Game theory

Game theory is a tool used by the players to understand the strategy of the competitor player.
* used by Business organisations to defeat their competitors

Eg. Solve ~~the following~~

Methods

(1) minmax – Maxmin Principle → Pure strategy
(2) Mixed strategy ord odds method } Mixed Strategy
(3) Domaing Methods
(4) equal game
→ Graphic game theory

Qn Solve the following game problem using Min-max – Maxmin Principle

(a) Pay off ~~Matrix~~ table

Strategy		Player-2 (1)	Player-2 (2)	Minimum
Player (1)	1	9	2	2
	2	8	6	6 — Max
	3	6	4	4
		Maximum 9	6 — Min.	

Value of game – 6

Player (1) → Str 2
Player (2) → Str 2

Ex (11)

strategy	Player-2 1	2	3	Minimum
player (1) 1	4	1	-3	-3
2	3	2	5	2 → max
3	0	1	6	0
Maximum	4	(2)	6	
		min.		

value of game - 2

play 1 → 2

play (2) → 2

Qu Solve the following problem using mixed strategy

(1) pay off ~~matrix~~ table

strategy	play 2 1	2	
play (1) 1	-2	3	3-(-4) = 7
2	3	-4	|-2-3| = 5
	-2-3 = 7	-3-(-4) = 1	12

value of the game = 12

probability of game = $\frac{-2\times7 + 3\times5}{12} = \frac{1}{8}$

Pla

prob Str 1 7/12

Str (2) 5/12

for play 2

prob of 1 = 7/12

2 = 5/12

(ii)

	0	-10	1
Q	1	2	10
	12	1	13

not possible for odd Method.

~~odd x~~

⇒

0	-10	mini
1	2	-10

1 — Max

1	2

Max

min.

Value of the game = 1

(iii)

pl 2

4	1	1
2	3	3
2	2	4

My 1

value of the ~~game~~ game = 12

Prob of ge = $\frac{1\times4 + 2\times3}{4} = \frac{4+6}{4} = \frac{10}{4}$

P-1 1 — 1/4

2 — 3/4

P-2 1 → 2/4 = 1/2

2 → 2/4 = 1/2

~~Ques~~ :-

Saddle point :- When maximin & minmax values are same then we call it saddle point

Eg

Strategy	Player-2			maximum
	1	2	3	
Player-1 1	0	-2	2	-2 → maximin value
2	5	4	-3	-3
3	2	-3	-4	-4
max	5	4	2	

2
↓
minimax value

minmax ~~Value~~ ≠ ~~minimax~~ maxmin.

⇒ there is no saddle point.

dominated strategy :- A strategy is dominated by a 2nd strategy if the 2nd strategy is always at least as good regardless of what the opponent does.

Qu Solve the following Problem using Mixed strategy (odd Method).

①

	B_1	B_2	
A_1	-2	3	[7]
A_2	3	-4	[5]
	[7]	[5]	12

$-2-3$
$-3-(-4)$

$-2-3$
$3-(-4)$ Value of the game

{∵ When we calculate we dont ignore sign but when we write we ignore}

Probability of happening of game $= \frac{-2 \times 7 + 3 \times 5}{12} = \frac{1}{12}$

$=$

Proba of $A_1 = \frac{7}{12} =$ Prob of B_1

Prob of $A_2 = \frac{5}{12} =$ Prob of B_2

Dominance Method

Qu solve the following Problem using Dominance problem

He want LOSS Min.

	B_1	B_2	B_3	B_4	B_5
A_1	1	2	3	4	5
A_2	1	3	2	7	4
A_3	3	4	1	5	6
A_4	6	5	7	6	5
A_5	2	0	6	3	1

He want maximize Profit

we will find here best possible strategy for both.

Loss (B)

Profit A	B_1	B_2	B_3	B_4	B_5
A_1	1	2	3	4	5
A_2	1	3	2	1	4
A_3	3	4	1	5	6
A_4	6	5	7	6	5
A_5	2	0	6	3	4

We will remove rows which has min profit in A_1, A_2 first elents same

Now in 2nd, $2 < 3$ so till 1 2 / 1 3

first row can cut

Now in 3rd $3 > 2$ ⇒ we can't decide which of the raw should cut.

Now we compare A_1, A_3 $1, < 3$, $2 < 4$ but $3 > 1$ Not possible

So, compare A_1, A_4 then $1 < 6$, $2 < 5$, $3 < 7$, $4 < 6$, $5 \leq 5$

⇒ we can cut A_1, be A has one strategy which is better than A_1

Ily process for B but we will cut which has greater values because B Want to minimize Loss

compare B_1 with B_2 (Not possible)

we compare B_1, B_4

B values of B_4 > values of B_1

so we will cut B_4

Now for A

values of A_2 < values of A_4

⇒ Cut A_2

Now for B

Compare B_2 & B_5

Cut B_5

Now for A

compare A_3, A_4

Cut A_3

for B

if we compare B_1 & B_3 or B_2 & B_3 { its your choice }

we can cut B_3

⇒

Now		B_1	B_2	Min
	A_4	6	5	[5] — Max
	A_5	2	0	0
Max		6	[5]	

Min

{ Now we can solve by min-max method }

⇒ value of the game = 5

Qn Solve by dominance method.

	B_1	B_2	B_3	B_4
A_1	6	4	8	0
A_2	6	8	4	8
A_3	8	4	8	9
A_4	0	8	9	16

(Solve)