Instructions: You need paper (lined if possible), a ruler and a pen or a pencil to write this test. You may answer the questions in any order you like. You should start each question on a new page. You must write your answers; typed answers will not be accepted. When you are finished answering the questions, please order the pages so your answers to question 1 are first, and then your answers to question 2, etc. Then, in a single email message, send an image of each page to me at jburbidg@uwaterloo.ca. Please put Econ 393, your name and your id number in the subject line of your email. The deadline for submitting your answers is 6:00 pm Tuesday June 9th, Toronto time. The marks allocated to each question are shown in brackets.

1. (two marks for each part) Consider a world with two goods, 1, 2, many type As, and an equal number of type Bs. Assume the endowments of each A are (17, 3) and each B are (3, 7), and assume that the utility function for either an A or a B is $u(x_1, x_2) = x_1 x_2$.

(i) As carefully as you can, draw the Edgeworth rectangle for this exchange economy (put good 1 is on the horizontal axis). Draw the $A$ and $B$ indifference curves that pass through the endowment point, and the $A$ and $B$ offer curves. Label the endowment point $E$ and the competitive equilibrium $C$.

(ii) In a new diagram, redraw the Edgeworth rectangle to illustrate the equilibrium in which the Bs have a monopsony in the good they are buying. Assume the Bs do not have the power to practice price discrimination. Label the equilibrium $Y$ and label all the lines in your diagram.

(iii) In a third diagram, redraw the Edgeworth rectangle to illustrate the equilibrium in which the As have a monopoly in the good they are selling, and the As are able to practice perfect price discrimination. Label the equilibrium $Z$ and label all the lines in your diagram.

ANSWER

From work earlier in the course we know a lot about this example. In particular, the tangencies between $A$ and $B$ indifference curves lie along the diagonal of the Edgeworth rectangle. The answers are in the pictures towards the end of this pdf.
2. Suppose a “town” comprises people uniformly distributed along a line 36 miles long, with 100 people per mile. Travel costs are 1 dollar per person per mile. There is one bowling alley located at mile 12 and another located at mile 24. All customers are willing to pay up to 15 dollars for a night of bowling. The mile-24 bowling alley is a little newer — the marginal cost of caring for a customer while at that bowling alley is 2 dollars. The marginal cost of caring for a customer at the mile-12 bowling alley is 4 dollars. Ignore the fixed costs of each bowling alley — set them equal to zero.

(3 marks) (a) Assume the bowling alleys pay transport costs for their customers, and each bowling alley acts to maximize its profits. As carefully as you can, draw: (i) a graph of price against location; (ii) a graph of profit against location; and (iii) a graph of consumer’s surplus against location.

(3 marks) (b) Describe all the Pareto efficient allocations in this economy. Is the equilibrium in (b) Pareto efficient?

ANSWER

(a) See the graphs for Question 2 later in this pdf.

(b) One way to answer this question is to ask, if a central planner were running this economy, who would the CP have bowling? If the private equilibrium in (a) has the same people bowling then it’s Pareto efficient. For the consumer at mile 1, social benefit is 15 and social cost is 4 dollars at the mile 12 alley plus 11 dollars in transport costs. Anywhere to the left of this person, e.g., someone at mile 0.5 social marginal cost exceeds social marginal benefit. The central planner would not have them bowling. Doing the same kind of calculation for the person at mile 36 we see that social marginal benefit exceeds social marginal cost. So a central planner would have everyone bowling except the people between mile 0 and mile 1. This is exactly the people who are bowling in the equilibrium in (a) so the (a) equilibrium is Pareto efficient.

3. The Federation of Quebec Maple Syrup Producers is a government-sanctioned monopoly that regulates the production and marketing of maple syrup in Quebec. Let’s build a very simple model of maple syrup production and marketing. Suppose all producers are identical. Each has the capability to produce up to, but no more than, 10000 cans of syrup each year. For each producer marginal cost is constant at 4 dollars per can and average cost is 6 dollars per can when production is 10000 cans per year. Suppose the inverse market demand is

\[ p = 12 - \frac{Y}{1000000}, \]

where \( Y \) is the total number of cans sold in the market.

(3 marks) (i) As carefully as you can, draw the competitive equilibrium diagrams that correspond to Figure (i) in the web site file Assignment 1 pictures. In your “producer” picture make sure you label the axes, and marginal cost, and average cost. Show market demand, market supply, producers’ surplus and consumers’ surplus in your “market” picture.
(3 marks) (ii) Now draw the diagrams that correspond to Figure (ii) in Assignment 1 pictures — monopoly with no price discrimination. In this equilibrium assume the output for every producer, that is, the quota set by the Federation, is the same.

(2 marks) (iii) Does the individual producer have an incentive to exceed its quota and sell some cans outside the Federation? Defend your answer.

**ANSWER**

(i) In perfect competition with constant marginal cost, a producer either operates the plant at capacity (when \( p > MC \)) or shuts down (when \( p < MC \)). In this case price exceeds MC and equals the minimum of AC at 6 dollars per can in long-run equilibrium. There are 600 producers in the competitive equilibrium. See the graphs for Question 3 (i).

(ii) The Federation maximizes profits by choosing \( Y \) to make \( MC \) equal \( MR \). Here \( Y = 4000000 \) cans and price rises to 8 dollars per can. Each producer’s quota is \( 4000000/600 = 6666 2/3 \) cans.

(iii) In the monopoly equilibrium with the Federation the individual producer is looking at a market price of 8 dollars per can and a marginal cost of 4 dollars per can. There is a strong incentive to produce some more cans of maple syrup and sell them privately. But, of course, if all producers do this the Federation’s monopoly power is weakened and we move back towards the competitive equilibrium. There is a long history of instability in cartels — e.g. OPEC.

4. True, false and explain (2 marks each).

(i) A profit-maximizing monopolist will pass an increase in the profits tax rate onto consumers in higher prices.

(ii) Mergers always reduce consumers’ surplus.

**ANSWER**

(i) False. So long as after-tax profits are a strictly increasing function of pre-tax profits, whatever price-output combination maximizes profits before the tax increase will also maximize profits after the tax increase. If firms are maximizing profits, price should not change with an increase in the profits tax rate.

(ii) False. Vertical mergers may increase consumers’ surplus. See the Loblaw-Nestle example in Assignment 4.
Edgeworth rectangle for 1(i)

A's ind. curve is orange
B's ind. curve is purple
A's offer curve is the green curve
B's offer curve is the blue curve

x2 for A

x1 for A
Edgeworth rectangle for 1(ii)

A's ind. curves are orange
B's ind. curves are purple
A's offer curve is the green curve
Edgeworth rectangle for 1(iii)

A's ind. curves are orange
B's ind. curves are purple
Question 3 (i)
Question 3 (ii)