

ECT1
ECONOMICS TRIPOS PART 1

Thursday 10 June 2021

11.00am – 2.30pm + 30 minutes upload

Paper 1

MICROECONOMICS

Answer **ALL SIX** questions from Section A and **TWO** questions from Section B.

Section A and B will each carry 50% of the total marks for this paper.

Each question carries equal weight.

Write your **Blind Grade Number** (not your name) on your answers.

Candidates are asked to note that there may be a reduction in marks for scripts with illegible handwriting.

Please note that there is no mechanism available to raise a query during the assessment. If you have queries regarding your assessment or the question paper, you should continue to the best of your ability and raise these with your College Tutor after the assessment.

Submitting your assignment to Moodle

You must submit your answers within the assessment window by uploading **one single** PDF file to Moodle. This file must include the completed cover sheet and **all** your typed and hand-written pages with your answer.

Assessment window

You have **3 hours and 30 minutes** to complete the exam + 30 minutes to upload your answers.

SECTION A

1. For the following utility functions determine whether the corresponding preferences are i) monotonic, ii) strictly convex. Explain your answer.
 - (a) $u_1(x, y) = \min\{x, 2y\}$, $x, y \geq 0$;
 - (b) $u_2(x, y) = \min\{x, 2y\} + \max\{x, 2y\}$, $x, y \geq 0$.
2. Suppose Bob has £100 that he can spend to buy sweets from shops A and B . Shop A charges an entrance fee of £10; and sells chocolate candies and ice-cream at prices of £5 and £10 per kilogram, respectively. Shop B charges an entrance fee of £20; and sells chocolate candies and ice-cream (identical to the ones sold by shop A) at prices of £10 and £5 per kilogram. Plotting the weight of chocolate candies on the horizontal axis, and weight of ice-cream on the vertical axis, draw Bob's budget set.
3. Consider a monopolist with a cost function $c(q) = 0.5q^2$, who faces an inverse demand $p(q) = 100 - q$. Suppose the government forces the monopolist to produce at least $q^* = 60$ units, otherwise it will not allow the monopolist to operate.
 - (a) Find the price p that the monopolist will choose.
 - (b) Find the size of the deadweight loss as compared to the efficient level of production.

4. Are the following statements true, false or uncertain? Explain your answer.
- (a) In a pure exchange economy, price levels are determined in a general equilibrium system.
 - (b) In a pure exchange economy, Walras' law states that the value of aggregate excess demand is zero for any prices.

5. Agent A has 3 units of cheese and 2 units of wine. Agent B has 1 unit of cheese and 6 units of wine. A and B have identical utility functions. The utility of agent i is:

$$u_i(x_c^i, x_w^i) = x_c^i x_w^i,$$

where $i \in \{A, B\}$, and x_c^i and x_w^i are person i 's consumption of cheese and wine respectively.

- (a) Draw the Edgeworth box illustrating the initial endowments and indifference curves of both agents.
 - (b) Find an expression for the MRS of each agent and hence find the equation of the contract curve. Draw the contract curve on the Edgeworth box.
 - (c) Find the equilibrium price ratio and equilibrium allocation (final consumptions). Mark the competitive equilibrium allocation on the Edgeworth box.
6. Consider an exchange economy consisting of two persons living in a household, A and B . There are two goods, consumption (x) and leisure (y). Let x_i and y_i be the amounts of good x and y consumed by individual $i = A, B$. The household pools consumption together, so each person values the total consumption of the household and his/her own leisure. A has utility function $u_A(x_A, y_A, x_B) = x_A + x_B + \ln(y_A)$ and B has utility function $u_B(x_B, y_B, x_A) = x_A + x_B + \sqrt{y_B}$. The endowments are $(e_A^x, e_A^y) = (6, 1)$ and $(e_B^x, e_B^y) = (2, 0)$. Set the price of x equal to 1 and denote by p the price of good y .
- (a) Solve for the competitive equilibrium price p and the equilibrium allocation.
 - (b) Show all the Pareto efficient allocations.
 - (c) Is the competitive equilibrium allocation derived in (a) Pareto efficient or not? Explain why.

SECTION B

7. Jane has inherited a box with $w_1 = 6$ kg of tea and $w_2 = 1$ kg of coffee. She has no other source of income. Her utility of consuming x kg of tea and y kg of coffee is $u(x, y) = xy$.
- (a) Assume that the price of tea is £1 per kg, and the price of coffee is $p_0 = £4$ per kg. Jane can trade tea and coffee at these prices. Find Jane's optimal consumption, and utility u_0 after trading.
 - (b) Assume that the Supreme Leader of Jane's country changes the price of coffee, and that Jane has to trade her initial endowment given the new price. Among all possible prices of coffee, find the price p_1 that minimizes Jane's utility after trading.
 - (c) Given the new price p_1 , find how much additional income Jane needs to be given, so that after trading she reaches her old level of utility, u_0 .
 - (d) Now assume that the Supreme Leader has instead increased the price of coffee to $p_2 > p_0$, such that when Jane optimally trades her initial endowment given price p_2 , she reaches her old level of utility, u_0 . Find p_2 .
8. Suppose that a firm has production technology

$$f(K, L) = \sqrt{KL}$$

- (a) Assume that prices on K, L equal $r = 2, w = 1$, respectively. Derive the firm's cost function, $c(q)$.
- (b) Now assume that the firm cannot buy capital from outside. Instead, the firm can produce capital using labour, with production technology $K(L) = \sqrt{L}$. That is, when the firm hires labour, it uses part of it to produce capital, and then uses this capital with the rest of labour to produce the final good. Derive firm's cost function $c(q)$ of producing the final good.
- (c) Now assume that the firm can both buy capital as in part (a), and produce it as in part (b). Derive firm's cost function $c(q)$.

9. Consider a monopolist with a cost function $c(q) = q^2$, who faces two markets A and B , with inverse demand functions $p_A(q_A) = 10 - q_A$ and $p_B(q_B) = 13 - 2q_B$, respectively.
- Assume that the monopolist has to charge the same price on both markets. Find the profit-maximizing choice of price.
 - Assume that the monopolist can engage in third-degree price discrimination. Find the profit-maximizing choices of prices in both markets.
 - Now assume that the government imposes a tax t per unit of sale on market A . Find the value of t , such that the monopolist who engages in third-degree price discrimination, will serve both markets and will charge the same price.
10. Are the following statements true, false or uncertain? Explain your answer.
- If preferences are quasilinear, the efficient amount of a consumption externality will be independent of the assignment of property rights.
 - In an economy with production and no externalities, Pareto efficiency requires that each individual's marginal rate of substitution be equal to the marginal rate of transformation.
 - Every Pareto efficient allocation can be achieved as a competitive equilibrium.
11. An airport is located next to a large tract of land owned by a housing developer. The developer would like to build houses on this land, but noise from the airport reduces the value of the land, and, respectively, it reduces the profit of the developer. Let X be the number of planes that fly per day and let Y be the number of houses that the developer builds. The airport's total profits are $48X - X^2$, and the developer's total profits are $60Y - Y^2 - XY$. Let us consider the outcome under various assumptions about institutional rules and about bargaining between the airport and the developer.
- Suppose that no bargains can be struck between the airport and the developer, and that each can decide on its own level of activity. Find the number of planes per day that maximizes profits for the airport and the number of houses that maximizes the developer's profits.
 - Suppose that a law is passed that makes the airport liable for all damages to the developer's property values. Find the airplane traffic per day that the airport will choose and the number of houses that the developer will choose to build.
 - Suppose that the housing developer purchases the airport. Find the airplane traffic and the number of houses as chosen optimally by the developer.
 - Which institution rule(s) proposed above fail(s) to achieve an efficient outcome? Explain.

12. Consider the Ricardian trade model where there are two countries (country A and country B), two output goods (wine and cheese) and one input (labour). Suppose that A has an absolute advantage in both goods and a comparative advantage in cheese. In each country, there are two sectors. One sector produces wine and the other sector produces cheese. Each sector uses constant returns to scale production functions with labour as the only input. In A the labour requirement is $\frac{1}{\alpha_A^w}$ for one unit of wine and $\frac{1}{\alpha_A^c}$ for one unit of cheese. The corresponding quantities in B are $\frac{1}{\alpha_B^w}$ and $\frac{1}{\alpha_B^c}$.
- (a) Suppose that trade is not allowed. P_c and P_w denote the prices of cheese and wine in country A , respectively. In what range of prices will both goods will be produced in country A ? Show the derivation.
 - (b) Suppose that trade is allowed. p_c and p_w denote the prices of cheese and wine in the world market, respectively.
 - i. In what range of prices will country A specialize in cheese production and country B specialize in wine production? Show the derivation.
 - ii. In what range of prices will country A be producing both cheese and wine and country B specialize in wine production? Show the derivation.
 - iii. In what range of prices will wine not be produced in either of the two countries? Show the derivation.
 - (c) Which country has a higher wage in equilibrium? Explain your answer.
 - (d) An international labour union claims that there should be one common wage in both countries and sectors. For instance, assume that the wage rate must be fixed at a level such that profit in the cheese sector in country A is zero. Is this compatible with a competitive equilibrium? Explain your answer.

END OF PAPER