THE LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE

Summer 2016 examination

EC202
Microeconomic Principles 2

Suitable for all candidates

Instructions to candidates

This paper contains six short questions worth 8 marks each (Section A) and six long questions each worth 20 marks (Section B and Section C). Answer five short questions from Section A, and three long questions, at least one question from Section B and at least one question from Section C.

Time Allowed -	**Reading Time:**	*15 minutes*
	Writing Time:	*3 hours*
You are supplied with:		*No additional materials.*
You may also use:		*No additional materials.*
Calculators:		*Calculators are not allowed in this examination*

Section A

Answer **FIVE** of questions 1-6. Each question carries 8 marks

1. A competitive firm produces a single output from three inputs; production is given by $q \leq [z_1 z_2 z_3]^{\frac{1}{3}}$ where q is the quantity of output and z_1, z_2, z_3 are quantities of the inputs.

   (a) If the input prices are given by w_1, w_2, w_3 show that the cost function is $3q\,[w_1 w_2 w_3]^{\frac{1}{3}}$. [3 marks]

   (b) Sketch the (long-run) MC and AC curves. [2 marks]

   (c) Input 3 is fixed in the short run. Using the diagram from part (b) explain what the short-run MC and AC must look like. [3 marks]

2.

   (a) In economy A goods 1 and 2 can be produced using a single good 3 as an input according to the following constraint

   $$a_{13}q_1 + a_{23}q_2 \leq R_3$$

   where a_{13}, a_{23} are positive constants, q_1, q_2 are the outputs of the two goods and R_3 is the given resource stock of good 3. Draw the production possibility set for goods 1 and 2 in economy A. [2 marks]

   (b) In economy B production of goods 1 and 2 requires the use of goods 3,4 and 5 as inputs according to the following three constraints (which must all hold):

   $$a_{1j}q_1 + a_{2j}q_2 \leq R_j,\ j = 3, 4, 5,$$

   where a_{1j}, a_{2j} are positive constants and R_j is the given resource stock of good j. Draw the production possibility set for goods 1 and 2 in economy B: explain why it must be convex. [3 marks]

   (c) Explain what would happen to the production sets of economy A and economy B if additional stocks of good 3 became available.[3 marks]

3. A person has the utility function $U(x_1, x_2) = 2\sqrt{x_1} + x_2$. Write the price of good 1 as p, assume that the price of good 2 is fixed at 1 and assume the income y is sufficiently high to ensure that positive amounts of both goods are bought.

   (a) If the initial value of p is also 1 show that the compensating variation of a price rise Δp is $-\Delta p\,[1 + \Delta p]^{-1}$. [4 marks]

   (b) Again assume that p initially has the value 1. The government now imposes a tax t on good 1 in order to raise revenue. Show that the loss to a consumer exceeds the revenue raised by the government by an amount $t^2\,[1 + t]^{-2}$. [4 marks]

4. Construct a simultaneous-move game with two players and two actions for each player that has two Nash equilibria in pure strategies and no Nash equilibrium in mixed strategies.

5. Consider the following stage game:

$1\backslash 2$	L	R
U	$2, 3$	$0, 1$
D	$1, 0$	$5, 4$

   What is the set of *feasible and individually rational payoffs* associated with the infinitely repeated game with the above stage game?

6. A friend wants to buy a special pen for her father's birthday, the "16 K." Even though the list price in the collector's manual is only £250, she is willing to pay £500 for it.

   She finds the pen on a new website in which people post descriptions of the items that they would like to buy and how much they are willing to pay for them. However, she is aware that some sellers might try and fool her by sending the "12 K" instead of the "16 K" and she values the "12 K" at only £100. Genuine sellers would meet her offer so long as it was at least as high as the list price in the collector's manual, whereas fraudulent sellers would send her the "12 K" version if she posted any price greater than £100.

   From speaking to friends, she estimates that out of all potential sellers 25% are genuine sellers and the remainder fraudulent. She determines therefore to post a price of £200(=0.75*100+0.25*500).

(a) She told you about this, and you suggest that she is better off not posting to this site. Why? [2 marks]

(b) Suppose that the proportion of potential sellers who are genuine is x. What is the smallest value of x at which your friend should post an offer at the site? At what price? [3 marks]

(c) Suppose that the proportion of potential sellers who are genuine is 75%. At what price should she post an offer to the site? [3 marks]

Section B

Answer at least **ONE** and no more than **TWO** questions.

7. A person lives for $T+1$ years and consumes a quantity x_{it} of good i in period t, where $i = 1, 2, ..., n$ and $t = 0, 1, ..., T$.

   (a) His utility is given by

   $$\sum_{t=0}^{T} \sum_{i=1}^{n} \alpha_i \beta_t \log (x_{it} - \gamma_{it})$$

   where the $\alpha_i, \beta_t, \gamma_{it}$ are non-negative parameters such that $\sum_{i=1}^{n} \alpha_i = \sum_{t=0}^{T} \beta_t = 1$ and $\beta_t / \beta_{t-1} = \delta, t = 1, ..., T$, where $0 < \delta < 1$.

   i. Sketch the indifference curves for goods i and j at a given time t; interpret the slope. [1 mark]

   ii. Interpret the parameters γ_{it}. [1 mark]

   iii. Sketch the indifference curves for good i consumed in period t and the same good i consumed in period $t-1$; interpret the slope. [1 mark]

   (b) The person receives an exogenous income y_t in period t; the price p_{it} of good i in period t is known in advance; it is also known that there is a per-period interest rate r that is constant through time. If there are no other restrictions on borrowing and lending what is the person's lifetime budget constraint? [4 marks]

   (c) Find the quantities x_{it}^* that maximise the utility function in part (a) subject to the lifetime budget constraint in part (b). [5 marks]

   (d) Find the effect of an increase in the price p_{it} on the demand for good $j \neq i$ at time $t' \neq t$. Interpret your answer. [4 marks]

   (e) Suppose that for commodity i the parameter γ_{it} is the same for all t. If p_{it} is known to be the same for all t will the optimal consumption of good i be the same for all t? Explain your answer. [4 marks]

8. In a two-commodity exchange economy there are two types of people. People of type a own all of commodity 1 (100 units per person) and people of type b own all of commodity 2 (200 units per person). Let x_i^h denote the consumption of good i by a person in group h, $i = 1, 2$, $h = a, b$.

   (a) Assume that preferences of type a are given by $\log x_1^a + \log x_2^a$. Show that in a competitive market each person's demand for the two commodities will be $\mathbf{x}^a = (50, 50p_1/p_2)$. Find the offer curve for a person of type a. [5 marks]

   (b) Assume that preferences of a type-b person are given by $3 \log x_1^b + \log x_2^b$. Find a type-$b$ person's demand for the two goods and the offer curve. If there are equal numbers of people of each type use the result from part (a) to find the competitive-equilibrium price and allocation. [5 marks]

   (c) Repeat part (b) for the case where type-b preferences are $3x_1^b + x_2^b$. [5 marks]

   (d) Repeat part (b) for the case where type-b preferences are $\min\left\{x_1^b, x_2^b\right\}$. [5 marks]

9. Anne has an initial stock of wealth W and risks losing some of this wealth through fire. The probability of such a fire is known to be π and the loss if the fire occurs would be L (where $L < W$). Insurance cover against a fire is available at a premium κ, where $\kappa > \pi L$; it is also possible to take out partial cover on a pro-rata basis, so that an amount tL of the loss can be covered at cost $t\kappa$ where $0 < t < 1$.

   (a) Draw and explain a diagram that depicts Anne's budget set. [4 marks]

   (b) Anne's preferences under uncertainty are given by a standard von Neumann-Morgenstern utility function. Explain why Anne will not choose full insurance, even if she is risk averse. [5 marks]

   (c) Assuming that she is risk averse, find the conditions that will determine Anne's optimal value of t. [6 marks]

   (d) Beth's wealth is greater than Anne's, but she faces the same possible loss through fire L with the same probability π; she can get insurance cover on exactly the same terms as Anne. Beth has the same preferences as Anne and these preferences exhibit decreasing absolute risk aversion. Use your answer to part (c) to show that the insurance cover Beth chooses is less than that chosen by Anne. [5 marks]

Section C

Answer at least **ONE** and no more than **TWO** questions.

10. Suppose that the inverse market demand is given by $P = 100 - (q_i + q_e)$, where P is the market price, q_i is the output of the incumbent firm and q_e is the output of a potential entrant to the market. The incumbent firm's total cost function is $C(q_i) = 40q_i$, whereas the cost function of the entrant is $C(q_e) = K + 40q_e$, where K is a sunk cost incurred to enter the market. The incumbent chooses q_i units of output, the entrant observes it and expects this output level to be maintained.

    (a) Represent the competition described above as an extensive form game. What are the strategies of the two firms? [4 marks]

    (b) Compute the best response for the entrant. [4 marks]

    (c) Suppose that $K = 100$. How much output would the incumbent firm have to produce to just keep the entrant out of the market? What is the price at that output level? [4 marks]

    (d) Find the minimal K^* such that for any $K \leq K^*$ the incumbent prefers the entrant to enter the market. [8 marks]

11. Consider the following normal form game:

$1\backslash 2$	L	C	R
T	$1,1$	$0,0$	$1,0$
M	$0,7$	$5,5$	$2,1$
B	$0,0$	$7,0$	$3,3$

(a) Identify the *set of pure strategy Nash equilibria* of this game. [4 marks]

(b) Identify the *mixed strategy Nash equilibria* of this game. [4 marks]

(c) Assume now that this game is played in three consecutive periods. The two players have the same discount factor δ. The average discounted payoff of the players is:

$$\Pi_i = \frac{1}{1+\delta+\delta^2}\left[g_i(a_i^1, a_{-i}^1) + \delta g_i(a_i^2, a_{-i}^2) + \delta^2 g_i(a_i^3, a_{-i}^3)\right] \quad (1)$$

where $g_i(a_i^t, a_{-i}^t)$ is the stage game payoff of player i if the strategy profile chosen by both players in period $t \in \{1,2,3\}$ is (a_i^t, a_{-i}^t): $a_1^t \in \{T, M, B\}$ and $a_2^t \in \{L, C, R\}$.

Construct strategies for the three-period repeated game that support the payoff $(3,3)$ in each period of the game as a *Subgame Perfect Equilibrium*. For what values of the discount factor δ are these strategies subgame perfect? [6 marks]

(d) Construct strategies for the three-period repeated game that support the payoff $(5,5)$ in periods $t=1$ and $t=2$, and the payoff $(3,3)$ in period $t=3$ for both players as a *Subgame Perfect Equilibrium*. For what values of the discount factor δ are these strategies subgame perfect? [6 marks]

12. A worker's type is $t \in \{0, 1\}$. The probability that any worker is of type $t = 1$ equals $2/3$, while the probability that $t = 0$ equals $1/3$. The productivity of a worker in a job is $(t + 1)^2$. Each worker chooses a level of education $e \geq 0$. The total cost of obtaining education level e is $C(e|t) = e^2(2 - t)$. The worker's wage is equal to his expected productivity.

    (a) Characterise all pooling perfect Bayesian equilibrium in which both types of workers choose a strictly positive education level. [8 marks]

    (b) Find all separating perfect Bayesian equilibria. [8 marks]

    (c) Which separating equilibrium survives the intuitive criterion? Is it the one with the lowest education level? [4 marks]