23K-0047

Assignment 2

Q2 Initial Population:

$$\begin{bmatrix} [3\ 3\ 2\ 2\ 3\ 2\ 2] \\ [2\ 2\ 3\ 1\ 3\ 2\ 1] \\ [3\ 3\ 1\ 1\ 2\ 2\ 2] \\ [1\ 2\ 3\ 1\ 1\ 3\ 2] \end{bmatrix}$$

⋮

Until all 6 in total

Then fitness we calculate the fitness of example: [-90, -80, -87, -82, -81, -78]

Then through roulette wheel the probabilities are calculated: [0.180, 0.160, 0.174, 0.164, 0.162, 0.156]

Then 2 parents are selected based on the probabilities,

parent 1: [3 3 2 2 3 2 2]

parent 2: [2 2 3 1 3 2 1]

Then children are generated through crossover:

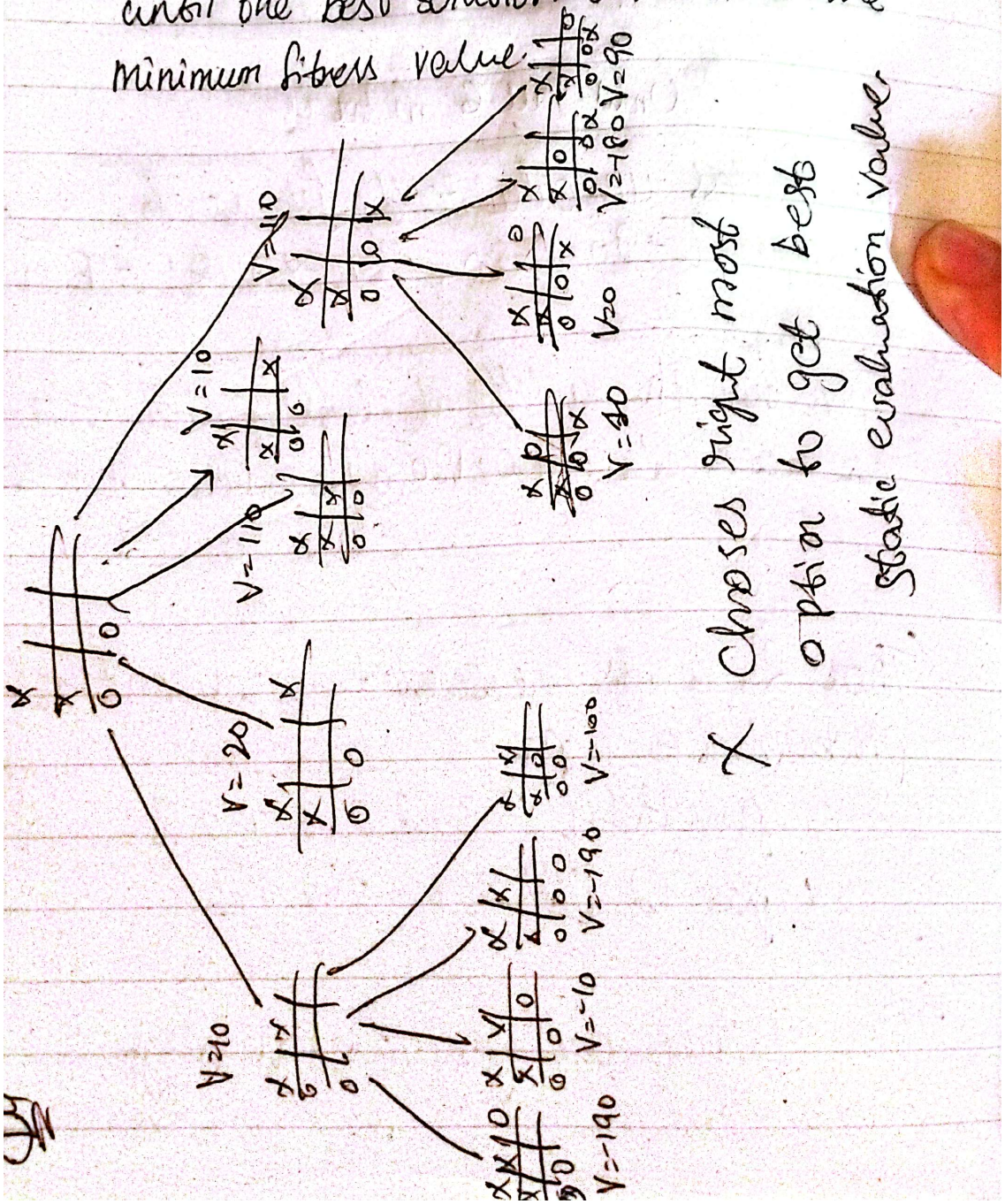
$C_1 = [3\ 1\ 2\ 3\ 1\ 2\ 1]$, $C_2 = [3\ 3\ 3\ 2\ 2\ 2\ 2]$

Then both are mutated:

$C_1 = [3\ 3\ 1\ 2\ 2\ 1\ 1]$

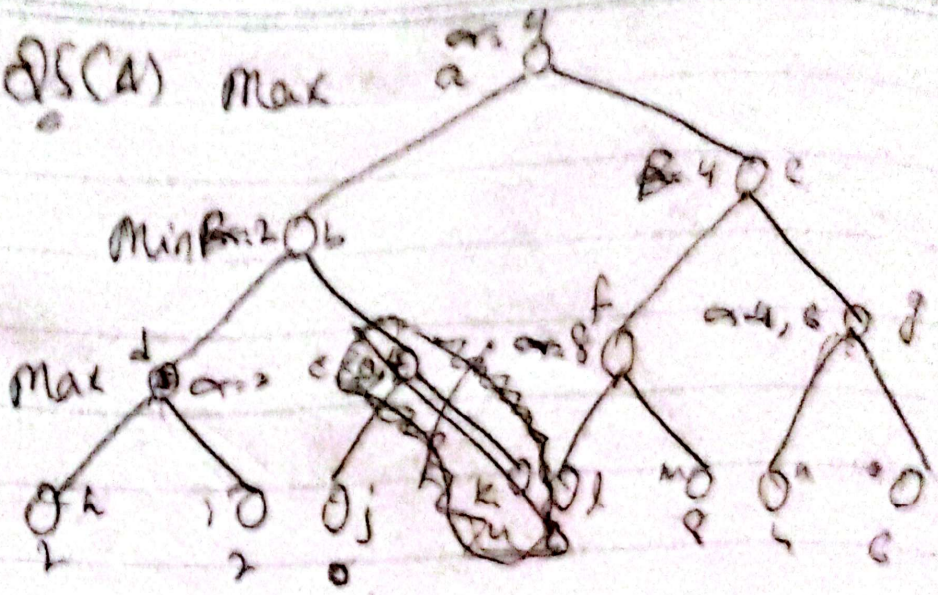
$C_2 = [3\ 2\ 3\ 2\ 2\ 3\ 3]$

All the produced children are now the new population. This whole process is repeated until the best solution is found based on the minimum fitness value.



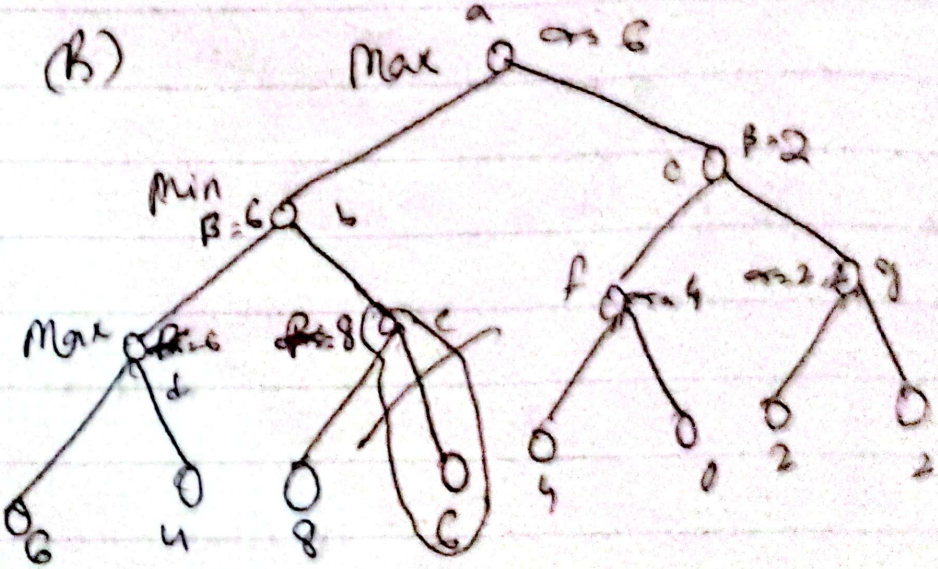
X Chooses right most option to get best static evaluation value.

Q5(A) Max



Winning Path $a \rightarrow c \rightarrow g$

(B)



Path: a, b, d

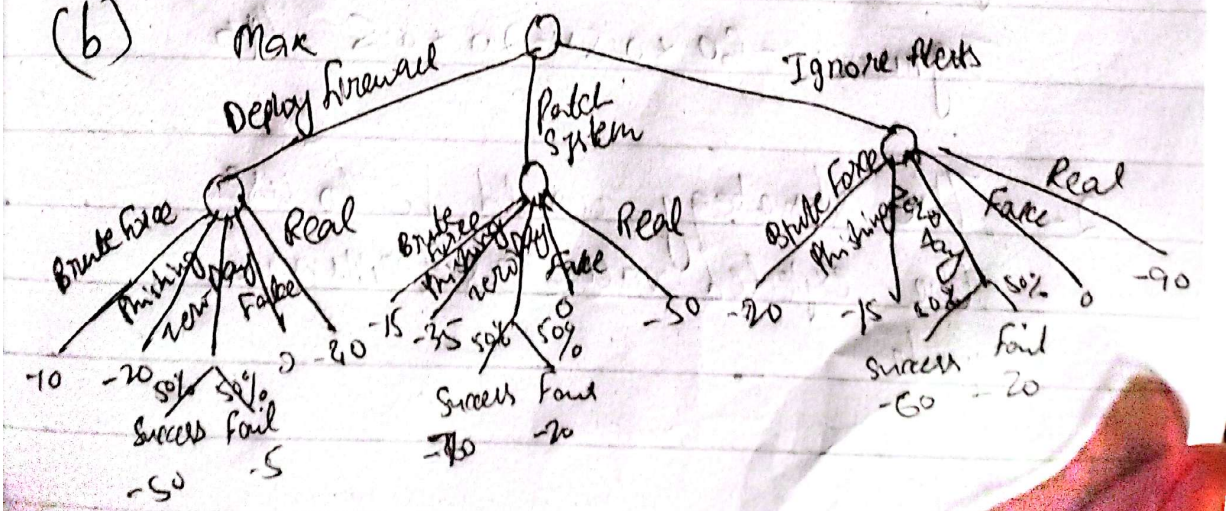
1 Path pruned

Q6 (a) 1- Players are attackers and defender. Attacker will maximize their attack score for system while defender will maximize their score by increasing security.

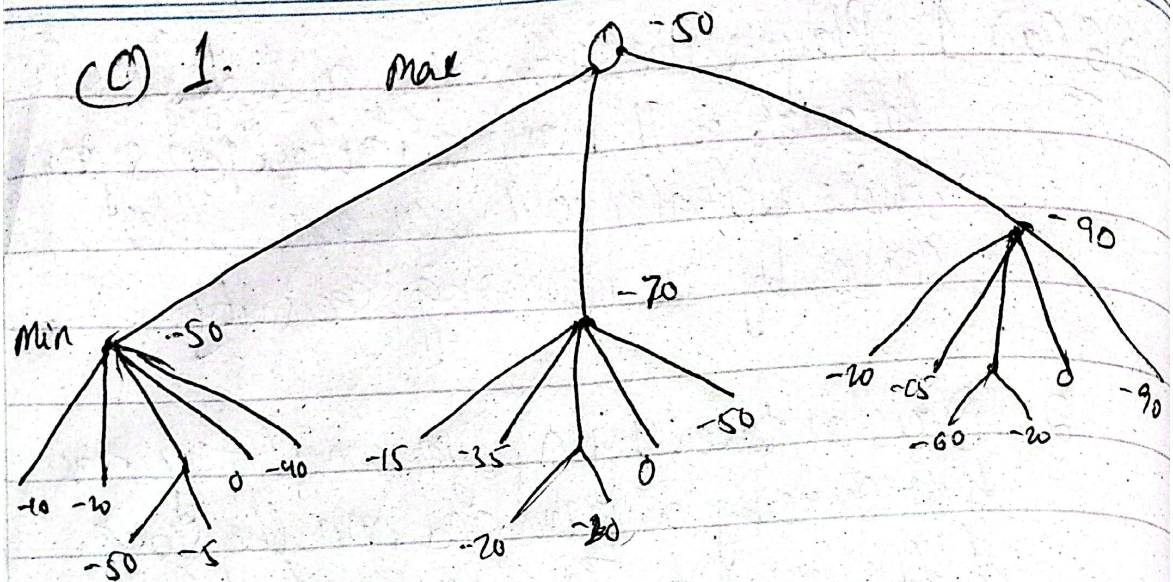
2- Decision taken by a player would try max their score by a move and min the score of the opponent. In case of defender the defender will try to increase his security score by minimizing the attackers attack score while attacker will max its attack score and minimize defenders defence score.

3- The defender will have to look out for multiple options by tracking attack probabilities.

(b)



(c) 1.



Defender's best option is to deploy a firewall, cost = -50

(c)(2) Assuming a real attack is done then the rest of the branches will be pruned leaving only one branch behind each.

(d) 1- Firewall: $-50 * 0.5 + (-5 \times 0.5) = -27.5$

Patch: $-70 \times 0.5 + -20 \times 0.5 = -45$

Ignore: $-60 * 0.5 + -20 \times 0.5 = -40$

2- The strategy would be to use the expected value as terminal node.