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

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	Answer only Sub-Question (b), i.e. find MSNE.
Problem 14.23	

1. What is a Nash equilibrium? Why would strategies that *do not* constitute a Nash equilibrium be an unlikely outcome of a game?

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Ans. Nash equilibrium occurs when the player choose strategy that provide a highest payoff, given the strategies chosen by the other plyers in the game. If players choose strategy that do not constitute the Nash equilibrium, the players could choose another strategy that increase their payoff given the strategies chosen by the other plyers. Since plyers could increase their payoff by choosing othe strategies, strategies that do not constitute a Nash equilibrium are an unlikely outcome.

2. What is special about the prisoners' dilemma game? Is every game presented in this chapter a prisoners' dilemma?

Ans. A prisoners' dilemma game show the conflict between self-interest and collective-interest. The chicken is special because it has multiple Nash equilibrium. In each Nash equilibrium, one player chooses a cooperative strategy while the other plyer choose a non-cooperative strategy. The different between the prisoners' dilemma and children game is that in the prisoners's dilemma both players have a dominant strategy to confess, and by choosing this dominant strategy, both players receive a payoff worse than if they both choose to not confess.

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

Ans. A dominant strategy is a strategy that is better than any other strategy the player might follow no matter what the other player does. A player has a dominated strategy when it has other strategies that give it a higher payoff no matter what the other player does. A player would be unlikely to choose a dominated strategy because the player could always improve his payoff by choosing another strategy regardless of the strategies chosen by the other players.

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14.6. Asahi and Kirin are the two largest sellers of beer in Japan. These two firms compete head to head in the dry beer category in Japan. The following table shows the profit (in millions of yen) that each firm earns when it charges different prices for its beer:

Asahi \ Kirin	¥630	¥660	¥690	¥720
¥630	180, 180	184, 178	185, 175	186, 173
¥660	178, 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 Asahi have a dominant strategy? Does Kirin?

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

c) Assume that Asahi and Kirin will not play the dominated strategy you identified in part (b) (i.e., cross out the dominated strategy for each firm in the table). Having eliminated the dominated strategy, show that Asahi and Kirin now have another dominated strategy.

d) Assume that Asahi and Kirin will not play the dominated strategy you identified in part (c). Having eliminated this dominated strategy, determine whether Asahi and Kirin now have a dominant strategy.

e) What is the Nash equilibrium in this game?

a.) Dominant is a strategy that is better than any other strategy that a player might choose, no matter what strategy the other player follows. Both Kirin and Asahi don't have dominant strategy because it is better off for Asahi to sell ¥ 630 if Kirin sell at ¥630, but Asahi better off to sell ¥ 660 if Kirin sell ¥ 690.

b.) Dominated is a strategy such that the player has another strategy that gives a higher payoff, no matter what the other player. In this game, Asahi has a dominated at ¥720 and Kirin has a dominated at ¥ 720 as well. No matter what Kirin does, Asahi will not sell at ¥ 720 and no matter what Asahi does, Kirin will not sell at ¥ 720. If neither player will play these dominated strategies, ¥ 720 can be removed from the table. (red hilight in the table)

c.) Another dominated : Asahi has a dominated at ¥ 690 and Kirin has a dominated at ¥ 690.

d.) Since we eliminated another dominated strategy, both player have dominant strategy which is at ¥ 630.

e.) Nash equilibrium in this game is $(S^*_{Asahi}, S^*_{Kirin}) = (¥630, ¥630)$

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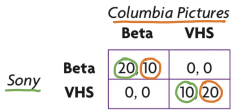
14.15. Consider the following game between Sony, a manufacturer of video cassette players, and Columbia Pictures, a movie studio. Each firm must decide whether to use the VHS or Beta format—Sony to make video players, Columbia to release its movies for rental or purchase.

		Columbia Pictures: Beta	Columbia Pictures: VHS
Sony	Beta	20, 10	0, 0
	VHS	0, 0	10, 20

a) Restrict attention to pure strategies. Does either firm have a dominant strategy? What is (are) the Nash equilibrium (equilibria) of this game?

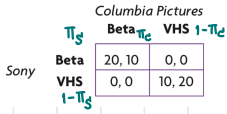
b) Is there a mixed strategy Nash equilibrium in this game? If so, what is it?

c) Restrict attention again to pure strategies, but now focus on a sequential-move game in which Sony chooses its strategy first. What is (are) the Nash equilibrium (equilibria) of this game?



a.) Both Sony and Columbia Pictures do not have dominant strategy
There are 2 Nash equilibrium : (Beta, Beta) , (VHS, VHS)

b.)



Sony set probability of playing Beta = π_s
" " VHS = $1-\pi_s$
Columbia set probability of playing Beta = π_c
" " VHS = $1-\pi_c$
Playing mixed strategy : Sony choose π_s such that
Columbia's expected π from Beta = Columbia's expected π from VHS

$$10\pi_s + (1-\pi_s)\cdot 0 = 0\cdot(\pi_s) + (1-\pi_s)\,20$$

$$\pi_s = \frac{2}{3}$$

Sony's expected π from Beta = Sony's expected π from VHS

$$20\pi_c + 0\cdot(1-\pi_c) = 0\cdot\pi_c + 10(1-\pi_c)$$

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

Show $\pi_s = \frac{2}{3}$ → Sony puts more prob. on the Beta that Columbia doesn't like

Similarly, in any mixed strategy equilibrium → Columbia plays Beta with prob. $\pi_c = \frac{1}{3}$ → Columbia puts less prob. on the Beta that Sony prefers.

c.) Columbia will always choose the same strategy to be optimal
In moving first, therefore Nash Equilibrium is Sony will choose Beta
followed by Columbia choose Beta (Beta, Beta)

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14.23. ABC and XYZ are the two cereal manufacturers contemplating entry into a South American market. Each will be able to build one plant, and that plant can be used to make either a cereal that is high in fiber and low in calories (High Fiber) or a less healthy cereal with a sweet taste (Sweet). Once a plant is chosen to produce one kind of cereal, it will be prohibitively expensive to switch production to the other type. The following table shows the annual profit (in millions of pesos) that each firm would earn given the production choices of the two firms.

ABC's profit is the left number in each cell; XYZ's profit is the right number. For example, if ABC makes the sweet cereal and XYZ produces the high-fiber cereal, annual profits will be 50 million pesos for ABC and 60 million pesos for XYZ.

ABC \ XYZ	High Fiber	Sweet
Sweet	50, 60	30, 40
High Fiber	20, 30	40, 60

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?

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

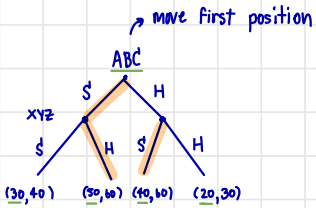
c) Would XYZ have a first-mover advantage if capacities were chosen sequentially? If so, briefly explain how it might credibly implement this strategy.

a.) Best response for ABC —, Best response for XYZ —

There are two Nash Equilibrium : $(S^*_{ABC}, S^*_{XYZ}) = (50, 60)$

$(S^*_{ABC}, S^*_{XYZ}) = (40, 60)$

b.) ABC will want to end up in the (50, 60) equilibrium, so they gain 50 million pesos instead of (40, 60) equilibrium that they gain only 4 million pesos. As a result, ABC should move first



c.) XYZ will both gain 60 millions pesos in both (40,60) and (50,60) Nash equilibrium. So it has no first mover advantage