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Given the draw occurs when both players choose the same strategy. The payoff matrix is

		Player II	
	Rock	Paper	Scissors
Player I Rock	(-1,-1)	(0,1)	(1,0)
Paper	(1,0)	(-1,-1)	(0,1)
Scissors	(0,1)	(1,0)	(-1,-1)

It is evident that no pure strategy can exist in nash equilibrium, every nash equilibrium must be completely mixed. If the strategy $x = (x_1, x_2, x_3)^T$ is in nash equilibrium for player I, then it must solve

$$x_3 - x_1 = x_1 - x_2 \quad - (1)$$
$$x_1 - x_2 = x_2 - x_3 \quad - (2)$$
$$x_1 + x_2 + x_3 = 1 \quad - (3)$$

from (1) & (2) $x_3 = 2x_1 - x_2 \Rightarrow 3x_1 + x_2 - x_2 = 1$

$x_1 = 1/3$

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$x_1 = x_2 = x_3 = 1/3$

Since the game is symmetric, the same equalization equation shows that player II's strategy must be the same. The only nash equilibrium in this game is $x = y = (1/3, 1/3, 1/3)^T$

So the expected payoff to each player is 0.

lets determine R's conditional distribution given c.

conditional distribution of R

$$P(P = \text{Paper} \mid R = \text{Rock}) = \frac{P(P = \text{Paper and } R = \text{Rock})}{P(R = \text{Rock})}$$

as $P(P = \text{paper and } R = \text{Rock}) = 1/6$

$$P(R = \text{Rock}) = P(R = \text{Rock and } P = \text{Rock}) + P(P = \text{Paper and } R = \text{Rock}) + P(P = \text{Scissor and } R = \text{Rock})$$

$$= 0 + 1/6 + 1/6 = 1/3$$

$$P(P = \text{Paper} \mid R = \text{Rock}) = \frac{1/6}{1/3} = 1/2$$

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Similarly $P(P = \text{scissor} \mid R = \text{Rock}) = 1/2$

$P(R = \text{Rock} \mid P = \text{Rock}) = 0$

condition on PI being told to play Rock,

She knew that player II's strategy is to play $(0, 1/2, 1/2)$.

we see that PI optimal strategy is to play Rock,

Similar process shows that the same is true if PI

told to play paper or scissors and that the

same is true for PII. therefore this strategy

is a correlated equilibrium.

The expected payoffs of PI is

$$= (-1)\cdot 0 + 0\cdot 1/6 + 1\cdot 1/6 +$$
$$1\cdot 1/6 + (-1)\cdot 0 + 0\cdot 1/6 +$$
$$0\cdot 1/6 + 1\cdot 1/6 + (-1)\cdot 0$$
$$= 1/2$$

Similarly the expected payoff of

both players is $1/2$.

2. Given the bidders for each combination of items

Bidder:	1	2
Items received:		
No items	0	0
Item 1	2	1
Item 2	1	2
Both items	2	2

Considering the two bids set $b_1 = (2, 1)$ and $b_2 (1, 0)$

$b_1(0, 1)$: Bidder 2 is bidding item 2.

$b(1, 0)$: Bidder 1 is bidding item 1

On adding valuations of bidder 2 we get the allocation of total. item 1 social surplus maximization.

On optimal allocation of items to bidders

$b_1 (1, 0)$: Bidder 1 is bidding in item 2
$\Rightarrow (2-0)$

$b_2 (0, 1)$: Bidder 2 is bidding in item $1 \Rightarrow$
$(2 - 0)$

Sum is 4

So we get 4 as Social Sulphur maximization.

price of anarchy is given by = $\frac{\text{optimal Social sulphur maximization}}{\text{current duration}}$

$= 4/2 = 2$

3. The example of LPT is

2	2	4	5	5	5	7	5	7
15	15	14	13	13	12	9	9	8

$A: [n] \rightarrow [m]$ denote any assignment of n tasks to m identical machines starting from A. the Max-weight best response policy reache a pure nash equilibrium after each agent was activated at most once

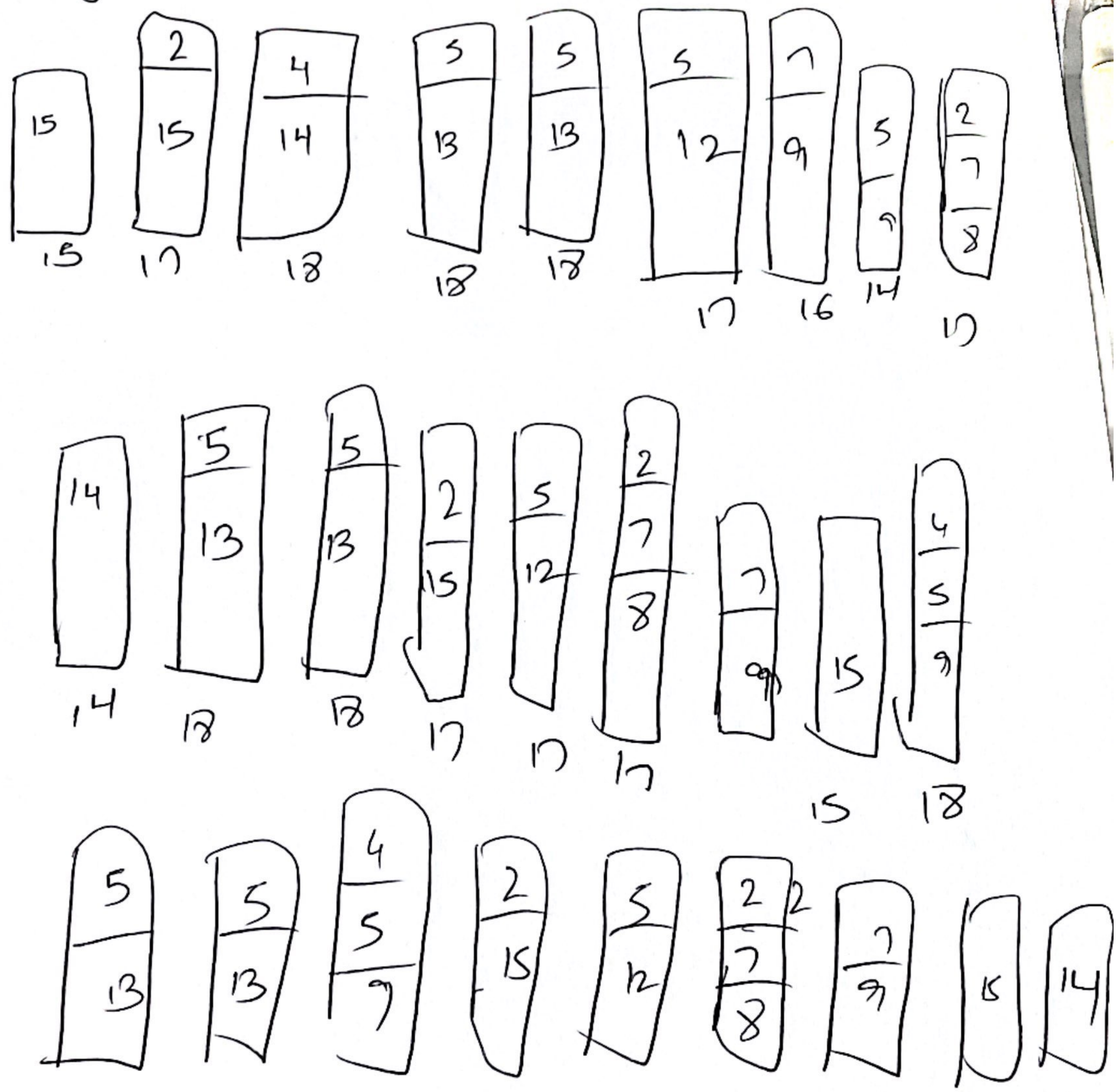
After the jobs are sorted and all are in descending order 7 goes with 8, 9 goes with 7 or 5. as shown above

So The maximum load is 17 by sorting upfront.

The Given maximum load 17 in example doesn't apply for $\begin{matrix}4\\14\end{matrix}$ so the sorting order is

4	5	5	2	2	5	7	7	5
14	13	13	15	15	12	9	8	9

3) with the maximum load 17 without any corrections by sorting upfront.

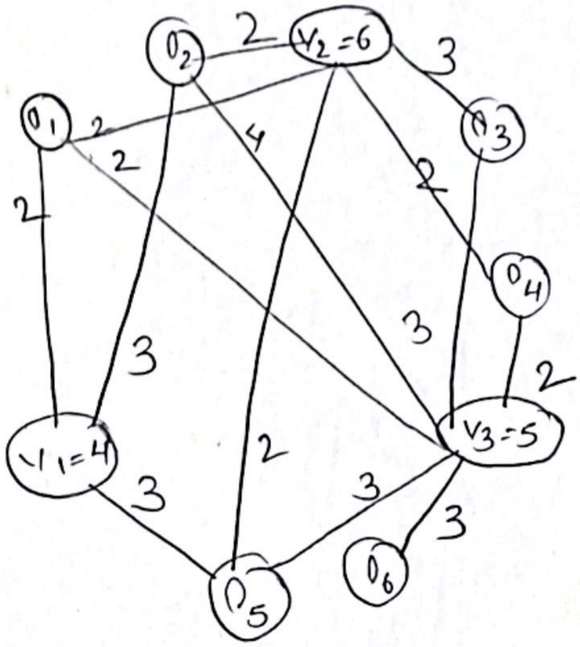


2 PNE, OPT

6(c) 5

1

4



Agent choices with payoffs $\pi_i(s)$	$W(S)$	$\sum_{i=1}^{K} \pi_i(S)$	
$o_1(0)$ $o_3(1)$ $o_5(0)$	3	1	PNE
$o_1(0)$ $o_3(1)$ $o_6(0)$	5	1	
$o_1(0)$ $o_4(0)$ $o_5(0)$	2	0	
$o_1(0)$ $o_4(0)$ $o_6(0)$	3	0	
$o_2(0)$ $o_3(0)$ $o_5(0)$	5	0	
$o_2(0)$ $o_3(1)$ $o_6(0)$	5	1	PNE
$o_2(1)$ $o_4(1)$ $o_5(0)$	5	2	PNE, OPT
$o_2(0)$ $o_4(1)$ $o_6(0)$	5	1	

by calculating the payoffs by finding least and heighest and second heigest weights