

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF MASTER OF SCIENCE
AGRICULTURAL ECONOMICS

AGEC 801: MICROECONOMICS THEORY

STREAMS: MSC (AGEC)

TIME: 3 HOURS

DAY/DATE: MONDAY 06/04/2020

11.30 A.M. – 2.30 P.M.

INSTRUCTIONS: Answer ALL questions in section A and any other THREE in section B

QUESTION ONE

- (i) Suppose $U(x, y) = 4x^2 + 3y^2$
- (a) Calculate $\frac{\partial u}{\partial x}, \frac{\partial u}{\partial y}$ [2 marks]
- (b) Evaluate these partial derivatives at $x = 1, y = 2$ [2 marks]
- (c) Write the total differential for U [2 marks]
- (d) Calculate $\frac{\partial y}{\partial x}$ for $\partial U = 0$, that is the implied tradeoff between x and y holding U constant? [2 marks]
- (ii) With the help of a clearly labeled diagram, show how individuals and firms interact to determine market prices in the short run in a perfectly competitive market. [7 marks]

QUESTION TWO

- (i) Suppose a firm's total revenues depends on the amount produced (q) according to the function
- $R = 70q - q^2$ and total costs also depend on q $C = q^2 + 30q + 100$
- (a) What output level should the firm produce to maximize profits ($R - C$)?, what will the profits be? [2 marks]
- (b) Show that the second order conditions for a maximum are satisfied at the output level found in part (a) [3 marks]

AGEC 801

- (ii) With the help of a clearly labeled diagram, show the long run equilibrium for a perfectly competitive industry with constant costs. [5 marks]

SECTION B

QUESTION THREE

- (a) Illustrate by use of a graph the typical indifference curves for the following utility functions, and determine whether they have convex indifference curves?
- (i) $U(x, y) = 3x = y$ [3 marks]
- (ii) $U(x, y) = (x \cdot y)^{0.5}$ [3 marks]
- (b) Suppose individual A has initial amount of 2 goods that provide utility to him/her. The initial amounts are given by \bar{x} and \bar{y}
- (i) Graph these initial amounts on the person's indifference curve map [3 marks]
- (ii) If this person can trade x and y (or vice versa) with other people, what kinds of trades would he or she voluntarily make? [3 marks]
- (iii) Suppose this person is relatively happy with the initial amounts in his or her possession and will only consider trades that increase utility by at least amount k. how would you illustrate this on the indifference curve map? [3 marks]

QUESTION FOUR

Miss Jones drinks only pure spring water, but she can purchase it in two different sized containers: 0.75 liter and 2 liters container. Because the water is identical, she regards these two "goods" as perfect substitutes.

- (i) Assuming Miss Jones utility depends only on the quantity of water consumed and that the containers themselves yield no utility, express this utility function in terms of quantities of 0.75 liter containers (x) and 2 liter containers (y) [3 marks]
- (ii) State Miss Jones demand function for x in terms of p_x , p_y , and I [4 marks]
- (iii) Graph the demand curve for x, holding I and p_y constant [4 marks]
- (iv) How do changes in I and p_y shift the demand curve for x [4 marks]

QUESTION FIVE

- (a) Nancy receives utility from two goods, goat's milk (m) and bread (b), according to the utility function $U(m, b) = m.b$
- (i) Show that increases in the price of goat's milk will not affect the quantity of bread Nancy buys; that is, show that $\frac{\partial b}{\partial p_m} = 0$ [2 marks]
- (ii) Show also that $\frac{\partial b}{\partial p_m} = 0$ [2 marks]
- (iii) Use the Slutsky equation and the symmetry of net substitution effects to prove that the income effects involved with the derivatives in parts (i) and (ii) are identical [2 marks]
- (iv) Prove that (iii) explicitly using the Marshallian demand functions for m and b [3 marks]
- (b) With the help of well-defined graphs, show the difference between gross complements and gross substitutes in relation to cross price effects. [6 marks]

QUESTION SIX

Suppose the production function for widgets is given by $q = kl - 0.8k^2 - 0.2l^2$ where q represents the annual quantity of widgets produced, k represents annual capital input, and l represents annual labor input.

- (i) Suppose $k=10$; graph the total and average productivity of labor curves [3 marks]
- (ii) At what level of labor input does this average productivity reach a maximum? [3 marks]
- (iii) How many widgets are produced at that point? [3 marks]
- (iv) Again assuming that $k=10$, graph the MPI curve [3 marks]
- (v) At what level of labor input does $MPL=0$? [3 marks]
-