Kittithat Ruangsri 6104640625

# B.E. International Program
## Faculty of Economics
## Thammasat University

**EE311 Microeconomics Theory, Semester 2/2019**

**Homework Assignment #6 | Due date: Wednesday 8 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

**Price Discrimination (CH 12)**

Question: Solve Example 2 of Block Tariff (Page 19 of Topic 9 Part 1)

12. Consider a market with 100 identical individuals, each with the demand schedule for electricity of $P = 10 - Q$. They are served by an electric utility that operates with a fixed cost 1,200 and a constant marginal cost of 2. A regulator would like to introduce a two-part tariff, where $S$ is a fixed subscription charge and $m$ is a usage charge per unit of electricity consumed. How should the regulator set $S$ and $m$ to maximize the sum of consumer and producer surplus while allowing the firm to earn exactly zero economic profit?

12.** Consider a bar whose owner plans to set profit-maximizing two-part tariff (entry fee and per-drink price) on two types of customers. **The owner would like to welcome both types into his bar, meaning that he will not charge an entry fee that is too high.**

There are 20 people of the X-type whose individual demand is given by P = 10 – Qx. There are 30 people of the Y-type whose individual demand is given by P = 10 – 2Qy. The MC = AC = $2 per drink.

Find the optimal entry fee and per-drink price. Also, calculate the profit the bar can make from these 50 customers.

14. Suppose that Acme Pharmaceutical Company discovers a drug that cures the common cold. Acme has plants in both the United States and Europe and can manufacture the drug on either continent at a marginal cost of 10. Assume there are no fixed costs. In Europe, the demand for the drug is $Q_E = 70 - P_E$, where $Q_E$ is the quantity demanded when the price in Europe is $P_E$. In the United States, the demand for the drug is $Q_U = 110 - P_U$, where $Q_U$ is the quantity demanded when the price in the United States is $P_U$.

a) If the firm can engage in third-degree price discrimination, what price should it set on each continent to maximize its profit?

b) Assume now that it is illegal for the firm to price discriminate, so that it can charge only a single price *P* on both continents. What price will it charge, and what profits will it earn?

**(HINT: You should find the "total" demand for drugs by using the horizontal summation, i.e. $Q = Q_U + Q_E$.)**

20. A cruise line has space for 500 passengers on each voyage. There are two market segments: elderly passengers and younger passengers. The demand curve for the elderly market segment is $Q_1 = 750 - 4P_1$. The demand curve for the younger market segment is $Q_2 = 850 - 2P_2$. In each equation, *Q* denotes the number of passengers on a cruise of a given length and *P* denotes the price per day. The marginal cost of serving a passenger of either type is $40 per person per day. Assuming the cruise

line can price discriminate, what is the profit-maximizing number of passengers of each type? What is the profit-maximizing price for each type of passenger?

22. You are the only European firm selling vacation trips to the North Pole. You know only three customers are in the market. You offer two services, round trip airfare and a stay at the Polar Bear Hotel. It costs you 300 euros to host a traveler at the Polar Bear and 300 euros for the airfare. If you do not bundle the services, a customer might buy your airfare but not stay at the hotel. A customer could also travel to the North Pole in some other way (by private plane), but still stay at the Polar Bear. The customers have the following reservation prices for these services:

Reservation Prices (in euros)

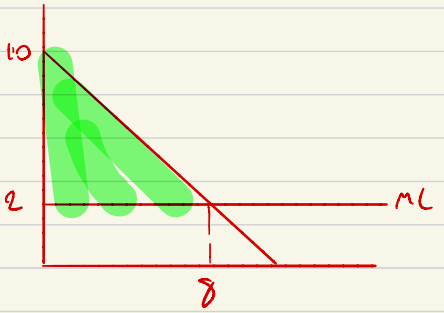
| Customer | Airfare | Hotel |
|---|---|---|
| 1 | 100 | 800 |
| 2 | 500 | 500 |
| 3 | 800 | 100 |

a) If you do not bundle the hotel and airfare, what are the optimal prices *PA* and *PH*, and what profits do you earn?

b) If you only sell the hotel and airfare in a bundle, what is the optimal price of the bundle *PB*, and what profits do you earn?

c) If you follow a strategy of mixed bundling, what are the optimal prices of the separate hotel, the separate airfare, and the bundle (*PA*, *PH*, and *PB*, respectively) and what profits do you earn?

12.




$P = 10 - Q$

$MC = 2$

We then charge $P^* = 2$

$2 = 10 - Q \therefore Q = 8$

The consumer will consume 8 units.

$PS = CS = (10-2)(8)(\frac{1}{2}) = 32$

Fixed cost = 1200

100 customers total

$\frac{1200}{100} = \$12$ of subscription fee. CS the $32 - 12 = 20$

and $100(8)(2-2)$ of usage fee $= 0$

12**. $P = 10 - Q_x$ (20) people $MC = 2$

$P = 10 - 2Q_y$ (30) people

$Q_y = \frac{10 - P}{2}$


Total profit = $\pi$ lump-sum fee + $\pi$ unit-cost fee

$\pi$ lump sum = $\triangle \times 50$

$= 50(10 - p^*)(Q_y)(\frac{1}{2})$

$= 50\ (10-p)(10-p)(\frac{1}{2})$

$= \frac{50}{4}(10-p)^2$ //

$\pi$ unit-cost : $\square + \square$

$= (P - mc)(Q_x)(20) + (P - mc)(Q_y)(30)$

$= P - mc\,(20Q_x + 30Q_y)$

$= (P - 2)\left(20(10 - p) + 30\left(\frac{10-p}{2}\right)\right)$

$= (P - 2)\left(\frac{200}{3} - \frac{20}{3}p + \frac{300}{2} - \frac{30}{2}p\right)$

$= (P-2)(10 - p) + 5 - p$

$= 35(P-2)(10-p)$

Total profit : $\frac{50}{9}(10-p)^2 + 35(P-2)(10-p)$

$\frac{d\pi}{dP} = \frac{100}{9}(10-p)(-1) + 35(10 - 2p - 0 + 2)$

$0 = -250 + 25p + 450 - 70p$

$250 - 25p = 450 - 70p$

$45p = 170$

$p^* = 3.8$

lump-sum fee $= (10 - 3.8)\left(\frac{10 - 3.8}{2}\right)$

$= 9.67$

14. $MR = MC$

Europe: $70 - 2Q_1 = 10$ $\qquad 30 = 70 - p$

$Q_1 = 30$ $\qquad p_1 = 40$

$\pi_1 = (40 - 10)(30) = 900$

US: $110 - 2Q = 10$ $\quad 50 = 110 - P$

$Q_2 = 50$ $\quad P_2 = 60$

$\pi_2$: $(60-10)50 = 2500$

Total $\pi$: 3400

14. $Q = Q_1 + Q_2$

$Q = 70 - P + 110 - P$

$Q = 180 - 2P \quad \therefore \quad P = 90 - 0.5Q$

$MR = MC \quad 90 - Q = 10 \quad \therefore Q = 80$

$P = 90 - 0.5(80) \quad \therefore P = 50$

$Q_1 = 70 - 50 = 20$

$Q_2 = 110 - 50 = 60$

Total $\pi = (50-10)20 + (50-10)60 = 3200$

20. $Q_1 = 750 - 4P_1 \quad \therefore P_1 = 187.5 - \frac{1}{4}Q_1 \quad \therefore MR_1 = 187.5 - \frac{1}{2}Q_1$

$Q_2 = 850 - 2P_2 \quad \therefore P_2 = 425 - \frac{1}{2}Q_2 \quad \therefore MR_2 = 425 - Q_2$

$MR_1 = MR_2 \quad \therefore 187.5 - \frac{1}{2}Q_1 = 425 - Q_2$

$Q_1 + Q_2 = 500$ $\quad Q_1 = 175$

$187.5 - \frac{1}{2}Q_1 = 425 - Q_2$ $\quad Q_2 = 325$

To find price, $P_1 = 187.5 - \frac{1}{4}(175) = 143.75$

$P_2 = 425 - \frac{1}{2}(325) = 262.5$

22a. Max profit no bundle = $P_A$ should be 800

$P_H$ should be 800

$\pi = (800-300) + (800-300) = 1000$

b. Max profit bundling = $P_{AH} = 900$

$\pi = 3(900-600) = 900$

c. Mixed bundling = $P_A = 800$

$P_H = 800$

$P_{AH} = 1000$

$\pi = (1000-300) + (800-300) + (800-300) = 1400$