DO NOT REMOVE THE QUESTION PAPER FROM THE EXAMINATION HALL

UNIVERSITY OF LONDON

CENTRE FOR FINANCIAL AND MANAGEMENT STUDIES

MSc Examination
Postgraduate Diploma Examination
for External Students

91DFMC358
91DFMC458

FINANCE (ECONOMIC POLICY)
FINANCE (FINANCIAL SECTOR MANAGEMENT)
FINANCE (QUANTITATIVE FINANCE)

Modelling Firms and Markets

Specimen Examination

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*This is a specimen examination paper designed to show you the type of examination you will have at the end of the year for **Modelling Firms and Markets**. The number of questions and the structure of the examination will be the same but the wording and the requirements of each question will be different. Best wishes for success in your final examination.*

The examination must be completed in **THREE** hours.

Answer **THREE** questions, selecting at least **ONE** question from **EACH** section. The examiners give equal weight to each question; therefore, you are advised to distribute your time approximately equally between three questions.

Candidates may use their own electronic calculators in this examination provided they cannot store text. The make and type of calculator **MUST BE STATED CLEARLY** on the front of the answer book.

PLEASE TURN OVER

Answer **THREE** questions, selecting ***at least* ONE** question from **EACH** section.

Section A

*Answer at least **ONE** question from this section.*

1. *Answer **ALL** parts of the question.*

a) The inverse demand curve facing two duopolists producing a homogeneous product is given by

$$P = 100 - \left(X_1 + X_2\right)$$

where X_1 and X_2 are the outputs of the two firms. Marginal cost for both firms is given as 10. Assume that fixed costs are zero for both firms. Derive the Cournot equilibrium and explain why this is a Nash Equilibrium.

(40% of the marks)

b) Now assume that Firm 2 has two possible cost functions. Marginal cost may be 10 or 25. There is an equal probability of both, but Firm 2 knows its own cost function. Marginal cost for Firm 1 remains at 10. What will be the Cournot equilibrium in each case? Comment on the output of Firm 2 if costs are 10 for both firms.

(60% of the marks)

2. *Answer **ALL** parts of the question.*

A ticket to a newly staged opera is on sale through sealed-bid auction. There are three bidders, Amy, Bob and Chris. Amy values the ticket at £10, Bob at £20, and Chris at £30. The bidders can bid any positive amount.

a) Show that there is no dominant strategy for any bidder if the highest bidder wins the ticket and pays his own bid.

(30% of the marks)

b) From now on, assume this is a second-price auction, that is, the highest bidder wins the ticket and pays the second-highest bid. If everyone bids his or her own valuation, what is the payoff of each bidder?

(40% of the marks)

c) Show that when everyone bids his or her own valuation this is a Nash Equilibrium for the second-price auction.
(30% of the marks)

3. *Answer **ALL** parts of the question.*

Susan believes she faces health costs in the current year of either £5,000 with probability 0.8 or £20,000 with probability 0.2.

a) Please state and explain the actuarially fair premium for insurance that fully covers health costs Susan might incur. ***(20% of the marks)***

b) Suppose an insurance company sells insurance to 10,000 people who face the same distribution of health costs, as does Susan. Give a measure of the variability of the average claim per individual insured.
(40% of the marks)

c) Susan obtains a major medical and hospital policy that covers all costs, aside from a £1,000 annual deductible and a 20% coinsurance rate. If Susan actually incurs annual health charges of £4,000, by how much will her health insurance company reimburse her?
(40% of the marks)

4. *Answer **BOTH** parts of the question.*

a) In a competitive exchange economy, demonstrate the first and second welfare theorems, and discuss their implications and limitations. ***(50% of the marks)***

b) Do Pareto-Efficient outcomes require competitive markets? Discuss in relation to the general equilibrium exchange economy and the issue of 'externalities'.
(50% of the marks)

PLEASE TURN OVER

Section B

*Answer at least **ONE** question from this section.*

5. Consider a pure exchange economy with two goods, h = 1, 2, and two consumers, i = 1, 2, with consumption sets $X_i = R^2_+$, endowments $e_1 = (1,0)$ and $e_2 = (1,1)$, and utility functions

$$u_1(x_{11}, x_{12}) = (x_{11})^{1/2} + (x_{12})^{1/2}$$

and

$$u_2(x_{21}, x_{22}) = \min\{x_{21}, x_{22}\}$$

respectively.

Show that the initial endowment can be decentralised as a quasi- equilibrium, that is, there exists a price vector p∗ such that $(p^*, x^*) = (p*, e)$ is a quasi-equilibrium.

Is (p^*, x^*) a competitive equilibrium (with or without transfers)?

Explain your answer with reference to the assumptions of the second theorem of welfare economics.

6. *Answer **ALL** parts of the question.*

Two bidders have private values for a good. Specifically, each has a value that is equally likely to be any number in the interval [0, 2].

a) What is the optimal bid for bidder *j* when her value is equal to v_j and the seller holds a first-price sealed-bid auction? Explain. ***(25% of the marks)***

b) What is the optimal bid for bidder *j* when her value is equal to v_j and the seller holds a Vickrey auction? Explain. ***(25% of the marks)***

c) What is the seller's expected revenue if she holds a Vickrey auction? ***(25% of the marks)***

d) Is the outcome of the Vickrey auction Pareto efficient? (Assume that the seller values the good at zero.) Is the outcome of a Vickrey auction Pareto efficient if the seller sets a reserve price equal to 1? Explain.

(25% of the marks)

7. *Answer **ALL** parts of the question.*

Consider an education signalling model with three types of workers, who have productivities $x_L < x_M < x_H$. Assume that education does not add to productivity and has unit costs of $c_L > c_M > c_H$ to the three types. Each worker knows his type, but the market has initial belief (p_L, p_M, p_H) with $p_L + p_M + p_H = 1$.

a) For what range of worker productivity and education costs is there a pooling equilibrium in which all types choose the same education level? Does the pooling equilibrium satisfy the intuitive criterion?

(40% of the marks)

b) Find the least-cost fully separating equilibrium, *ie* a separating equilibrium in which each type chooses a different level of education. Does it satisfy the intuitive criterion? ***(40% of the marks)***

c) Are there any other fully separating equilibria that satisfy the intuitive criterion? ***(30% of the marks)***

8. *Answer **BOTH** parts of the question.*

Consider a signalling game. Player 1 observes a type, $t \in \{0,1\}$ where $\Pr[t=1] = p$ and $\Pr[t=0] = 1-p$ for a commonly known value $p \in \{0,1\}$. Then Player 1 chooses whether to invest, $a \in \{0,1\}$. Player 2 observes a but not t. Player 2 then decides whether to invest, $b \in \{0,1\}$. After b is chosen, t is revealed to player 2 and both players receive their payoffs. The players' payoffs are:

$$u_1(a,b,t) = b + at$$
$$u_2(a,b,t) = b(2t-1)$$

a) Find a pooling perfect Bayesian equilibrium of this game. (You can specify p if you need/want to.)

(60% of the marks)

b) Let $p = 0.5$. Is there a separating perfect Bayesian equilibrium of this game? ***(40% of the marks)***

[END OF EXAMINATION]