UNIVERSITY OF CAMBRIDGE

ECONOMICS TRIPOS PART I

Monday 11 June 2012 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	SPECIAL REQUIREMENTS
20 Page booklet x 1	Approved calculators allowed
Rough work pads	
Tags	

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 Find all the Nash equilibria of the following game:

	L	M	R
u	5,2	10,1	1,4
m	1,4	9,3	3,2
r	0,5	8,4	1,6

2 A firm has the following production function:

$$z = f(K, L) = AK^{\alpha}L^{1-\alpha},$$

where z is the amount of good Z produced, $\alpha \in (0, 1)$, $A > 0$, K is the level of capital held by the firm, and L is the amount of labour chosen by the firm. The cost of one unit of capital is r, the cost of one unit of labour is w. Capital is fixed in the short-run.

(a) Suppose that the firm operates in a perfectly competitive market where the price of a unit of Z is p^C. How many units of Z does the firm produce in the short-run?

(b) Briefly discuss what happens in the long-run.

3 "The backward induction equilibrium of the Stackelberg game is also a Nash equilibrium. Therefore the leader's production quantity is profit-maximizing, given the production quantity of the follower". Comment.

4 Suppose that utility is given by

$$u(x, y) = x + 16\sqrt{y}$$

where x is the quantity of good X consumed, and y is the quantity of good Y consumed. The price of good X is $p_x = 1$ and the price of good Y is $p_y = 2$.

(a) How much of each good will the individual consume if her budget is 10?

(b) How much will she consume if her budget is 20?

(c) Briefly comment on your result.

5 In an exchange economy with two agents (A and B) and two goods (x and y), agent A has an endowment of 0.75 units of good x and 0.25 units of good y, while agent B has 0.25 units of x and 0.75 of y. A's utility function is

$$u_A(x_A, y_A) = min\{x_A, y_A\},$$

while B's utility function is

$$u_B(x_B, y_B) = (x_B)^{\frac{1}{2}}(y_B)^{\frac{1}{2}}$$

where x_i and y_i $(i = A, B)$ are i's consumption of x and y respectively.

(a) Sketch the Edgeworth box and find the equation of the contract curve in terms of x_A and y_A. Sketch the contract curve.

(b) If the agents negotiate a trade and B has all the bargaining power, what final allocation would you predict?

6 A £1 increase in the price of DVDs leads to a decrease in demand of 100 units. A £100 increase in the price of TVs leads to a decrease in demand of 200 units. Can you say that the demand for TVs is less responsive to price than that for DVDs? Justify your response in detail.

SECTION B

7 Two players play the following game. First player 1 chooses either *In* or *Out*. If she chooses *Out* then the game ends; in that case player 1 gets payoff 3 and player 2 gets payoff zero. If she chooses *In* then they play the following simultaneous-move game (player 1 chooses the row).

	L	R
U	2,0	1,3
D	10,1	0,0

(a) Describe the strategy sets of the two players.

(b) Describe the normal form of the game and find all the Nash equilibria in pure strategies.

(c) Give a definition of the term *subgame-perfect equilibrium* and find all the pure-strategy subgame-perfect equilibria of this game.

(d) Which strategies are strictly dominated? Explain why player 2 has the same best-response to any strategy of player 1 according to which 1 randomizes over all her strategies other than those which are strictly dominated.

(e) Find all the Nash equilibria of the game in which at least one player plays a mixed strategy. Explain why player 1 must play *Out* in any such equilibrium.

8 A consumer has a time endowment of 24 hours, and he can work at an hourly wage of $w = 2$. There is one good X which costs $p_x = 1$ per unit. Free time gives him no utility unless it is spent at the cinema, but the cinema costs £1 per hour. His utility is given by

$$u(x, c) = \sqrt{x} + c$$

where x is the amount of good X he consumes and c is the time he spends at the cinema.

(a) How much of X does he consume? How much time does he spend at the cinema?

(b) Suppose that the consumer experiences a negative utility of -1 for every hour that he does not spend working or at the cinema. Show his new utility function and budget constraint. How much X does he consume? How much time does he spend at the cinema? Discuss.

(c) Suppose instead that he can go to the cinema (at a cost of £1 per hour) or to the pub (at a cost of £2 per hour). Assume that his new utility function is

$$u(x, c, p) = \sqrt{x} + \sqrt{c} + \sqrt{p},$$

where p is the time he spends at the pub. Find the optimal values of x, c and p.

(d) Suppose that the price of an hour at the pub decreases to £1. What are the new optimal values of x, c and p? Discuss.

9 Two farmers each have to decide, simultaneously, how much to contribute to an irrigation project. Each can choose any non-negative amount. If c_i $(i = 1, 2)$ is the contribution of farmer i, then i's payoff is

$$u_i(c_1, c_2) = f_i(c_1 + c_2) - c_i = k - e^{\alpha_i(c_1+c_2)} - c_i,$$

where $\alpha_i > 1$ and $k > 0$ are constants.

(a) Sketch f_i as a function of c_i, for fixed c_j $(j \neq i)$.

(b) Derive and sketch the best-response functions. Find the Nash equilibria.

(c) Now suppose that there are n farmers, each choosing a contribution, and, for each $i = 1, ..., n$, $u_i(c_1, c_2, ..., c_n) = f_i(c_1 + c_2 + ... + c_n) - c_i$. What are the Nash equilibria of this game?

10 An individual lives for two periods, and her utility is given by:

$$u_1(c_1) + u_2(c_2)$$

where $u_1(c_1) = c_1^{1/2}$, $u_2(c_2) = c_2^{1/2}$, c_1 denotes consumption in period 1, and c_2 denotes consumption in period 2. The individual receives an allowance of £10 from her parents in period 1 (which she doesn't need to pay back). The interest rate is 10%.

(a) Find the optimal c_1 and c_2.

(b) Now suppose that her parents do not give her an allowance, and so she must work. She has 10 units of time in each period, which she can allocate between work and leisure. The wage is $w = 1$ per unit. Her utility is now given by

$$u_1(l_1, c_1) + u_2(l_2, c_2)$$

where $u_1(l_1, c_1) = l_1^{1/2} + c_1^{1/2}$ and $u_2(l_2, c_2) = {l_2}^{1/2} + c_2^{1/2}$. We set $l_2 = 10$. Interpret this last assumption.

(c) Solve for the optimal c_1, c_2 and l_1.

(d) Suppose that if she does not work, the government makes her a payment of £7 in period 1. Will she work? Discuss.

11 (a) For an economy with two goods and two agents:

(i) Define the term *competitive equilibrium.*

(ii) State Walras' Law and explain why it must be true if the agents' preferences satisfy the assumption of monotonicity. Why might your argument fail in the case in which the agents' preferences do not satisfy this assumption?

(b) Find the competitive equilibrium prices and allocation and verify Walras' Law in the following case. Agent A has one unit of good x while agent B has none. Agent A has none of good y while agent B has 2 units. Agent i ($i = A, B$) has utility function $u_i(x_i, y_i) = x_i^{0.5} y_i^{0.5}$.

(c) Now suppose that there is a third agent, C, who has the same utility function as A and B and the same endowment as A. Everything else is as in (b). Find the competitive equilibrium prices and allocation.

12 A monopolist can produce at a total cost of $c(z) = z^2$, where z is the number of units of Z produced. Demand is given by $p = 100 - z$, where p is the price of one unit of good Z. (You can assume that $p \leq 100$).

(a) Find the monopolist's optimal output, price and profit.

(b) Suppose that an identical firm enters the market. How much will each firm produce? At what price will they sell and what will their profits be?

(c) Show graphically the deadweight losses generated by the optimal choices made by the firms in parts (a) and (b).

(d) Now suppose that for the firm from part (b) to enter, it must pay the government a fee of £315. If the monopolist can set its output level ahead of time, and it sets it equal to 50, will the new firm enter?

(e) Will the monopolist find it optimal to deter entry in this way?

END OF PAPER