ECON 4301A-Fall 2013
Mid-term Exam
October 18, 2013

Student Name : _____

Student Number : _____

Instructions

1. There are 6 questions for a total of 100 points
2. Read carefully before you provide your answers
3. Show all your work. Random guesses will receive NO credit
4. Budget your valuable time

Good Luck

Question 1 (15 points)

Assume an industry faces a total cost function of the form $TC(q) = 4 + 2q + q^2$.

a (9). Derive the marginal and average cost functions and calculate the scale-economies index at $q = 1$ and $q = 4$.

b (6). Calculate the level of output that corresponds to the minimum efficient scale.

Question 2 (20 points)

CineFL, a large multiplex movie theater, faces two different demand curves. The demand curve for seniors is $P_S = 5 - (1/30)Q_S$, while the demand curve for adults is $P_A = 10 - (1/10)Q_A$. CineFL faces constant marginal and average costs of \$1 and is the only movie theater in the small town of Cineville.

a (10). Find the profit-maximizing prices and quantities for CineFL under 3rd-degree price discrimination.

b (5). What would be the necessary condition for 3rd-degree price discrimination to increase total welfare relative to non-discriminatory pricing in Cineville?

c (5). Treating tickets for adults and seniors as two different markets, calculate the Lerner index in each of the two markets.

Question 3 (30 points)

The demand for JV3, an energy drink made by MonoP, is $P_C = 80 - Q_C$ in Canada, and $P_F = 60 - Q_F$ in France. MonoP faces constant marginal and average costs of \$20 and is a monopolist due to its secret formula for JV3.

a (15). Derive the monopolist's two-part pricing scheme under 1st-degree price discrimination in each of the two countries. The scheme consists of a fixed fee and a price per energy drink.

b (15). Derive the monopolist's block-pricing scheme under 1st-degree price discrimination in each of the two countries. The scheme allows the purchase of a specified number of energy drinks for a fixed fee.

Question 4 (10 points)

DelCon is considering selling its delicious ice-cream cones using stands along Hot Beach, which is 5 miles long. According to its estimates, there are 1,000 sunbathers evenly spread along the beach and each sunbather will buy one ice-cream cone provided its price plus any transportation cost does not exceed \$5. Each sunbather incurs a transportation (disutility) cost of leaving the comfort of her chair and umbrella to get a cone of 25 cents per 1/4 mile. Each cone costs \$0.50 to make and DelCon incurs a fixed cost of \$40 per day to run one of its stands.

Calculate the profit for DelCon when it operates 5 stands and serves all sunbathers.

Question 5 (10 points)

The table below shows the maximum rental per film that two theater chains, RCN and AMC, are willing to pay for two Top Production films: the blockbuster Chronicles of Saturn, and the less popular Red Planet.

Theater	Chronicles of Saturn	Red Planet	Bundle
RCN	\$800	\$250	\$1,050
AMC	\$700	\$300	\$1,000

a (5). Calculate the rental fee that Top Productions should charge for each of its films to RCN and AMC under 1st-degree price discrimination.

b (5). Assume now that Top Productions must charge the same rental fees to each theater. Using total revenues as your metric, show whether TopProductions is better off with individual pricing or with pure bundling of the two films.

Question 6 (15 points)

AnitC and SuperV are two monopolists producing cough-relief capsules and vitamin-C tablets, respectively. Those sick ones trying to recover from a cold view a cough-relief capsule and a vitamin-C tablet as perfect complements. As a result, they care about their combined price. Their maximum willingness to pay for the "magic duo", a cough-relief capsule and a vitamin-C tablet, is \$10. For your calculations below, assume that AntiC and SuperV incur no marginal costs for producing their capsules and tablets, respectively.

a (10). Calculate the equilibrium prices (P_C, P_T) for cough-relief capsules and vitamin-C tablets. Hint: AntiC faces a demand curve of the form $Q_C = 10 - (P_C + P_T)$ and SuperV faces a demand curve of the form $Q_T = 10 - (P_C + P_T)$.

b (5). Calculate the equilibrium number of capsules & tablets (Q_C, Q_T) and the profits (Π_C, Π_T).

Question 1: Answers

a. The average and marginal cost functions are

$$AC(q) = \frac{TC}{q} = \frac{4}{q} + 2 + q$$

$$MC(q) = \frac{dTC}{dq} = 2 + 2q$$

The scale-economies index at the assumed output levels is

$$q = 1: \ S(1) = \frac{AC(1)}{MC(1)} = \frac{7}{4}$$

$$q = 4: \ S(4) = \frac{AC(4)}{MC(4)} = \frac{7}{10}$$

b. The minimum efficient scale corresponds to the output level that minimizes AC—notice that AC is U-shaped—which we may calculate as follows

$$\frac{dATC}{dq} = 0 \Rightarrow -\frac{4}{q^2} + 1 = 0 \Rightarrow q_{mes} = 2$$

Question 2: Answers

a. In the case of 3rd-degree price-discrimination, the monopolist equates marginal revenue with marginal cost in each market

$$MR_A = MC \Rightarrow 10 - Q_A/5 = 1 \Rightarrow Q_A^* = 45 \Rightarrow P_A^* = 10 - Q_A^*/10 = \$5.5$$

$$MR_S = MC \Rightarrow 5 - Q_S/15 = 1 \Rightarrow Q_S^* = 60 \Rightarrow P_S^* = 5 - Q_S^*/30 = \$3$$

b. The necessary condition for 3rd-degree price discrimination to increase welfare relative to non-discriminatory pricing is an increase in total output.

c. The Lerner indices are as follows

$$L_A = (P_A^* - MC)/P_A^* = 4.5/5.5 = 0.82$$

$$L_s = (P_S^* - MC)/P_S^* = 2/3 = 0.67$$

Question 3: Answers

a. MonoP should charge a price equal to marginal cost in each market and a fixed fee equal to the consumer surplus implied by marginal-cost pricing

$$P_C^* = 20 \Rightarrow Q_C^* = 80 - 20 = 60 \Rightarrow CS(Q_C^*) = 0.5 \times 60^2 = \$1,800$$

$$P_F^* = 20 \Rightarrow Q_F^* = 60 - 20 = 40 \Rightarrow CS(Q_F^*) = 0.5 \times 40^2 = \$800$$

Therefore, MonoP should charge a per-unit price of \$20 in both markets, a fixed fee of \$1,800 in Canada, and a fixed fee of \$800 in France.

b. MonoP should set the quantity in each market equal to the quantity implied by marginal-cost pricing and charge a fixed fee equal to the willingness to pay (WTP) for the quantity bought with marginal-cost pricing. Therefore, we now have

$$Q_C^* = 60 \Rightarrow WTP(Q_C^*) = 80Q_C^* - Q_C^{*2}/2 = \$3,000$$

$$Q_F^* = 40 \Rightarrow WTP(Q_F^*) = 60Q_F^* - Q_F^{*2}/2 = \$1,600$$

Question 4: Answers

The maximum price that DelCon can charge with n stores while serving all sunbathers is

$$p = V - \frac{5t}{2n},$$

where V is the sunbathers' maximum willingness to pay for an ice-cream cone and t is the disutitlity (transportation) cost, which is equal to \$1 per mile. The implied profit is given by

$$\Pi(N, n) = N(V - \frac{5t}{2n} - c) - nF,$$

where c is the cost per cone and F is the fixed cost per stand. Using the assumed values, we obtain

$$p(5) = 5 - \frac{5 \times 1}{2 \times 5} = 5 - 0.5 = \$4.5$$

$$\Pi(1,000, 5) = 1,000(4.5 - 0.5) - 5 \times 40 = \$3,800$$

Question 5: Answers

a. If Top Productions were able to perfectly price discriminate, it should charge each theater the maximum rental fee that the theater is willing to pay. Its total revenue will then be

$$TR_{PD} = \$800 + \$700 + \$250 + \$300 = \$2,050.$$

b. Top Production can either charge \$700 for Chronicles of Saturn and \$250 for Red Planet with individual pricing, or bundle the two films together, and charge \$1,000 for both. The implied revenues with individual pricing and pure bundling are as follows

$$TR_{IND} = 2 \times 700 + 2 \times 250 = \$1,900$$

$$TR_B = 2 \times 1000 = \$2,000$$

Therefore, Top Productions is better off bundling the two films. Bundling essentially allows Top Productions to charge a price higher than \$700 to RCN for the Chronicles of Saturn and a price higher than \$250 to AMC for Red Planet.

Question 6: Answers

a. Since tablets and capsules are always consumed one-to-one, the monopolists face the following demand functions

$$Q_C = 10 - (P_C + P_T)$$

$$Q_T = 10 - (P_C + P_T)$$

The inverse demand curves are

$$P_C = (10 - P_T) - Q_C$$

$$P_T = (10 - P_C) - Q_T$$

The corresponding MR curves are

$$MR_C = (10 - P_T) - 2Q_C$$

$$MR_T = (10 - P_C) - 2Q_T$$

Profit maximization then implies

$$MR_C = MC \Rightarrow Q_C = \frac{10 - P_T}{2}$$

$$MR_T = MC \Rightarrow Q_T = \frac{10 - P_C}{2}$$

The implied optimal prices are

$$P_C = \frac{10 - P_T}{2}$$

$$P_T = \frac{10 - P_C}{2}$$

We find the equilibrium by solving the following system of linear equations

$$2P_C + P_T = 10$$

$$P_C + 2P_T = 10$$

Using $P_C = 10 - 2P_T$ from the 2nd equation and plugging in the 1st, we get

$$2(10 - 2P_T) + P_T = 10 \Rightarrow P_T^* = 10/3$$

$$P_C^* = 10 - 2P_T^* = 10/3$$

b. The implied equilibrium quantities Q_T^* and Q_C^* are

$$Q_T^* = \frac{10 - P_C^*}{2} = 10/3$$

$$Q_C^* = \frac{10 - P_T^*}{2} = 10/3$$

The implied equilibrium profit values Π_T^* and Π_C^* are

$$\Pi_T^* = P_T^* \times Q_T^* = \$100/9$$

$$\Pi_C^* = P_C^* \times Q_C^* = \$100/9$$