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23K-0057

Assignment 2.

Q2) Dry Run:

1) encoding:

[1, 2, 3, 1, 2, 3, 1] → task 1, facility 1 & task facility 1 . . .

2) population:

		cost
A ⇒	[1, 2, 3, 1, 2, 3, 1] ⇒	481
B ⇒	[2, 3, 1, 2, 3, 1, 1] ⇒	488
C ⇒	[3, 1, 2, 3, 1, 1, 2] ⇒	511
D ⇒	[1, 2, 3, 1, 1, 2, 3] ⇒	499
E ⇒	[2, 3, 1, 1, 2, 3, 1] ⇒	611
F ⇒	[3, 1, 1, 2, 3, 1, 2] ⇒	474

3) fitness function:

A = 1/481 ⇒ 0.00207 → 17.04%

B = 1/488 ⇒ 0.00205 → 16.87%

C = 1/511 ⇒ 0.00196 → 16.13%

D = 1/499 ⇒ 0.00200 → 16.46%

E = 1/511 ⇒ 0.00196 → 16.13%

F = 1/474 ⇒ 0.00211 → 17.37%

\+ 0.01215

4) Selection

- randomly generate selection point
- higher probability chromosomes chosen
- A and F are selected.

5) Crossover. select at pt. 4.

A = [1|2|3|1|2|3|1] F = [3|1|1|2|3|1|2]

G = [1|2|3|1|3|1|2] H = [3|1|1|2|2|3|1]

6) Mutation:

mutating G: swap 2 with 5.

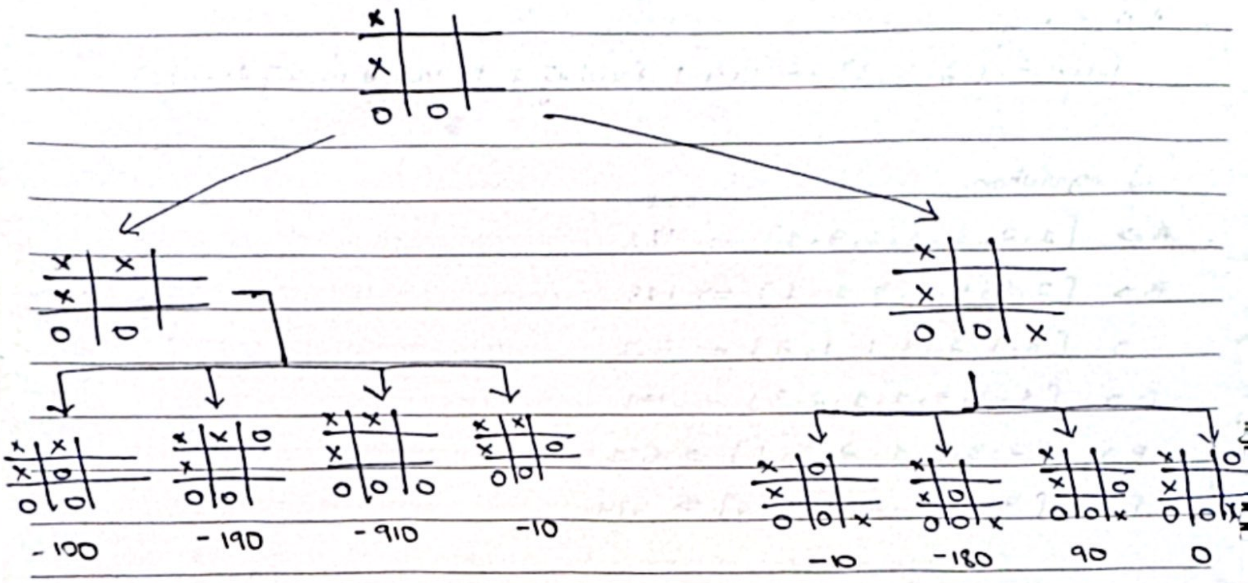
G [1|2|3|1|3|1|2]

G' [1|3|3|1|2|1|2]

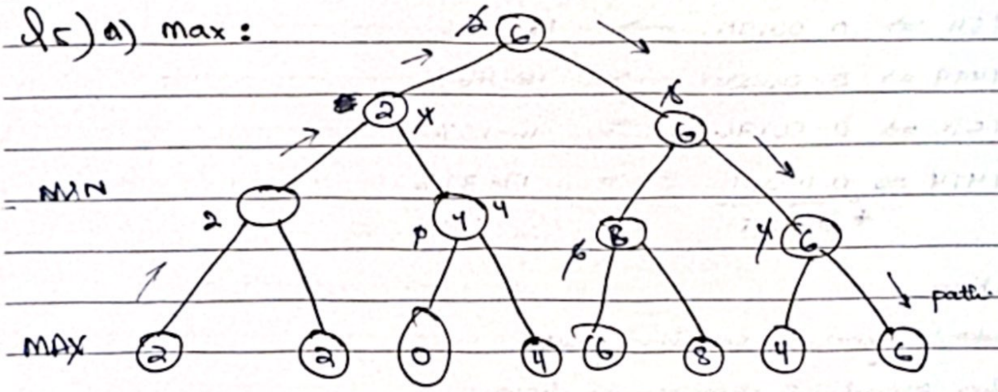
7) New Generation: evaluate new population fitness.
↳ repeat until converge.

Q4) V=0

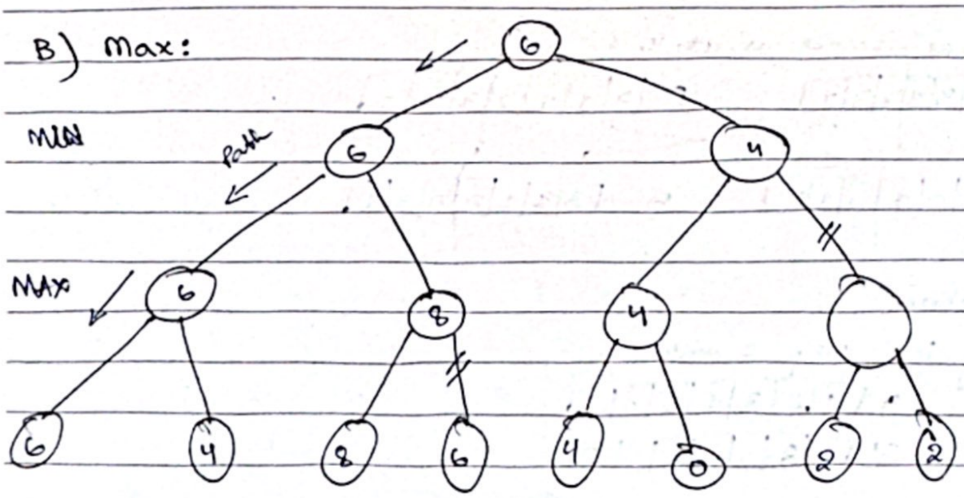
for all rows, columns and diagonals (K):



Q5) a) max:



B) Max:



Q6 a) 1) Players and Objectives:

• Min (attacker): damage the security
↳ using various attacks.

• Max (defender): minimizes the damage to system caused by Min.
↳ deploys security measures.

2) Decision Making:

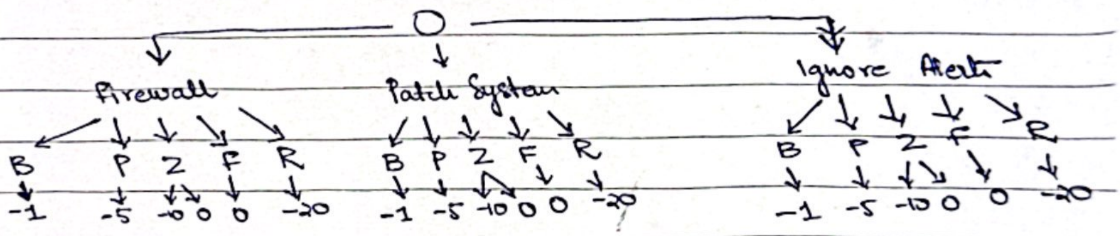
• Min: takes action that are either too obvious like brute-force or maybe makes fake attacks in order to avoid ~~being~~ detection.

• Max: detects the danger earlier on so uses defence mechanism based on risk levels always checks risk vs cost.

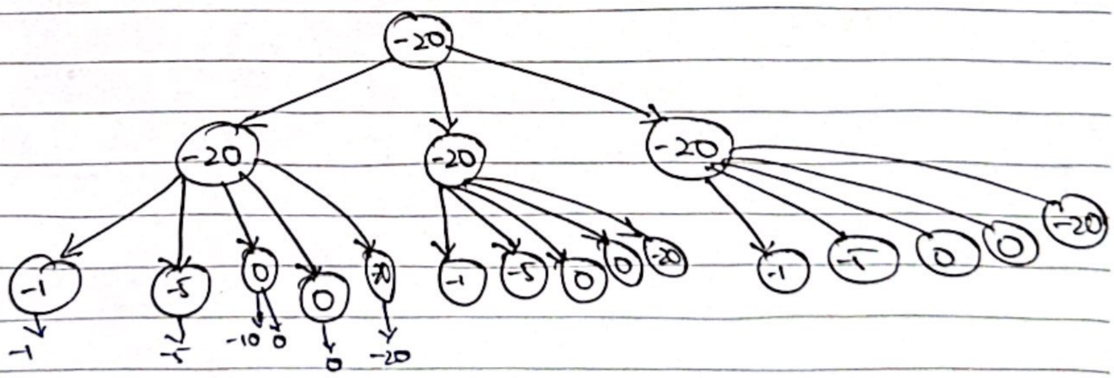
3) Stochastic Elements:

Zero-day exploits increases uncertainity of the game as it has a 50% success rate.
Defender is therefore unable to block it, hence it requires expectation based strategies instead of minimax.

b)



c)



d) 1) success = 50% → damage = -10

failure = 50% → damage = 0

value = $(0.5 \times (-10)) + (0.5 \times (0)) \Rightarrow -5$

2) Minimax; assumes it will always pick the worst-values/moves for max while Expectimax will assume that it has probabilities and so it may prefer patch over firewall if cost savings are more than the worst-case scenario.