UNIVERSITY OF FORT HARE

MATHEMATICAL ECONOMICS 2B
ECO222/ ECO222E

MAIN EXAMINATIONS

NOVEMBER

2019

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Time: 3 hours

Subject: ECO 222/222E

Marks: 100

This paper consists of 3 pages including the cover page

Internal Examiners

Ms A. Jiza
Mr B. Mgxekwa
Dr K. Sibanda

INSTRUCTIONS

- Answer ALL THREE (3) questions, showing clearly all the calculations.
- All questions carry equal marks
- Use clearly drawn diagrams where necessary
- Calculators are allowed
- Answers must be rounded off to two (2) decimal places.

QUESTION ONE [60 MARKS]

1.1. When the demand function is $2Q - 24 + 3P = 0$; calculate the Marginal Revenue when $Q = 7$. [4]

1.2. A monopoly faces the total revenue schedule $TR = 300q - 2q^2$ and the total cost schedule $TC = 12q^3 - 44q^2 + 60q + 30$ [6]

1.2.1. Are there two output levels at which MC = MR? Which is the profit-maximizing output?

1.3. Two consumers have the following utility functions:

Consumer 1: $U = X^{0.4} Y^{0.6}$

Consumer 2: $U = 2X^{0.5} Y^{0.25}$

Where X and Y are two goods. If $P_x = 2$ and $P_y = 3$ and each consumer has an income constraint of 60.

1.3.1. Give the income constraint function for the two consumers. [2]

1.3.2. Calculate the quantities of X and Y which will maximize utility, subject to the income constraint, for each consumer. [12]

1.3.3. Show how a rise in income to 80 will affect the quantity of X and Y which will maximize utility for each consumer. [12]

1.4. A firm faces the production function $Q = 2K^{0.2} L^{0.6}$ and can buy L at R240 a unit and K at R4 a unit.

1.4.1. If it has a budget of R16 000 what combination of K and L should it use to maximize output? **Use Economics and Substitution Method.** [10]

1.4.2. If it is given a target output of 40 units of Q what combination of K and L should it use to minimize the cost of this output? **Use Lagrange Multiplier** [10]

1.4.3. Calculate and interpret the value of lambda. [4]

QUESTION TWO [40 MARKS]

2.1. The Marginal Revenue function of a monopolistic producer is $MR = 10 - 4Q$.

2.1.1. Find Total Revenue (TR) function. (4)

2.1.2. Deduce the corresponding demand equation. (2)

2.2. The demand function for a product is $P_d = 60 - q - q^2$ and the supply function is $P_s = 10 + 4q$

2.2.1. Determine the equilibrium price and quantity and the value of the consumer's and producer's surplus at equilibrium [8]

2.2.2. What happens to the values of consumer's surplus and producer's if the tax of R2 per unit is imposed? [8]

2.2.3. Comment on whether there is a welfare gain or welfare loss to the consumers resulting from the tax. [2]

2.3. Given the following 3x3 matrix

$$A = \begin{matrix} 1 & 1 & -1 \\ 2 & 2 & 3 \\ 4 & 0 & 0 \end{matrix}$$

2.3.1. Derive the adjoint matrix (Adj.A) [3]

2.3.2. Use Sarrus' Rule to find det (A) [3]

2.3.3. Find the inverse matrix (A^{-1}) [4]

2.4. Given the following system of equations.

$$y - z = 2$$

$$3x + 2y + z = 4$$

$$5x + 4y = 1$$

2.4.1. Use Cramer's rule to find x in the equation systems below. [6]

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