



## B.E. International Program

Faculty of Economics

Thammasat University



### EE311 Microeconomics Theory, Semester 2/2019

### Homework Assignment #7 | Due date: Sunday 12 April 2020

#### Instruction:

- 1) Attempt all questions.
- 2) You may study and discuss in group but you have to write up your solutions independently and by handwriting only. Copying and/or Plagiarism is considered as a serious crime in academic arena and it will not be tolerated. If detected, all parties involved receive 'zero.'
- 3) If you have any questions, please feel free to email me at [pongpalin@econ.tu.ac.th](mailto:pongpalin@econ.tu.ac.th)

### Game Theory (CH 14)

Please attempt the following questions from your Textbook (available on Moodle).

The questions are on Page 597 onwards.

Review Question 1

Briefly Explain

Review Question 2

Briefly Explain

Review Question 3

Briefly Explain

Problem 14.6

Problem 14.15

Problem 14.23

Answer only Sub-Question (b), i.e. find MSNE.

Question 1) What is a Nash equilibrium? Why would strategies do not constitute a Nash equilibrium be an unlikely outcome of the game?

Ans : Nash equilibrium is a situation that occurs when both players of the game choose the best strategies that give them the highest payout, given the strategy chosen by another player.

The reason why the strategies that are not Nash equilibrium be an unlikely outcome of the game is because those strategies will not give the player the highest payoff, given the strategy chosen by another player. It is illogical for the players to do not want the highest payoff for themselves, thus the strategy that is not result in Nash equilibrium will be inferior and got ignore by the player.

Question 2) What is special about the prisoners' dilemma game? Is every game present in this chapter a prisoners' dilemma?

Ans : Prisoners' dilemma is a situation that occur when there is conflict between self interest of individual player and collective interest of all player. This will happen when the game's Nash equilibrium has overall lower payoff than the other strategies that result in overall higher payoff for both player. Not every game in this chapter is prisoners' dilemma

Question 3) What is the difference between a dominant strategy and dominated strategy? Why would the player in a game be unlikely to choose a dominated strategy

Ans : The dominant strategy is the strategy that will give higher payoff than the other strategy, regarding the strategy other player choose. While the dominated strategy is the strategy that give lower payoff than other strategy, regarding the strategy other player choose. The players will want to maximize their payoff, so it is more likely for them to choose dominant strategy and ignore the dominated one.

14.6)

		Kirin			
		¥ 630	¥ 660	¥ 690	¥ 720
Asashi	¥ 630	180, 180	184, 178	185, 175	186, 173
	¥ 660	176, 184	183, 183	192, 182	194, 180
	¥ 690	175, 185	182, 192	191, 191	198, 190
	¥ 720	173, 186	180, 194	190, 198	196, 196

a) Does Asashi have dominant strategy? Does Kirin?

Ans: No, neither Asashi or Kirin have dominant strategy

b) Both Asashi and Kirin have a dominated strategy: Find and identify it.

Asashi: 720 ¥ strategy dominated by 690 ¥

Kirin: 720 ¥ strategy dominated by 690 ¥

c) Assume that Asashi and Kirin will not play the dominated strategy you identified in part b). Having eliminated the dominated strategy, determine whether Asashi and Kirin now have another dominated strategy

		Kirin		
		¥ 630	¥ 660	¥ 690
Asashi	¥ 630	180, 180	184, 178	185, 175
	¥ 660	176, 184	183, 183	192, 182
	¥ 690	175, 185	182, 192	191, 191

Asashi: 690 ¥ strategy is dominated by 660 ¥

Kirin: 690 ¥ strategy is dominated by 660 ¥

d) Assume that Asashi and Kirin will not play the dominated strategy you identify in part c). Having eliminated the dominated strategy, determine whether Asashi and Kirin now have dominant strategy.

		Kirin	
		¥ 630	¥ 660
Asashi	¥ 630	180, 180	184, 178
	¥ 660	176, 184	183, 183

Asashi : ¥ 630 is a dominant strategy

Kirin : ¥ 660 is a dominant strategy

e) What is the Nash equilibrium in this game

Ans : Both company choose 630 ¥, pay off (180, 180)

14.15)

		Columbia Picture	
		Beta	VHS
Sony	Beta	20, 10	0, 0
	VHS	0, 0	10, 20

b) is there a mixed strategy Nash equilibrium in this game? If so, what is it?

$p$  = probability that Sony choose Beta,  $1-p$  = probability that Sony choose VHS

$q$  = probability that CP choose Beta,  $1-q$  = probability that CP choose VHS

$$E_s[\text{Beta}] = 20q$$

$$E_c[\text{Beta}] = 10p$$

$$E_s[\text{VHS}] = 10(1-q) = 10 - 10q$$

$$E_c[\text{VHS}] = 20(1-p) = 20 - 20p$$

Sony will choose Beta ( $p=1$ ) when

$$E_s[\text{Beta}] > E_s[\text{VHS}]$$

$$20q > 10(1-q)$$

$$q > \frac{1}{3}$$

Sony will choose VHS ( $p=0$ ) when

$$E_s[\text{Beta}] < E_s[\text{VHS}]$$

$$20q < 10(1-q)$$

$$q < \frac{1}{3}$$

Sony is indifferent ( $p \in (0,1)$ )

$$E_s[\text{Beta}] = E_s[\text{VHS}]$$

$$20q = 10(1-q)$$

$$q = \frac{1}{3}$$

CP will choose Beta ( $q=1$ ) when

$$E_c[\text{Beta}] > E_c[\text{VHS}]$$

$$10p > 20(1-p)$$

$$p > \frac{2}{3}$$

CP will choose VHS ( $q=0$ ) when

$$E_c[\text{Beta}] < E_c[\text{VHS}]$$

$$10p < 20(1-p)$$

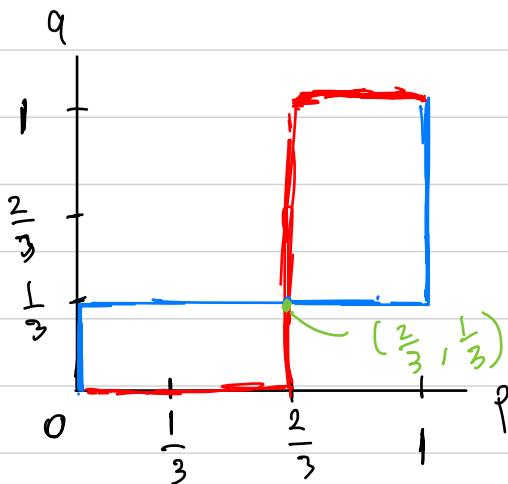
$$p < \frac{2}{3}$$

CP is indifferent ( $p \in (0,1)$ ) when

$$E_c[\text{Beta}] = E_c[\text{VHS}]$$

$$10p = 10(1-p)$$

$$p = \frac{1}{3}$$



$\therefore$  Mixed strategy Nash equilibrium exist  
when probability of Sony choose beta =  $\frac{2}{3}$   
probability of Columbia picture choose  
beta  $\frac{1}{3}$

and Pure strategy Nash equilibriums when  
Both choose Beta or VHS

1A.23)

XYZ

		XYZ	
		High fiber	Sweet
ABC	Sweet	<u>50</u> , <u>60</u>	30, 40
	High fiber	20, 30	<u>40</u> , <u>60</u>

a) If the two firms choose the type of plant simultaneously, is there a unique Nash equilibrium? if so, what is it? If not, why not?

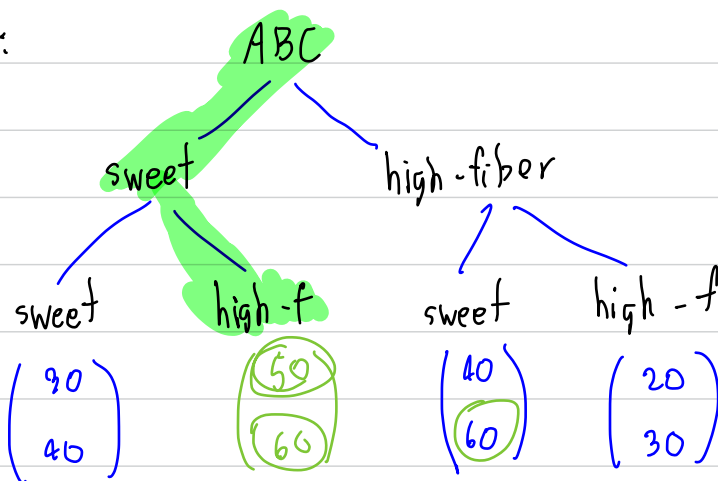
Ans: If two firms make decisions simultaneously, the game will have two Nash equilibria.

One is ABC choose Sweet and XYZ choose High fiber (50, 60)

Second is ABC choose High fiber and XYZ choose Sweet (40, 60)

b) Would ABC have a first-mover advantage if capacities were chosen sequentially? If so, briefly explain how it might credibly implement this strategy.

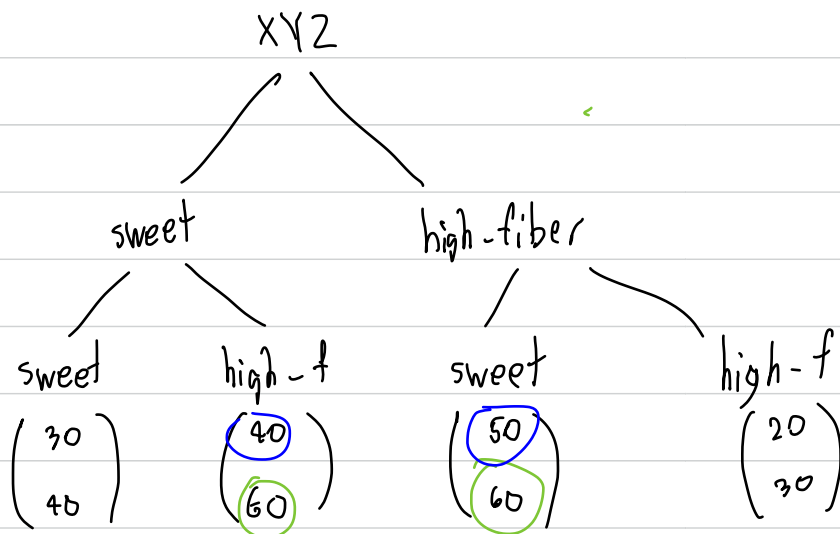
Ans:



When both firm choose simultaneously, NE will be unclear. However, when ABC choose first, XYZ will choose high-f when ABC choose sweet and choose sweet when ABC choose high-f to maximize its payoff. ABC should choose sweet to maximize its payoff (get 50 while XYZ get 60)

c) Would XYZ have a first-mover advantage if capacities were chosen sequentially? If so, briefly explain how it might credibly implement this strategy.

Ans :



If XYZ get to choose first, ABC will choose high-f if XYZ choose sweet and choose sweet when XYZ choose high-f to maximize its profit. XYZ choice does not matter because both choice will give same pay off (60) for XYZ thus XYZ does not get first mover advantage.