

Pay-Off Matrix Sums.

Dec-2021

- 16) Solve the game whose payoff matrix is given by.

		Player B			
		B ₁	B ₂	B ₃	Row minima.
Player A	A ₁	1	3	1	1 ✓
	A ₂	0	-4	-3	-4
	A ₃	1	5	-1	-1
Col maxima		1 ✓	5	1 ✓	

∴ Maximin = Minimax = 1. Both are equal.
It has Saddle point. It is called as pure Strategy.

Value of the game = 1.
Saddle point = [A₁, B₁] or [A₁, B₃].

- 18) Solve 2x2 game.

		B ₁	B ₂	Row minima
A ₁		5	3	3 ✓
A ₂		1	4	1
Col maxima		5	4 ✓	

here maximin = 3 and minimax = 4. Both are not equal. So, it is mixed Strategy.

Solve it using oddman method,

		B ₁	B ₂	
A ₁		5	3	3 3/5
A ₂		1	4	2 2/5
		1	4	5

Same Sign = Sub
diff Sign = add

$$\text{Value of the game } (V) = 5\left(\frac{3}{5}\right) + 1\left(\frac{2}{5}\right) = \frac{15+2}{5}$$

$$V = \frac{17}{5}$$

Strategy for player A $(S_A) = \left[\frac{3}{5}, \frac{2}{5}\right]$

Strategy for player B $(S_B) = \left[\frac{1}{5}, \frac{4}{5}\right]$

18) Solve 2x2 game.

	B ₁	B ₂
A ₁	5	1
A ₂	3	4

Row minime

1

3 ✓

maximin = 1, Minimax = 4.

Col maximum 5 4 ✓

maximin $\neq$ minimax, So, it has no saddle point. It has mixed strategy. Solve using oddman method.

	B ₁	B ₂	Row
A ₁	5	1	1, 2/5
A ₂	3	4	4, 4/5
	3	2	5
	$\frac{3}{5}$	$\frac{2}{5}$	

$$V = 5\left(\frac{2}{5}\right) + 3\left(\frac{4}{5}\right)$$

$$= \frac{10+12}{5} = \frac{22}{5}$$

$$V = \frac{17}{5}$$

$$S_A = \left[\frac{1}{5}, \frac{4}{5}\right] \quad S_B = \left[\frac{3}{5}, \frac{2}{5}\right]$$

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15)

		Player B		
		B ₁	B ₂	Row minima
Player A	A ₁	2	6	2 ✓
	A ₂	-2	1	-2
		Col maxima 2, 6		

maximin = minimax = 2. Both are equal.
It is pure strategy. It has saddle point.

Value of the game = 2.

Saddle point = [A₁, B₁].

where $-2 \geq 1 \geq 6$

19) Solve the pay-off matrix.

(a)				Row minima
	B ₁	B ₂	B ₃	
A ₁	-3	-2	6	-3
A ₂	2	0	2	0 ✓
A ₃	5	-2	4	-2
		Col maxima 5, 0, 6		

maximin = 0, minimax = 0. Both are equal.

Value of the game is 0.

Saddle point at [A₂, B₂].

(6)

	B ₁	B ₂	B ₃	Row minima
A ₁	-2	5	2	-2 ✓
A ₂	-5	-6	-4	-6
A ₃	-5	20	-8	-8
Col maxima	-2	20	2	

maximin = -2, minimax = 2. It has pure strategy. It has saddle point at (A₁, B₁).

Value of the game is -2.

Dec 2023, May 2021, May 2022

(7) Pay-off matrix.

		Player B.				
		B ₁	B ₂	B ₃	B ₄	Row minima
Player A	A ₁	1	7	3	4	1
	A ₂	5	6	4	5	4 ✓
	A ₃	7	2	0	3	0
	A ₄					
Col maxima		7	7	4	5	

maximin = 4 & Minimax = 4. Both are equal. It is pure strategy. It has saddle point.

Value of the game is 4.

Saddle point at [A₂, B₃].

23) a) Solve the game.

	Player A			
	A ₁	A ₂	A ₃	Row minima
B ₁	-1	2	-2	-2 ✓
B ₂	6	4	-6	-6
Col maxima	6	4	-2 ✓	

maximin = minimax = -2. Hence both are equal, It has pure strategy. Value of the game is -2.

Saddle point at ~~[A₂, B₁]~~ [B₁, A₃].

(May 2024)

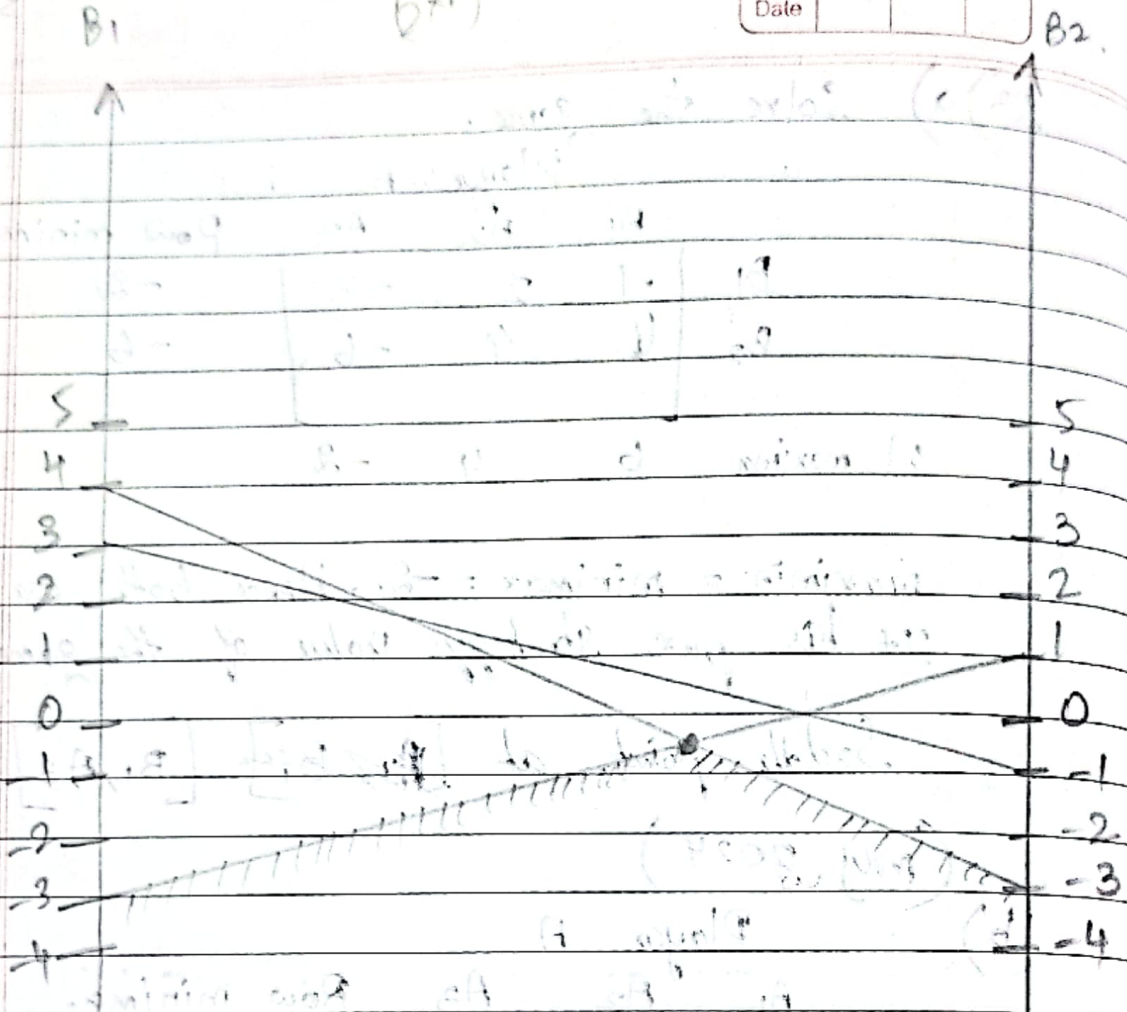
	Player A			
	A ₁	A ₂	A ₃	Row minima
B ₁	3	-3	4	-3 ✓
B ₂	-1	1	-3	-3
Col maxima	3	1	4	

Maximin = -3 ≠ minimax = 1. Both are not equal. It has failed in pure strategy.

No Saddle point occurs. It is mixed strategy.

Solve using graphical method.

(b+r) matrix = down shade.



	A ₂	A ₃	
B ₁	-3	4	4
B ₂	1	-3	7
	7	4	11

opp = add.
same = sub.

Solve by odd man method

$$\frac{1}{11} = \frac{4}{11}$$

$$\text{Value of the game (V)} = -3\left(\frac{4}{11}\right) + 1\left(\frac{7}{11}\right)$$

$$= \frac{-12 + 7}{11} = \frac{-5}{11}$$

$$V = \frac{-5}{11}$$

$$S_A = \left[0, \frac{1}{11}, \frac{4}{11}\right]$$

$$S_B = \left[\frac{4}{11}, \frac{7}{11}\right]$$

May 2023

1) Determine points & optimum strategy.

	B ₁	B ₂	Row minima
A ₁	1	4	1 ✓
A ₂	-1	-4	-4
A ₃	-3	-2	-3

Col maxima 1 4

maximin = minimax = 1. Both are equal.
It is pure strategy. Value of the game = 1.

Saddle point at [A₁, B₁].

2) Solve the game.

	B ₁	B ₂	B ₃	B ₄	Row minima
player A A ₁	3	2	4	0	0
A ₂	3	4	2	4	2 ✓
A ₃	4	2	4	0	0
A ₄	0	4	0	8	0

Col maxima 4 4 4 8

Both are not equal. maximin = 2 ≠ minimax = 4.

Solve by dominance property, by linear combination.

	B ₁	B ₂	B ₃	B ₄
A ₁	3	2	4	0
A ₂	3	4	2	4
A ₃	4	2	4	0
A ₄	0	4	0	8

Solve by oddman method,

$$\begin{array}{cc|cc}
 & B_3 & B_4 & & \\
 A_3 & 4 & 0 & 8 & 8/12 \\
 A_4 & 0 & 8 & 4 & 4/12 \\
 \hline
 & 8 & 4 & 12 & \\
 \hline
 & \frac{8}{12} & \frac{4}{12} & &
 \end{array}$$

$$\begin{aligned}
 \text{Value of the game} &= 4\left(\frac{8}{12}\right) + 0\left(\frac{4}{12}\right) \\
 &= \frac{32}{12} = \frac{8}{3}
 \end{aligned}$$

$$\text{Value of the game} = \frac{8}{3}$$

$$\text{Strategy for player A} = \left[0, 0, \frac{8}{12}, \frac{4}{12} \right]$$

$$\text{Strategy for player B} = \left[0, 0, \frac{8}{12}, \frac{4}{12} \right]$$

May - 2021

23) a) Solve the game.

	B ₁	B ₂	B ₃	B ₄	B ₅	Row minima
A ₁	-2	0	0	5	3	-2
A ₂	3	2	1	2	2	1 ✓
A ₃	-4	-3	0	-2	6	-4
A ₄	5	3	-4	2	6	-4
Col maxima	5	3	1	5	6	

Maximin = Minimax = 1. It has saddle point.
It is pure strategy.

Value of the game = 1,

Saddle point at $[A_2, B_3]$.

(b)

	B_1	B_2	B_3	B_4	B_5	Row minima
A_1	9	3	1	8	0	0
A_2	6	5	4	6	7	4 ✓
A_3	2	4	4	3	8	2
A_4	5	6	2	2	1	1

Col maxima 9 6 4 8 8

Maximin = Minimax = 4. It is pure strategy.

Value of the game = 4. Saddle point (A_2, B_3) .