

ECT1
ECONOMICS TRIPOS PART I

Thursday 7 June 2018

9:00-12:00

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 within each section will carry equal weight.

Write your **candidate number** (not your name) on the cover of each booklet.

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

If you identify an error in this paper, please alert the **Invigilator**, who will notify the **Examiner**. A **general** announcement will be made if the error is validated.

STATIONERY REQUIREMENTS

20 Page booklet x 1

Rough work pads

Tags

SPECIAL REQUIREMENTS TO BE SUPPLIED FOR THIS EXAMINATION

Calculator - students are permitted to bring an approved calculator

You may not start to read the questions printed on the subsequent pages of this question paper until instructed that you may do so by the Invigilator.

SECTION A

1. Explain carefully the relationship between a firm's long-run average cost curve and its short-run average cost curves.
2. Consider a consumer with increasing preferences over consumption streams in two periods $i = 1, 2$. His income in period i is positive. He can borrow or save at the same interest rate. At the initial interest rate, the consumer saves in period 1. Then, the interest rate goes down.
 - (a) If the consumer remains a saver after the interest rate falls, is he better off or worse off? Explain briefly.
 - (b) After the fall in the interest rate, is it possible that he increases his consumption in period 2? Explain whether your answer depends on whether consumption in period 1 and in period 2 are normal or inferior goods.
3. A consumer compares bundles (x_1, x_2) with respect to their distance from $(2, 5)$ on the $\mathbb{R}_{\geq 0}^2$ plane. Given any two alternatives $a = (a_1, a_2)$ and $b = (b_1, b_2)$ in $\mathbb{R}_{\geq 0}^2$, she prefers the one further away from the point $(2, 5)$. If a and b are equidistant from $(2, 5)$, then she is indifferent between a and b .

Answer the following questions and explain your answer briefly in each case.

- (a) Are her preferences increasing or not?
 - (b) Are her preferences convex or not?
 - (c) Does she have rational preferences or not?
 - (d) Can we call her a utility maximiser or not?
4. 'In a pure exchange economy with two agents, A and B , and two goods, x and y , if A is able to make a take-it-or-leave-it offer to B it makes no difference if the offer is an allocation or a pair of prices at which B can trade; the final allocation will be the same in both cases, and Pareto-efficient'. Comment.
5. 'In a pure exchange economy with two agents and two goods a competitive equilibrium will exist as long as both agents have non-satiated preferences, since they will negotiate a trade in which both markets clear'. Comment.
6. In a Robinson Crusoe economy with a single produced good and one input, labour, the production function is $y = L^2$, where L is labour input. The utility function is $U(c, l) = c^{2/3}l^{1/3}$, where c is consumption of the produced good and l is the amount of leisure. The amount of time available is T . Find the optimal amount of output and leisure. If this optimal allocation were the outcome of a competitive equilibrium, what would the equilibrium wage and profit have to be? Explain whether the allocation could be the outcome of a competitive equilibrium.

SECTION B

7. A monopolist's market research reveals that the population of students have a different demand for its product compared with the population of those who are in full-time employment. Specifically, the respective market demand functions are $D_S = 100 - 2p$ and $D_E = 100 - p$. The production function of the monopolist is $f(K, L) = \sqrt{KL}$, and the unit prices of inputs K and L are $p_K = 1$ and $p_L = 4$, respectively.
- Does this monopolist have increasing, constant, or decreasing returns to scale?
 - Derive the monopolist's cost function, that is, compute how much it costs for the monopolist to produce q units.
 - Suppose the monopolist can engage in third degree price discrimination and thus set two prices: p_S for the students and p_E for the employed. What are the monopolist's profit-maximising prices for the students and the employed?
 - Define the price elasticity of demand, and compute it for both students and employed at the prices set by the monopolist.
 - Now suppose the monopolist cannot price discriminate. What price will it set? What will be the price elasticity of demand for the combined market of students and employed?
 - In the light of your answers to parts (d) and (e), comment briefly on the relationship between price and price elasticity of demand at the monopolist's profit-maximising choices.
8. A consumer's preferences over bundles (x, y) in $\mathbb{R}_{\geq 0}^2$ are represented by a utility function
- $$u(x, y) = (\sqrt{x} + y)^2$$
- Provide a definition of quasi-linear preferences. Verify that the above consumer has quasi-linear preferences.
 - Suppose the consumer's optimal choice features positive amounts of both goods. Describe, in words, Slutsky's and Hicks' interpretations of the income effect associated with a small decrease in p_x . Qualitatively compare their magnitudes in this particular case.
 - Describe, in words, what Equivalent Variation (EV), Compensating Variation (CV) and Change in Consumer Surplus (CS) mean.
 - Qualitatively compare the magnitudes of the three welfare measures for this consumer when p_x decreases by a small amount. Explain how you have reached your conclusion.
9. 'Widely observed altruistic behaviour and the prevalence of framing effects render economic modelling based on utility-maximising individuals too unrealistic to be useful.' Discuss.

10. (a) Consider a Ricardian trade model with the following features. In country A , labour produces twice as much per hour in industry y as in industry x . Country B labour is twice as productive as country A labour in industry x and 50% more productive than country A labour in industry y . There are constant returns to scale in all firms and each consumer supplies one unit of labour inelastically.
- (i) Describe what is meant by a *competitive equilibrium* of the model, when trade in goods is possible but labour migration is not.
 - (ii) Suppose that in the competitive equilibrium there is complete specialization of production.
 - (α) Find upper and lower bounds for the ratio of the price of good x to the price of good y , and explain why specialization occurs in equilibrium if the ratio is between these bounds.
 - (β) Find the ratio of the wage in B to the wage in A , in terms of the output prices.
 - (γ) What is the lowest possible value of this ratio?
 - (b) ‘Free Trade exploits a country and makes it worse off if its workers make much lower wages than workers in other countries’. Discuss in the context of the model in (a).
11. Consider an economy with two types of firms which emit greenhouse gases. Each firm emits one thousand tonnes of such gases. The benefit to society of reducing emissions by Q tonnes is γQ . The cost of reducing emissions by q is αq^2 for a firm of type α and βq^2 for a firm of type β (independently of any other production decisions). There are n firms of each type. Assume that $\gamma < 2\alpha$ and $\gamma < 2\beta$.
- (a) Find the socially optimal amount of emission reduction for each firm.
 - (b) Find an emissions tax which would achieve the social optimum, and explain why it does so.
 - (c) Suppose the government adopts a cap-and-trade approach, issuing k emission permits for free to each firm. Each permit allows the emission of one tonne of greenhouse gases and can be traded between firms in a competitive market.
 - (i) How many permits should the government issue?
 - (ii) For a given type α firm, write down the profit, from abatement and corresponding sale of permits, if the market price of permits is p and abatement is q_α . Hence find the total demand for permits at price p .
 - (iii) Write down the market-clearing condition. Find the equilibrium price of permits when the government issues the optimal number of permits. Briefly discuss your result.
 - (iv) Consider briefly whether there is a better way for the government to distribute permits than giving k for free to each firm.

12. (a) n people eat a meal together in a restaurant. Person i ($i = 1, 2, \dots, n$) has utility function $U_i(y_i, x_i) = y_i + a_i \ln(x_i)$, where y_i is the amount of money i ends up with, x_i is the amount of food she eats, $\ln(\cdot)$ is the natural logarithm and $a_i > 0$. One unit of food costs $p > 0$. Assume that each person's initial income Y_i is large. y_i is equal to Y_i less the cost of x_i .
- (i) For each person, derive an expression for the Pareto-efficient amount of food consumption.
 - (ii) Suppose the diners know that, at the end of the meal, the bill is to be divided equally between them. How much will each person decide to consume?
 - (iii) What do the results in (a)(i) and (a)(ii) suggest about the efficiency of dividing the bill equally between diners?
- (b) n people each attend a firework display. Person i ($i = 1, 2, \dots, n$) has utility function $U_i(y_i, X) = y_i + a \ln(X)$, where X is the total quantity of fireworks, $a > 0$ and otherwise notation is as in (a). A quantity X of fireworks costs qX , where $q > 0$.
- (i) Derive an expression for the Pareto-efficient amount of fireworks and show that it corresponds to the Samuelson Rule.
 - (ii) If each person individually buys fireworks for the display at unit cost q , what will the total amount of fireworks be?
 - (iii) What do your results in (b)(i) and (b)(ii) suggest about private provision of public goods?

END OF PAPER