



KENYATTA UNIVERSITY
UNIVERSITY EXAMINATIONS 2016/2017
SECOND SEMESTER EXAMINATION FOR THE DOCTOR OF PHILOSOPHY IN
ECONOMICS
EET 901: MICROECONOMICS II

DATE: Wednesday, 17th May 2017

TIME: 2.00pm-5.00p.m

INSTRUCTIONS

Answer ALL question

1. (a) The Jua Kali Corporation operates a chemical plant, which is located on the banks of a river. Downstream from the chemical plant is a group of fisheries. The corporation plant emits by-products that pollute the river, causing harm to the fisheries. The profit corporation obtains from operating the chemical plant is KSh $\Pi > 0$. The harm inflicted on the fisheries due to water pollution is equal to KSh $L > 0$ of lost profit [without pollution the fisheries' profit is KSh A , while with pollution it is KSh $(A - L)$]. Suppose that the fisheries collectively sue the Jua Kali Corporation. It is easily verified in court that Jua Kali's plant pollutes the river. However, the values of Π and L cannot be verified by the court, although they are commonly known to the litigants. Suppose that the court requires the Jua Kali lawyer (Player 1) and the fisheries' lawyer (Player 2) to play the following litigation game. Player 1 is asked to announce a number $x \geq 0$, which the court interprets as a claim about the plant's profits. Player 2 is asked to announce a number $y \geq 0$, which the court interprets as the fisheries' claim about their profit loss. The announcements are made simultaneously and independently. Then the court uses Posner's nuisance rule to make its decision. According to the rule, if $y > x$, then Jua Kali Corporation must shut down its chemical plant. If $x \geq y$, then the court allows Jua Kali Corporation to operate the plant, but the court also requires Jua Kali Corporation to pay the fisheries the amount y . Note that the court cannot force the lawyers to tell the truth: in fact, it would not be able to tell whether or not the lawyers were reporting truthfully. Assume that the lawyers want to maximize the payoff (profits) of their clients.
- (i) Represent this situation as a normal-form game by describing the strategy set of each player and the payoff functions. (2 marks)
 - (ii) Is it a dominant strategy for the Jua Kali Corporation lawyer to make a truthful announcement (i.e. to choose $x = \Pi$)? [Prove your claim.] (2 marks)
 - (iii) Is it a dominant strategy for the fisheries' lawyer to make a truthful announcement (i.e. to choose $y = L$)? [Prove your claim.] (2 marks)
 - (iv) For the case where $\Pi > L$ (recall that Π and L denote the true amounts), find all the Nash equilibria of the litigation game. (2 marks)
 - (v) For the case where $\Pi < L$, find all the Nash equilibria of the litigation game. (2 marks)

(b) Koech (Player 1) and Kioko (Player 2) have decided to dissolve a business partnership whose assets have been valued at KSh 100,000. The charter of the partnership prescribes that the senior partner, Koech, make an offer concerning the division of the assets to the junior partner, Kioko. The junior partner can **Accept**, in

which case the proposed division is implemented, or **Reject**, in which case the case goes to litigation. Litigating involves a cost of Ksh 20,000 in legal fees for each partner and the typical verdict assigns 60% of the assets to the senior partner and the remaining 40% to the junior partner. Suppose, for simplicity, that there is no uncertainty about the verdict. Suppose also that there are only two possible offers that Koech can make: a 50-50 split or a 70-30 split.

(i) Represent this game in extensive form with perfect information. (2 marks)

(ii) Find solution using backward induction. (3 marks)

2. Consider the following principal-agent situation. There is a principal P and an agent A. P wants to hire A for a one-time project. If A works for P, A can choose high effort, e_H , or low effort, e_L . Profits are either high, medium, or low (π_L, π_M, π_H). If A chooses e_H then profits are high, with probability P_{HH} , medium with probability P_{HM} , and low with probability $1 - P_{HH} - P_{HM}$. If A chooses e_L then profits are high, with probability P_{LH} , medium with probability P_{LM} , and low with probability $1 - P_{LH} - P_{LM}$. P maximizes expected profits from the project less the expected wages. A maximizes expected utility as follows: Given a wage, w , and effort choice, e :

Required:

(a) Specify A's utility function. (3 marks)

(b) Show how to implement e_H and e_L if effort is observable and verifiable. (3 marks)

(c) If e is not observable, and the agent is risk-neutral, show that P can still obtain the same payoffs as in case (b). (3 marks)

(d) If e is not observable, and the agent is risk-averse, can P still implement each effort level? If so, how? What are the payoffs now? (6 marks)

3. Consider a market with n identical firms. Suppose that the market demand curve is given by $Q = P - 5$, where Q represents quantity and P represents price. Suppose that there is a constant per-unit cost of production of 5.

(a) Suppose that the firms in this market choose their quantities simultaneously. What are the equilibrium quantities, price, and profits? (4 marks)

(b) Suppose that the firms choose prices. Assume that if one firm has a lower price, then all consumers willing to purchase at that price go to that firm. Assume further that if both firms have the same price, then equal numbers of consumers go to each firm. What are the equilibrium prices, quantities, and profits? Explain your conclusion. (4 marks)

(c) Suppose the firms choose prices, and that game is infinitely repeated. Describe a trigger strategy that would encourage each of the n firms to set their prices at the monopoly price. (4 marks)

(d) Demonstrate that the ability of the firms to sustain a collusive outcome depends on the discount factor, δ , and the number of firms (n) in the market. (3 marks)

4. (a) Arrow (1951) shows that when the number of alternatives in X is restricted to just two, the method of majority voting does yield a social welfare relation that satisfies Arrow's Impossibility Theorem. Verify, by example or more general argument, that this is indeed the case. (3 marks)

(b) There are three individuals in society, $\{1,2,3\}$, three social states, $\{x, y, z\}$, and the domain of preferences is unrestricted. Suppose that the social preference relation, R , is given by pair-wise majority voting (where voters break any indifferences by voting for x first then y then z) if this results in a transitive social order. If this does not result in a transitive social order the social order is xP_yP_z . Let f denote the social welfare function that this defines.

- (i) Consider the following profiles, where P^i is individual i 's strict preference relation:

Individual 1: xP^1yP^1z

Individual 2: yP^2zP^2x

Individual 3: zP^3xP^3y

What is the social order? (3 marks)

- (ii) What would be the social order if individual 1's preferences in (a) were instead yP^1zP^1x ? or instead zP^1yP^1x ?

- (iii) Prove that f satisfies the Pareto property, WP. (2 marks)

- (iv) Prove that f is non-dictatorial. (2 marks)

- (v) Conclude that f does not satisfy IIA. (2 marks)

- (vi) Show directly that f does not satisfy IIA by providing two preference profiles and their associated social preferences that are in violation of IIA. (3 marks)