



AFRICAN ECONOMIC RESEARCH CONSORTIUM

Collaborative PhD Programme in Economics for Sub-Saharan Africa

COMPREHENSIVE EXAMINATIONS IN CORE AND ELECTIVE FIELDS

FEBRUARY 13–MARCH 4, 2019

MICROECONOMICS

Time: 08:00 – 11:00 GMT

Date: Monday, February 18, 2019

INSTRUCTIONS:

Answer a total of FOUR questions: ONE question from Section A; ONE question from Section B; and TWO questions from Section C. Please note that **Question 5** in Section C is **compulsory**.

The sections are weighted as indicated on the paper.

SECTION A: (15%)

Answer only ONE Question from this Section

Question 1

- (a) Explain why policies for promoting market competition are desirable. [5 Marks]
- (b) What is an externality and how does it give rise to market failure? [5 Marks]
- (c) How can such a market failure be corrected? [5 Marks]

Question 2

- (a) What is meant by homogeneity of degree zero for a consumer's demand? [6 Marks]
- (b) What is meant by money illusion in consumer theory? [4 Marks]
- (c) What is the relationship between (a) and (b)? [5 Marks]



SECTION B: (25%)

Answer only ONE Question from this Section

Question 3

A cost function of a competitive firm is given by $c(q) = 400 + 16q + q^2$, where q is the output produced by the firm.

- (a) Derive the short run and long run supply functions for the firm. **[10 Marks]**
- (b) Suppose that \$225 of the fixed costs is avoidable if the firm shuts down. Find the short run supply function with avoidable costs. **[10 Marks]**
- (c) Define natural monopoly and explain factors that give rise to natural monopoly. **[5 Marks]**

Question 4

- (a) Explain the terms moral hazard and adverse selection. Explain why the presence of asymmetric information can lead to inefficient equilibria or no equilibrium at all. **[15 Marks]**
- (b) With appropriate illustrations, refute or support the assertion that “there are no pure strategy pooling equilibria in the insurance screening game”. **[10 Marks]**



SECTION C: (60%)

Answer TWO Questions from this Section,

One of which MUST be Question 5, which is COMPULSORY

Question 5 (Compulsory)

For each of the following statements, define the underlined terms then determine whether the statement is **True, False or Uncertain** with a brief explanation of your answer. Answer **ANY FIVE** of the sub-questions in this question.

- (a) Concavity property of cost functions implies that the conditional factor demands are negatively sloped. [6 Marks]
- (b) The Pigouvian tax will always internalize the externality. [6 Marks]
- (c) Pareto optimal allocations are not always supported by general equilibrium prices. [6 Marks]
- (d) The Saint Petersburg paradox is used to show that we can rely on the criterion of the Expected Value to analyse decision-making under uncertainty. [6 Marks]
- (e) The Walras' law for an economy without production establishes that for any set of positive price vector P , the value of excess demand is identically zero. [6 Marks]
- (f) According to Arrow's impossibility theorem, the social choice does not pose any problem if it is assumed that the allocation X is socially preferred to an allocation Y when the majority prefer X to Y . [6 Marks]
- (g) When a price-taking firm is selling in a market with a price greater than the firm's average cost, it should increase its output level. [6 Marks]
- (h) Consider a game in which the Prisoner's Dilemma is repeated 10 times, and both players are rational and fully informed. Tit-for-tat strategy in this case is optimal. [6 Marks]

Question 6

- (a) Formally define “feasible allocation for K good, n -consumer exchange economy. Define the notion of “blocking coalition” in this n -consumer exchange economy and the core, and briefly explain how the “core” concept relates to competitive equilibrium. [15 Marks]



- (b) Let consumer A and B have utility functions $u_A(x_1^A, x_2^A) = (x_1^A)^a (x_2^A)^{1-a}$ and $u_B(x_1^B, x_2^B) = (x_1^B)^b (x_2^B)^{1-b}$ for consumption of good 1 and 2. Each agent has an endowment $e_A = (1,0)$ and $e_B = (0,1)$. The prices of the goods are given by $p = (p_1, p_2)$.
- (i) Compute the aggregate demand functions associated with the consumptions. **[7.5 Marks]**
- (ii) Determine the General equilibrium and Market clearing conditions for the markets of good 1 and good 2. **[7.5 Marks]**

Question 7

- (a) Consider the following scenario. Amina first chooses whether she wants to buy Mac or Windows. Juma observes Amina's choice and makes his own choice between the two. In addition, if and only if Amina chooses Windows, then since she is familiar with the software, she creates a letter in Word and posts it to Catherine who then also has the chance to choose between Windows and Mac. Neither Juma nor Catherine can observe one another's choice when they are making their own choice. Each person gets a payoff of 2 for each other person that made the same choice as them.
- (i) Depict the game in extensive form (i.e. draw the game tree). **[8 Marks]**
- (ii) How many subgames are there in this game? **[2 Marks]**
- (iii) Identify the pure strategy Subgame Perfect Nash equilibria. **[5 Marks]**
- (b) Consider the following game below:

		Player 2			
		W	X	Y	Z
Player 1	A	2,5	4,2	2,3	1,4
	B	1,5	3,3	4,4	1,6
	C	3,2	2,3	1,1	2,1

- (i) Find a pure strategy Nash Equilibrium of the game **[7.5 Marks]**
- (ii) Find a mixed strategy Nash equilibrium of the game **[7.5 Marks]**



Question 8

A risk neutral principal hires a risk averse agent to undertake a project, which has a fixed cost of $I \geq 0$ for the principal. The project is either successful, in which case the value of the project for the principal is $v_s = 20 - I$, or it is a failure, in which case the value is $v_f = 4 - I$. The agent chooses to put in either high or low effort. If he puts in high effort, then the probability of success is 0.75, and if he chooses low effort, probability of success is 0.25, as summarized in the table.

Effort/Value	$v_s = 20 - I$	$v_f = 4 - I$	φ
Low	0.25	0.75	0
High	0.75	0.25	$\ln(4)$

The principal cannot observe the agent's effort but observes whether the outcome is a success or a failure. Therefore, feasible contracts are payments to the agent in case of success and failure, i.e., (w_s, w_f) , so that the principal's payoff is $20 - I - w_s$ in case of success, and $4 - I - w_f$ in case of failure. Assume that the principal's payoff if she does not invest in the project is zero.

If the agent gets paid w , then his payoff is given by $\ln(w) - \varphi$, where $\varphi = \ln(4)$, if he puts in high effort, and $\varphi = 0$, if he puts in low effort. Also assume that the reservation utility (i.e., the payoff he gets if he does not accept the contract offer) of the agent is zero.

Note: You may assume that the Kuhn-Tucker conditions are necessary and sufficient to identify global optimum.

Recall some useful facts about functions \ln and e :

$$\lim_{x \rightarrow 0} \ln(x) = -\infty$$

$$\ln(e) = 1, \ln(4) > 0, a \ln(x) = \ln(x^a), \ln(ab) = \ln(a) + \ln(b), e^{\ln(x)} = x$$

$$\frac{d}{dx} \ln(x) = \frac{1}{x}$$

- What is the optimal contract that induces high effort? **[6 Marks]**
- What is the optimal contract that induces low effort? **[6 Marks]**
- What effort level is optimal to induce? **[6 Marks]**
- Assume that the principal can observe and contract on effort. What is the optimal contract and effort level the principal wants to implement? For what range of I , will the principal find it optimal to hire the agent? **[8 Marks]**
- Compare the solutions in point c) with asymmetric information, and d) when the principal can observe and contract on effort. For what values of fixed cost, I , there is a moral hazard problem? **[4 Marks]**