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23k-0065

AI ASSIGNMENT 2 Date:

Handwritten task

Q1, 2, 3
uploaded on github repository

(Q4)

X	2	3
X	5	6
O	O	9

three X : +1000
three O: -1000
two Xs, one empty = +100
One X, Two empty = +10
Two Os, one empty = -100
One O, Two empty = -10
Else = 0
V-Sum = Sum_R + Sum_C + Sum_D

States: 2 : O at 5

R1 +100	X	X	3
R2 0	X	O	6
R3 -100	O	O	5

L1 0
L2 0
L3 0
D1 0
D2 -100
Sum_R=0 Sum_C=0, Sum_D=-100
V-Sum = -100

States for X at Pos2 step 3 : O at 6

X	X	3	R1 = +100	X	X	3
X	5	6	R2 = 0	X	5	O
O	O	9	R3 = -100	O	O	9

Date:

State at 3:

X X O
X 5 6
O O 9

$C_1 = 0$
$C_2 = 0$
$C_3 = -10$
$D_1 = +10$
$D_2 = -10$
Sum R = 0
V. Sum = +0

$C_1 = 0$
$C_2 = 0$
$C_3 = -10$
$D_1 = +10$
$D_2 = -100$
Sum. R = -90, Sum. C = -10, Sum D: -8
V. Sum = -190

State 4: 0 at 9

$R_1 = +100$
$R_2 = +10$
$R_4 = -1000$
$RC_1 = 0$
$C_2 = 0$
$C_3 = -10$
$D_1 = 0$
$D_2 = -10$
Sum R = -890, Sum C = +0
Sum D = +0
V_Sum = -900

X X 3
X 5 6
O O O

$C_1 = 0$
$C_2 = -10$
$C_3 = 0$
$D_1 = +100$
$D_2 = -100$
Sum. R = +0
Sum C = -10
Sum D = 0
V. Sum = 0

Date:

Minimax Decision:

X at 2 = V_Sum { -190, -100, -14 - 910 } → minimum: - 910

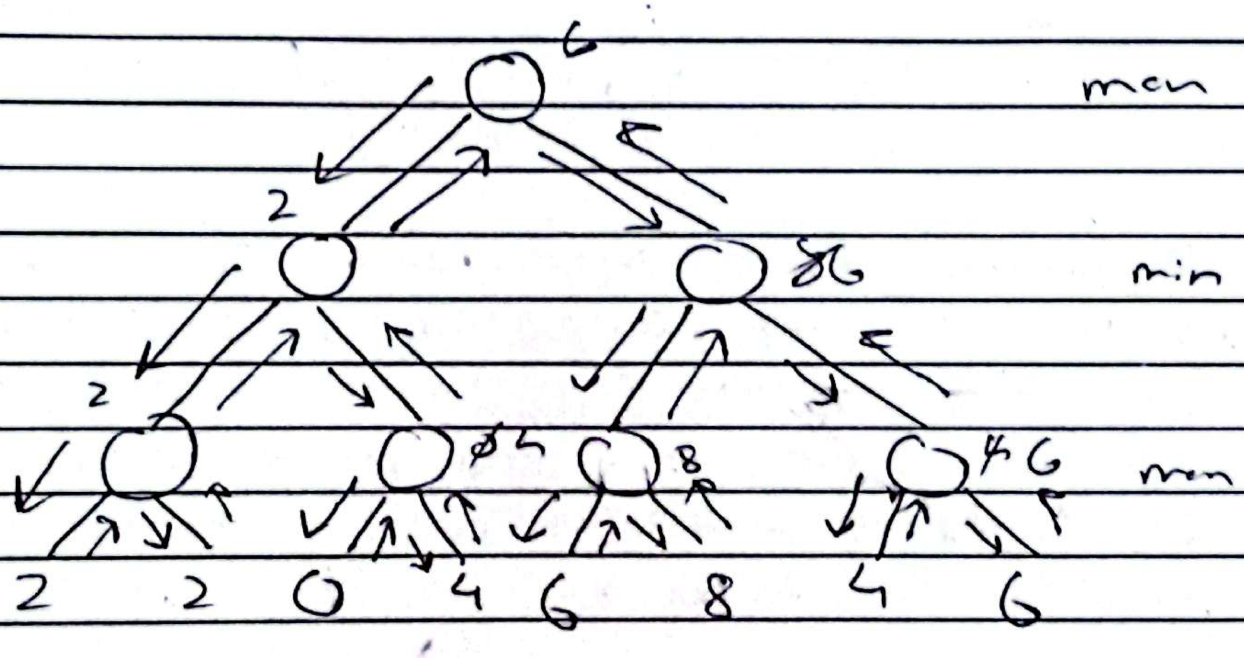
X at 9 = V_Sum = { 10, 0, -180, 90 } → minimum: -180

X choose max (minimum): max (-910, -180) = -180

Best Move:-

place X at position 9 as it yields a minimum v-sum of -180, better than - 910 for position 2

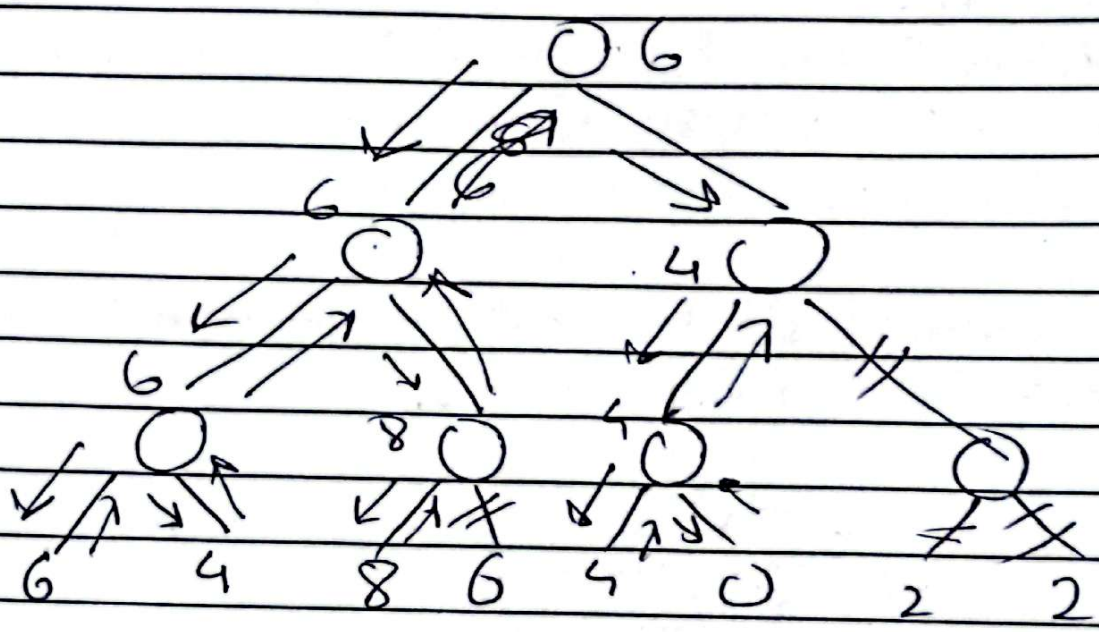
Q5) a)



All Branches evaluated, none of them pruned, No pruning cut. Winning path is: A → B2 → C4 → D8. All are computed and all stayed at

Date:

4)



- All branches under B except $(D_4(6)$ is evaluated, $D_4(6)$ proved when 2's exceeds $\beta = 6$ Under B_2, C_2 yields setting $\beta = 0$, Since A already has 6 from B and C_4 max is less than 6, C_4 including D_7 & D_8 is pruned as it can't improve Ac value. The winning path is $A \rightarrow B_1 \rightarrow C_4 \rightarrow D_1(6)$;

Struck out values are $6(P_4)$, $2(D_7)$, $2(D_8)$

Q6) a) i) Players:

max (Defender): An AI driven tasked with protecting the network from cyber threats.

min (Attacker): Aims to penetrate the network through various check methods.

Date:

2) Decision making:

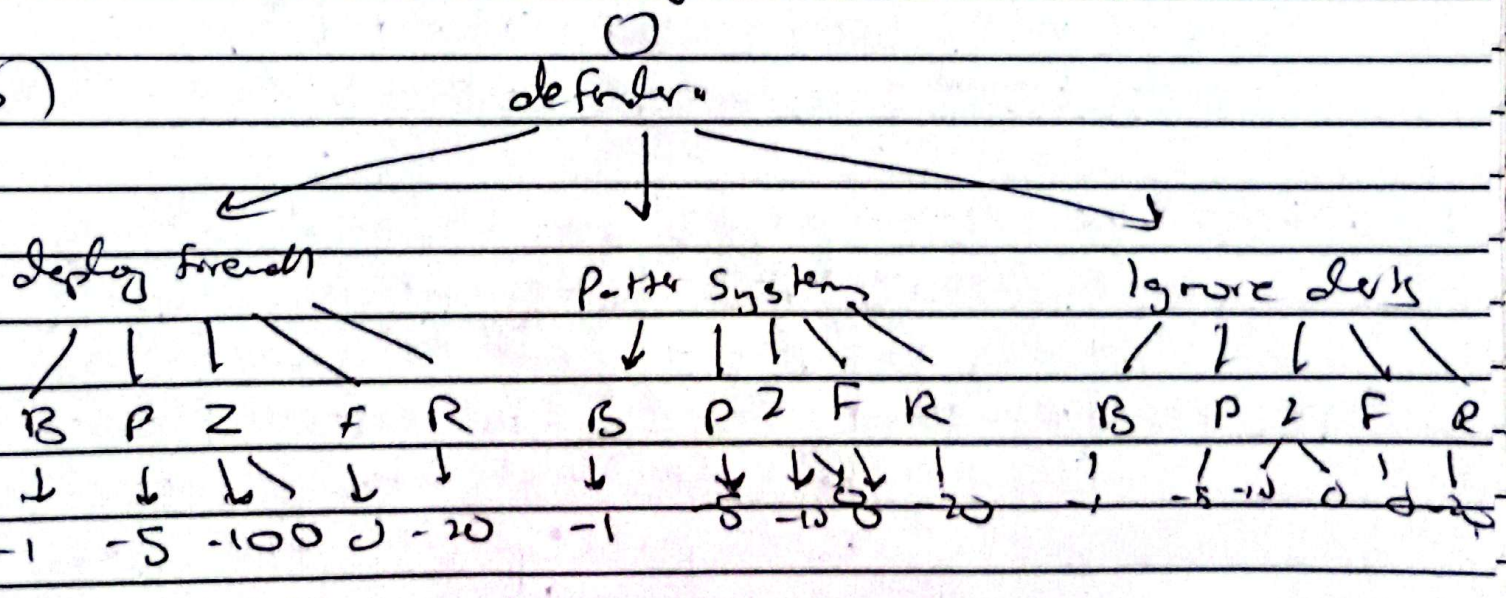
max (defender): Decides on actions such as setting up a firewall, applying, or dismissing alerts to reduce damage while balancing resource use.

min (attacker): Picks attacks like Brute force, Phishing, zero-Day Exploit, fake or real to inflict maximum harm on the network.

3) Stochastic Elements:

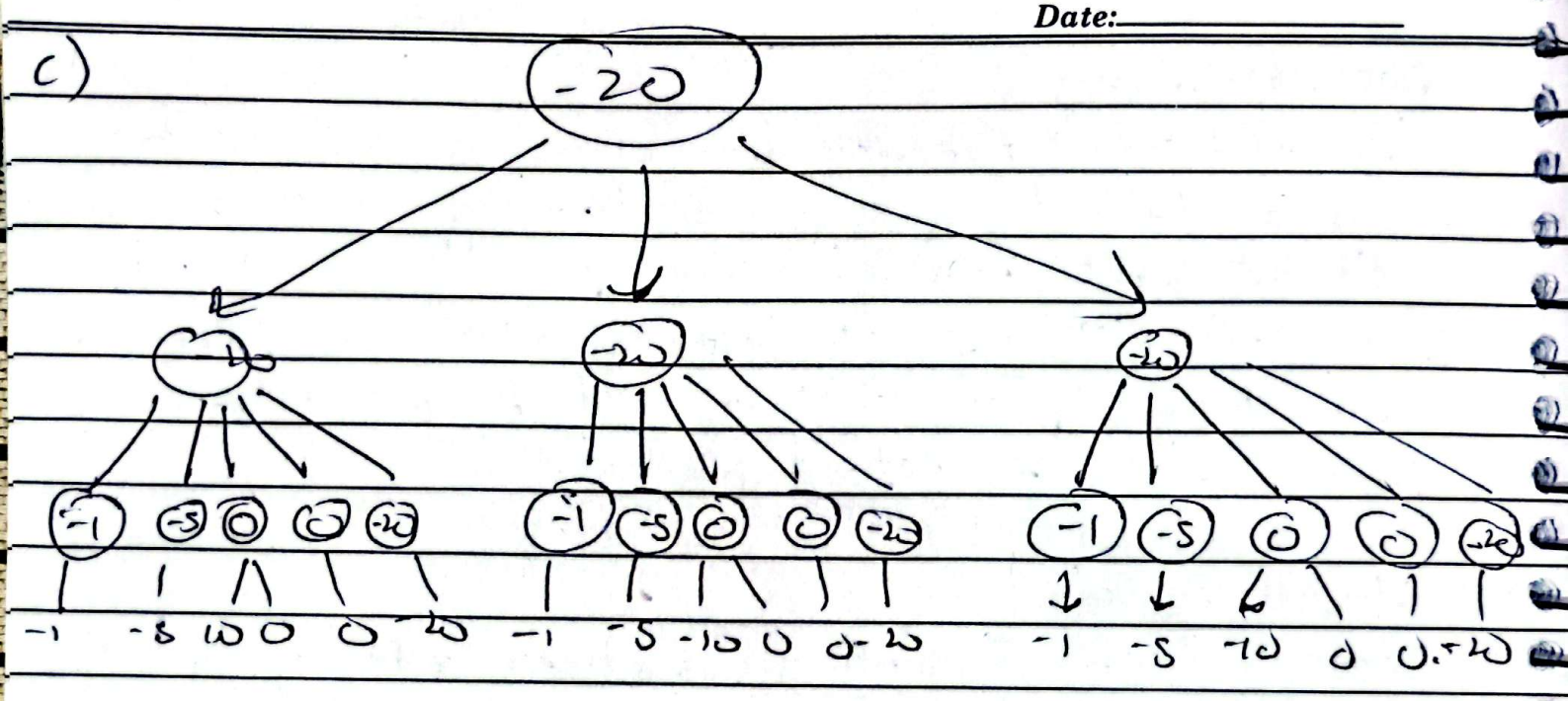
Attacks with probabilities such as zero-day exploits, create unpredictability, pushing the defender to adjust, from worst case, planning to strategies, based on expected value say Expectimax

b)



Date:

c)



d) 1) Success (50%) = damage -10
Fail (50%) : damage - 0
Expected value = (0.5 x -10) + (0.5 x 0) = -5
Zero-day Exploit = on average cause -5 damage to system

2) Minimax: The defender preparing for the worst attack, (eg zero-day exploit success at -10), typically choosing to deploy a firewall for strong defense
Expectimax: The defender considers the expected value (-5) for zero day exploits, viewing them as less severe. It might prefer patching the system over ever ignoring Alerts if false attacks are probable, taking a more calculated approach rather than always over protecting.