LISBON SCHOOL OF ECONOMICS & MANAGEMENT
UNIVERSIDADE DE LISBOA

Microeconomia II

Licenciatura in Economics

4th of June 2020

Regular Exam

Part A — 20 minutes (7.5 marks)

You get 0.75 marks for each right answer and a 0.75/3 (0.25) deduction for each wrong answer. If you want to leave a question unanswered, don't check any answer or (say, if you have already checked one) check "I do not wish to answer this question."

1. A monopolist engages in perfect price discrimination and sells to a market with inverse demand curve p = 15 – 0.5y. When it sells y = 10, marginal revenue is:
   a) Zero.
   b) 5.
   c) 10.
   d) -5.
   e) I do not wish to answer this question.

2. A monopolist sells to two markets with inverse demand curves p1 = 10 – y1 and p2 = 20 – y2, and it can charge a different price in each market. Presently it sells y1 = 4 and y2 = 8. The monopolist has zero marginal costs but cannot increase output. Is the monopolist able to increase profit?
   a) Yes, by selling more in market 1 and less in market 2.
   b) Yes, by selling more in market 2 and less in market 1.
   c) No, current quantities maximise profit already.
   d) The information is insufficient to answer.

3. In a Stackelberg duopoly which firm or firms maximise profit given the other firm's output?
   a) The leader and the follower.
   b) None.
   c) The leader only.
   d) The follower only.

4. Imagine a game with two players. If the game is simultaneous, A1 is a dominant strategy for player A. Then, if the game is sequential, it is necessarily in player A's best interest to play A1:
   a) Only if A plays first.
   b) Both if A plays first or last.
   c) Only if A plays last.
   d) It may not be in A's best interest to play A1 regardless of whether A plays first or last.

5. The Bertrand model can be characterized as a:
   a) Sequential game where firms choose prices.
   b) Simultaneous game where firms choose quantities.
   c) Sequential game where firms choose quantities.
   d) None of the other options is correct.

6. In which of the following situations are players in a prisoner's dilemma more likely to reach a cooperative solution?
   a) The cooperative solution is impossible in any of the other answers.
   b) The game is repeated an unknown number of times.
   c) The game is repeated a finite and known number of times.
   d) The game is played only once.

7. An individual maximises expected utility and has utility from wealth given by the function $u(w) = w^{0.5}$. Does he prefers a certain wealth of 100 or an uncertain wealth, a lottery, where he can get 25 or 225 each with probability 50%?
   a) He prefers a certain 100.
   b) He prefers 25 or 225 with probability 50% each.
   c) He is indifferent between the two options.
   d) The information is insufficient to answer.

8. Which of the following best illustrates moral hazard?
   a) An individual engages in behaviour that increases the probability of loss after having bough insurance against that same loss.
   b) An individual bought a used car not knowing whether it is good or bad.
   c) An individual bought a used car and found out afterwards that the car is worth less than what he had paid for it.
   d) Owners of good used cars cannot sell them at a fair price because buyers cannot tell a good car from a bad one before the purchase.

9. Which of the following best meets the conditions of the Coase theorem for a Pareto efficient outcome?
   a) Excessive fishing in Portuguese coastal waters.
   b) A noisy bar reduces a neighbouring hotel's profit.
   c) A pig farm pollutes a river, increasing the cost of clean water for farmers downstream.
   d) Several pig farms pollute a river, increasing the cost of clean water to a brewer downstream.

10. An unregulated, perfectly competitive market is in equilibrium at a price of 19. In this equilibrium there is a marginal external cost of 8. The Pareto-efficient quantity is such that the firm's marginal private cost is 16, and consumers' willingness to pay is 20. The appropriate Pigouvian tax (per unit) is:
    a) 16.
    b) 8.
    c) 4.
    d) The information is insufficient to answer.

Part B — 35 minutes (7.5 marks)

Each question in Part B is independent from the others and carries 2.5 marks. Do not use mathematical symbols in your answers. For instance, to indicate firm 1's profit, write Profit1 = x.

1. It is often said that the long-run monopolistically competitive equilibrium is Pareto inefficient. Carefully discuss this assertion.

2. In a duopolistic market the inverse demand curve is p(Y) below, and the firms have the cost functions c1(y1) and c2(y2) below as well. The two firms agree to maximise the sum of their profits. Indicate and explain in economic terms the conditions for the maximization of the sum of the profits. Find the price and the quantities each firm should produce to maximise the sum of the profits. Give the final values a clearly describe the steps you follow to arrive at them (you do not have to show all your calculations).

   $p(Y) = 50 – 0.5Y$; $c_1(y_1) = 0.2y_1^2$; $c_2(y_2) = 10y_2$

3. An individual maximises expected utility and will incur a loss with 4% probability. An insurer offers to insure any amount at a fair price. What amount will the individual want to insure depending on his attitude towards risk? Carefully explain.

Part C — 25 minutes (5 marks)

Each question in Part C is independent from the other and carries 2.5 marks. Do not use mathematical symbols in your answers. For instance, to indicate firm 1's profit, write Profit1 = x.

1. In a small island there are a few thousand individuals, all of them maximise expected utility and are risk averse. All of them can incur a loss of X euros with some probability. This probability varies from person to person. There is an insurer willing to sell insurance charging an insurance premium that just covers the expected payments to the insured. Each person knows their own probability of loss, but the insurer does not. Qualitatively describe the equilibria that are possible in this market, and carefully explain whether they are Pareto efficient.

2. Four neighbours risk having their houses robbed. It is possible to hire a security guard at €20 an hour. As there is a single access to the four houses, when a security guard is there all houses are protected, so the security guard is a public good. The individual demand curves Qi(p) are given below, where Qi is the number of hours neighbour i is willing to hire if out of his own pocket at price p (in euros). Find the Pareto efficient number of hours. Describe the necessary mathematical operations, but you do not have to show the calculations; with one exception: write the mathematical condition for Pareto efficiency and explain it in the present case, namely explain why that condition is necessary for Pareto efficiency. Also explain whether there can be obstacles to reaching a Pareto efficient outcome.

   $Q_1(p) = 60 - 2p$; $Q_2(p) = 40 - 2p$; $Q_3(p) = 15 - p$; $Q_4(p) = 15 - p$;

Answers to Part A

1	2	3	4	5	6	7	8	9	10
c	b	d	c	d	b	c	a	b	c

Note on Q4: The player that plays last will always play the dominant strategy if he has one, because it is the best response to any of the first player's moves. But the first player, even if he has a strategy that is dominant in a simultaneous game, may not want to play it when he plays first, because the another strategy may "force" the second player to play in way that is more advantageous to the first player. That's what the Stackelberg leader does. See also examples of this in class slides.

Note on Q10: The Pigouvian tax is the marginal external cost at the Pareto-efficient quantity, which is 4 (remember, at the Pareto-efficient quantity, marginal social benefit, just the consumers' WTP in this case, equals marginal social cost = marginal private cost + marginal external cost), not the marginal external cost at the unregulated equilibrium.

Answers to Part B

1. In a monopolistically competitive market there is free entry, so profits are zero in the long-run equilibrium. This means the demand curve directed at the firm must be tangent to the long-run average cost curve (AC): if it were underneath for all quantities, the price would be lower than AC, and the firm would incur a loss; if it were above for some quantity the firm could charge a price above AC and make a profit. As the firm sells a differentiated product, it faces a downward-sloping demand curve, and if this is tangent to the AC curve, then the AC curve is also downward sloping, which means the firm is not minimising AC: the firm is producing less than the minimum efficient scale. This means the industry could produce the same quantity at a lower AC, if there were fewer firms, each producing more. This is the argument for inefficiency. (It follows from the previous argument too that marginal cost is lower than AC, so lower than the price, therefore the equilibrium is inefficient). However if there were fewer firms there would be less product variety, and if consumers value variety it is not clear if they would be better off with lower prices and less variety.

2. Profit maximisation requires that production be allocated to firms such that marginal costs be the same: otherwise it would be possible to produce the same total quantity at a lower cost (hence at a higher profit) just by producing more at the low marginal cost firm and less at the high marginal cost firm. Additionally the marginal costs must be equal to the two firms' combined marginal revenue, for the usual reason. $MC2 = 10$, so $MR = MC1 = MC2 = 10$. $MC1 = 0.4y1 = 10 \Leftrightarrow y1 = 25$. Combined revenue: $r = pY = (50 – 0.5Y)Y$. Therefore $MR = 50 – Y = 10 \Leftrightarrow Y = 40$. $y2 = Y – y1 = 15$. From the inverse demand curve, $p = 30$.

3. With fair insurance, the insurance premium equals 0.04K, where K is the capital insured. Then, with initial wealth W and potential loss X, expected wealth is:

   $0.04(W0 – X – 0.04K + K) + 0.96(W0 - 0.04K) = W0 – 0.04X + 0.04 \times 0.96K – 0.96 \times 0.04K = W0 – 0.04X$

   That is, expected wealth is the same regardless of K. Intuitively what happens is the insured pays 0.04K to the insurer, and is paid by the insurer zero with probability 96% and K with probability 4%. So the expected compensation the insured gets from the insurer equals the insurance premium, so expected wealth is the same. Then a risk-averse person, as all options have the same expected wealth, will prefer the lowest risk possibly, which means full insurance, or $K = X$, and wealth $W0 – 0.04K$ with certainty (with $K < X$, the insured would face a lottery, with more wealth if the loss did not occur and less wealth if the loss occurred, but the same expected wealth).

   It is the opposite for a risk lover: all options have the same expected wealth, so he prefer as much risk as possible, which means no insurance. A risk neutral agent cares only about expected wealth, so he would be equally happy with insuring the full loss, nothing, or any amount in between.

Answers to Part C

1. This is a situation prone to adverse selection. The insurer does not know individual probabilities, so it can only charge an insurance premium based on the average probability of loss to everyone. But then low-risk people may prefer not to buy insurance (this is adverse selection — only the high-risk people buy insurance). This means the insurer will have to charge an even higher premium, a so more people (say, the average-risk people) may decide not to insure. It is possible that only very high-risk people will buy insurance, which will then have to be very expensive. This is Pareto inefficient: both insurer and low-risk people would benefit from an insurance policy based those low-risk people probability of loss; but as the insurer cannot identify them, it will not offer such policies; so potentially mutually advantageous transactions will not take place. There is the possibility however that people are so risk averse that even low-risk people will be willing to buy full insurance at the "average-risk" insurance premium, and so no adverse selection will happen.

2. The inverse demand curves are: $p1 = 30 – 0.5Y$, $p2 = 20 – 0.5Y$; $p3 = p4 = 15 – Y$. As surveillance is a public good, meaning that each unit is enjoyed by all neighbours, it is Pareto efficient to provide hours of surveillance up to the point where the aggregate marginal willingness to pay for an hour (vertical sum of the inverse demand curves) AggWTP = = p1 + p2 + p3 + p4 = 80 – 3Y = 20 = marginal cost. If AggWTP < 20, the four neighbours could get an extra hour, each paying less than the maximum they were willing to pay. Therefore Pareto efficiency requires AggWTP = 20: $80 – 3Y =20 \Leftrightarrow Y = 20$. (This, however, would make sense only if there were negative WTP, as $p3 = p4 = -5$ for $Y = 20$; so if there are no negative WTP, the relevant branch of the aggregate inverse demand curve would be $p1 + p2 = 50 – Y = 20 \Leftrightarrow Y = 30$.) In general, private provision of a public good is not Pareto efficient because of free riding: each individual contributing too little or nothing at all and simply enjoying whatever quantity of the good the other provide. In this case however even if individuals 2, 3 and 4 paid nothing, individual 1 would be willing to pay for 20 unit by himself (free riding would be a problem only for the true Pareto efficient quantity Y= 30).