



ECT1/PBT1
ECONOMICS TRIPOS PART I
PSYCHOLOGICAL AND BEHAVIOURAL SCIENCES TRIPOS PART 1

Monday 8 June 2015 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.

Write legibly.

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

- Find all the Nash equilibria of the following game:

	L	M	R
u	2,0	1,3	5,-1
m	-1,2	3,0	3,1
r	4,1	2,2	0,0

- Marco has an income of £100, which he spends on two goods, A and B . Initially, the prices of the two goods are $P_A = 10$, and $P_B = 10$, and his utility-maximizing consumption is to choose quantities $Q_A = 3$, and $Q_B = 7$. Suppose that the price of good B falls from £10 to £5, while Marco's income is unchanged, and that Marco's new utility-maximizing consumption bundle is $Q_A = 2.5$ and $Q_B = 15$ at these new prices. Further, after this price reduction, if enough income were taken away from Marco to put him back on his original indifference curve, then he would choose to consume $Q_A = 1.5$, and $Q_B = 9$.
 - Determine the change in consumption of B due to the substitution effect, and the income effect, respectively.
 - Is product B is a normal good or an inferior good? If it is an inferior good, is it also a Giffen good? Explain your answer.
- Do the functions $x^\alpha y^{(1-\alpha)}$ and $\alpha \ln(x) + (1-\alpha) \ln(y)$ represent the same preferences, where x and y are goods? If instead we view x and y as factors of production, then do these functions represent the same production function? Explain.
- Firm 1 has the profit function $\ln(x) - cx$ and Firm 2 has the profit function $\ln(y) - cy + dx$, where x is the quantity of input chosen by 1 and y is the quantity of input chosen by 2. c and d are strictly positive parameters. The firms simultaneously choose input quantities.
 - Find the Nash equilibrium.
 - Find the quantities which would maximize the sum of the two firms' profits. Explain why 1's input is higher than the Nash equilibrium quantity.
 - Find a tax which would cause the two firms to choose the solution in part (b).

5. At its current level of output, a competitive firm's marginal product of capital is twice its marginal product of labour. The price of labour is £6 per unit, and the price of capital is £3 per unit.
- (a) Is the firm minimizing its cost of manufacturing at its current level of output? If not, how can it reduce its costs?
 - (b) Suppose instead that the firm is a monopolist. Does this affect your answer to part (a), and if so, how? Explain.
6. An exchange economy has two agents, A and B , and two goods, x and y . If x^i and y^i (where $i = A, B$) are the amounts consumed by i of x and y respectively then the marginal rate of substitution of agent i is y^i/x^i . The total endowment of good x is 3 and of good y is 2. Find the competitive equilibrium price ratio.

SECTION B

7. “Experimental evidence shows that people do not behave in accordance with the predictions of game theory”. Discuss.
8. Two firms each have constant marginal cost $c > 0$ and no fixed costs. They produce identical products and face a linear demand curve $q = a - p$, where q is total quantity, p is price and $a > c$.
 - (a) If the firms formed a cartel to maximize the sum of their profits, what price would they both charge?
 - (b) Suppose that each firm sets its own price and the market lasts for just two periods, with each observing the first period’s prices before the second period. Find the subgame-perfect equilibria in pure strategies. Carefully define the strategies and explain your argument.
 - (c) Suppose that each firm sets its own price in each period, the game lasts indefinitely, and they both discount future payoffs. Under what conditions does a subgame-perfect equilibrium exist in which, in equilibrium, they always both charge the price you found in part (a)? Discuss the intuition for your answer.
 - (d) How would your answer to (c) change if each firm could only observe the other firm’s price with a lag of one period, i.e., a firm cannot observe the t -period price until the beginning of period $t + 2$?
9. A monopolist faces an inverse demand curve given by $P = 11 - Q$, where P and Q are the price and quantity respectively, with P being measured in pounds per unit, and Q in thousands of units. Suppose that the monopolist has a constant average and marginal cost, of £6 per unit.
 - (a) Derive the monopolist’s profit-maximizing quantity, and the corresponding price. What is the resulting profit? Check that the monopolist is producing on the elastic portion of her demand curve, and explain why that must be the case.
 - (b) Suppose that a government regulatory agency sets a price ceiling of £7 per unit, so that the maximum price the monopolist can charge is £7. What is the monopolist’s profit-maximizing quantity, and the corresponding price? What is the resulting profit?
 - (c) Suppose that the regulatory agency wants to maximize the level of output chosen by the monopolist. What price ceiling should it set, and what is the resultant output and the profit in that case?

Question Continued on next page.

- (d) Suppose, instead of setting a price ceiling of £7, the regulatory agency had allowed some imports of the good. Specifically, suppose that it had set an import quota of 1.5 thousand units. Further, suppose that these imports went to those consumers who had the highest willingness to pay. Would the resulting price have been higher or lower than £7? Discuss.
10. Three people, numbered 1, 2 and 3, each have to decide whether to contribute to the provision of a public good. Each can provide £200 or nothing. If three people contribute, the value of the good is £500, if two contribute the value is £400, and if one or none contributes the value is zero. A player's payoff is the value of the public good minus the value of that player's contribution.
- (a) Suppose that they each decide simultaneously whether to contribute. Find all the Nash equilibria in pure strategies.
- (b) Now suppose that they decide in sequence, in order of player number, and each observes the previous decisions. (i) Draw the extensive form. (ii) How many subgames does the game have? (iii) Describe all the subgame-perfect Nash equilibria.
- (c) If the game is as in (b) except that the value of the public good is £200 in the event that there are only two contributions, find the subgame-perfect equilibrium which has the highest sum of players' payoffs. Comment.
- (d) Suppose again that the game is as in (b) except that players 1 and 2 decide simultaneously rather than sequentially. Use backward induction to derive the reduced game between 1 and 2 and hence find all the subgame-perfect Nash equilibria.
11. You are given the following linear demand curve for a particular good, called good 1:

$$Q_1(p_1, p_2, m) = 100 - 2p_1 + 4p_2 + 3m$$

where p_1 and p_2 are the prices of good 1 and good 2, respectively, and m is income.

- (a) Are good 1 and good 2 substitutes or complements for each other? Explain.
- (b) Find the own price elasticity of demand, the cross-price elasticity of demand, and the income elasticity of demand.
- (c) Suppose that $m = 10$ and $p_2 = 2$. For what combination of Q_1 and p_1 , if any, is the own price elasticity unity? Explain your answer.
- (d) Suppose that $p_1 = 4$ and $p_2 = 2$. At what income levels, if any, is good 1 a luxury good? Explain your answer.

12. Consider a firm whose production function is given by:

$$f(x_1, x_2) = (2x_1 + x_2)^{\frac{1}{2}}$$

where x_1 and x_2 represent the quantities used of the two inputs.

- (a) Does this production function exhibit increasing, decreasing, or constant returns to scale? Explain briefly.
- (b) If the firm faces factor prices of $(1, 1)$ for the two inputs, what is the cheapest way to produce 4 units of output? Explain.
- (c) Derive the cost function for this firm, as a function of its output y , when factor prices are $(1, 1)$.
- (d) Suppose that the firm operates in a perfectly competitive market, in which it can sell its output at a price of p per unit. What is its profit-maximizing level of output? Explain briefly.

END OF PAPER