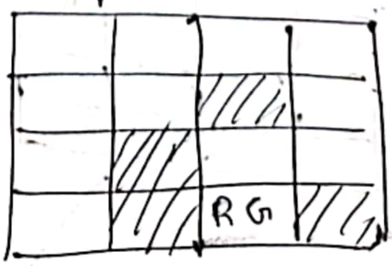


left
$g(n) = 6$
$h(n) = 1$
$f(n) = 1$



bottom
$g(n) = 7$
$h(n) = 0$, $f = 7$

Goal found



$\boxed{F^3}$

$F^3 \; \boxed{B^5 \quad E^5}$

$B^5 \; \boxed{E^5 \quad C^5 \quad A^7}$

$E^5 \; \boxed{C^5 \quad J^5 \quad A^7}$

$C^5 \; \boxed{J^5 \quad A^7 \quad D^7}$

$J^5 \; \boxed{M^5 \quad A^7 \quad D^7}$

$M^5 \; \boxed{A^7 \quad D^7}$

$A^7 \; \boxed{D^7}$

$D^7 \; \boxed{H^7}$

$H^7 \; \boxed{L^7}$

$L^7 \; \boxed{K^7}$

K^7 $\lfloor o^7$

O^7 $\lfloor$

GOAL

∴ path =>

$(2,2) \rightarrow (1,2) \rightarrow (1,3) \rightarrow (1,4) \rightarrow (2,4) \rightarrow (3,4)$

$\downarrow$

$(3,3)$

$\downarrow$

Goal : $(4,3)$

(b) A heuristic is admissible when, $h(n) \leq g(n)$

here, $h5(n)$ is most likely one inadmissible as it doubles an admissable heuristic.

$h9(n)$ can also be inadmissible as it select max heuristic between an admissible and an inadmissible heuristic.

(c) Among $h6(n)$ and $h7(n)$; ~~h(7~~ $h7(n)$ will be more dominant as $h7(n) \geq h6(n)$ always.

(d) According to me, ~~h7(n~~ $h7(n)$ will be the best heuristic as $h1(n)$ and $h2(n)$ both are admissiblan and max $(h1(n), h2(n)$ will be taken.

Answer to the q no - 2

(a)

parent 1 : [1, 2, 3, 4, 5, 6, 7, 8]

parent 2 : [3, 1, 2, 8, 7, 6, 5, 4]

parent 3 : [2, 4, 5, 6, 8, 7, 3, 1]

parent 4 : [7, 8, 1, 3, 6, 5, 4, 2]

(b) Fitness function can be :

preferred = +1

Avoid = -1

neutral = 0

Fitness function = $\sum$ (Preferred) - $\sum$ (Avoid)

for parent 1 =

$$\underbrace{1+0}_{G1} + \underbrace{1+0}_{G2} + \underbrace{0+0}_{G3} + \underbrace{0+1}_{G4}$$

$$+ \underbrace{1+1}_{G5} + \underbrace{1+0}_{G6} + \underbrace{0+1}_{G7} + \underbrace{1+0}_{G8}$$

= 8

for parent 2 = $1+0+1+1+1+0+0+1+1+0$

$+0+1+1+1+1+0$

$= 10$

for parent 3 = $1+1+1+1+1+1+1+0+0+1$

$+1-1-1+1+1+1$

$= 9$

for parent 4 = $1+0+1+0+0+1+1+1+1+1$

$+1+1+1+1+1+0$

$= 11$

$\therefore$ chromosome 2 and 4 are the 2 fittest

(c) Regular crossover will not work in this scenario as a guest can only appear once. So, no duplicate value should be available. But in regular crossover duplicate value can be available. so it will not work in this scene

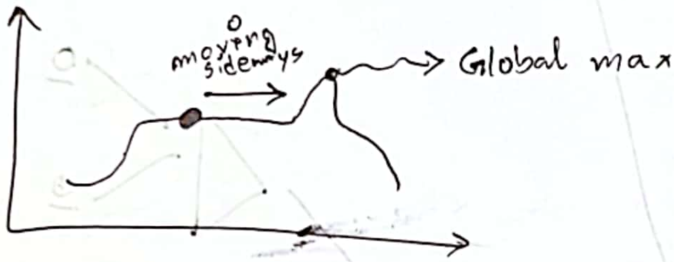
(d) A possible mutation can be swap mutation where guests can exchange seats.

CamScanner

Answer to the q no - 3

ⓐ True.

As in hill climb algorithm, if plateu is found moving sideways might give us better solutions rather than stayin at the plateu.



ⓑ True

As simulated annealing depends on temparature value it does not need to have knowledge of the entire search space. It will only move until temparature value is high.

(c) True.

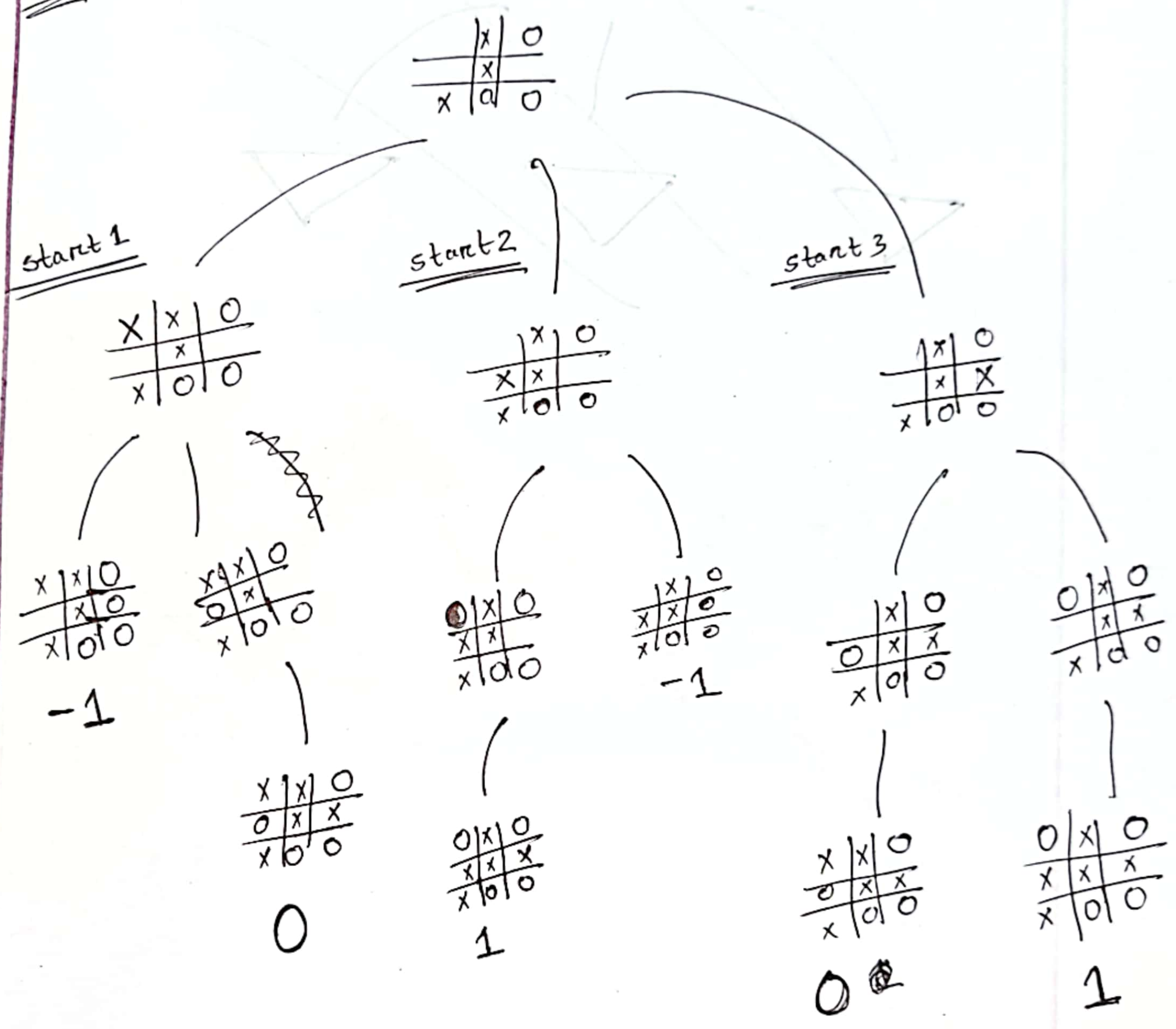
Normal hill climbing algorithm always goes towards increasing values. If it explored all search spaces it would not ~~have~~ get stuck on local optima, plateaus or ridges.

(d) False.

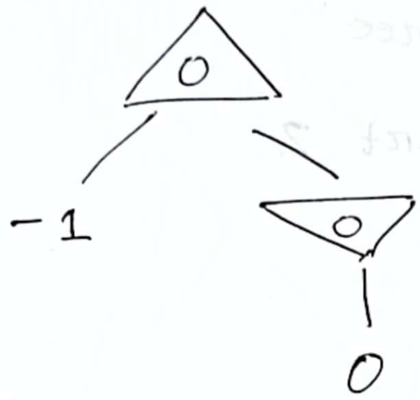
Hill climbing is not a path finding algorithm, rather it is an algorithm where path does not matter and only goal matters.

Answer to the q no - 4

(a)

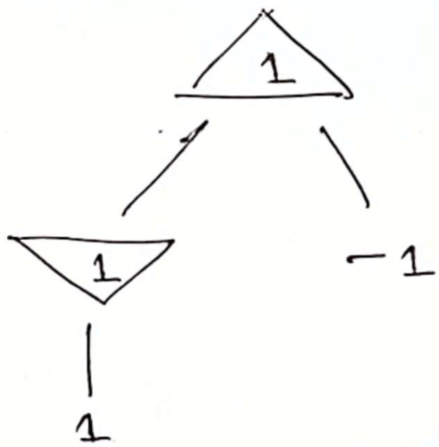


start 1



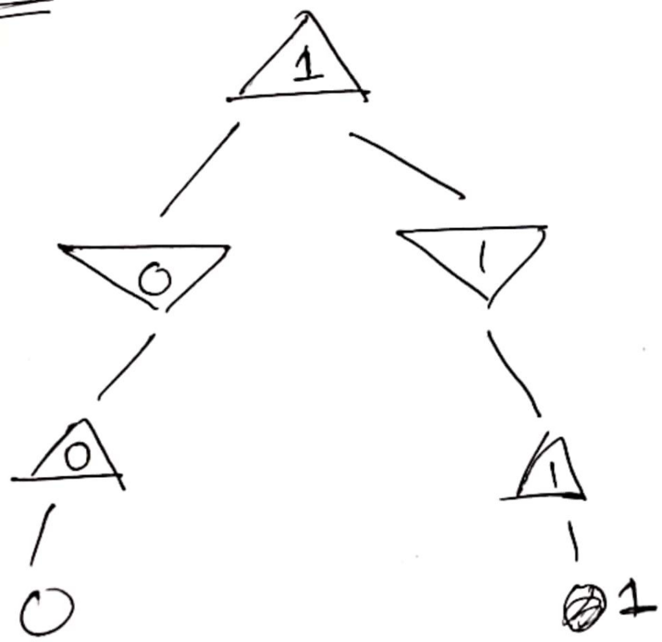
∴ draw

start 2



∴ X wins

start 3

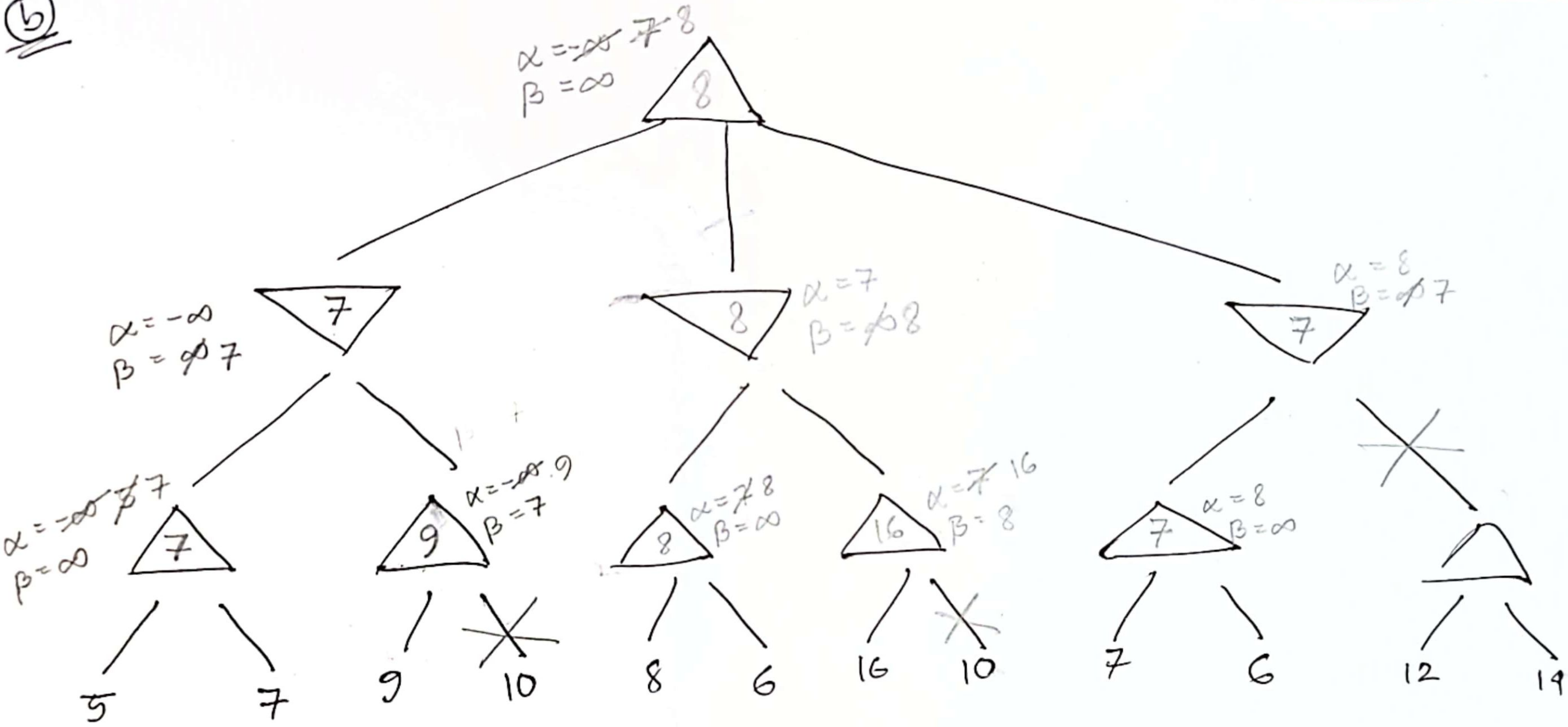


∴ X wins.

$\because$ in start 2 and 3, X wins. But start 2 has a smaller tree

$\therefore$ X should use start 2

(b)



max, α

min β

max α

$\alpha \geq \beta$