



MACHAKOS UNIVERSITY

University Examinations for 2018/2019 Academic Year

SCHOOL OF BUSINESS AND ECONOMICS

DEPARTMENT OF ECONOMICS

FOURTH YEAR SUPPLEMENTARY EXAMINATION FOR
BACHELOR OF ECONOMICS

EES 100: MATHEMATICS FOR ECONOMICS I

DATE: 25/7/2019

TIME: 2:00 – 4:00 PM

INSTRUCTIONS:

- (i) Answer question one (Compulsory) and any other two questions
- (ii) Do not write on the question paper
- (iii) Show your working clearly

QUESTION ONE (COMPULSORY) (30 MARKS)

- a) Solve by elimination and substitution techniques, the following system of linear equations;
 $x + y = 3$
 $x - 2y = 9$

(6 marks)

- b) Suppose the AR and AC of a firm are defined by the following functions

$$AR = 4 - \frac{1}{4}Q$$

$$AC = \frac{4}{Q} + 2 - 0.3Q + 0.05Q^2$$

- i) Determine the level of q and p that will maximize profits of the firm.
(6 marks)
- ii) Obtain TR and TC curves (4 marks)

- c) Consider the following universal set T and its subsets C, D and E:

$$T = \{0, 2, 4, 6, 8, 10, 12\}$$

$$C = \{4, 8\}$$

$$D = \{10, 2, 0\}$$

$$E = \{0\}$$

Find $C \cap D \cap E$ (4 marks)

- d) Construct the appropriate standard form for parabola corresponding to the expression $X^2 - 10x + 2y + 31 = 0$ and sketch the corresponding parabola. (6 marks)
- e) Consider the following consumption and tax functions:

$$C = 70 + 0.85 Y^d$$

$$T = \alpha_0 + \alpha_1 Y$$

$$Y^d = Y - T$$

- i) Identify the endogenous and exogenous variables (1 mark)
- ii) What is the name given to the parameter α_1 ? What does it measure? (1 mark)
- iii) If income increases by 100, how much of that increase will be allocated to consumption (2 marks)

QUESTION TWO (20 MARKS)

- a) The function used commonly to present Total Cost function is the cubic function.

$$TC = \alpha_0 + \alpha_1 Q + \alpha_2 Q^2 + \alpha_3 Q^3 \quad (\alpha_0, \alpha_1, \alpha_2 > 0, \alpha_3 < 0)$$

Determine the Average total costs (ATC), the Average Fixed Cost (AFC) and the Average Variable Costs (AVC) for the firm. (10 marks)

- b) The simple Keynesian national income model can be represented by:

$$Y = C + I_0 + G_0$$

$$C = \alpha + \beta Y$$

Determine the equilibrium income Y and Consumption. (4 marks)

- c) Sets P and Q. and the corresponding universal set T are given-by:

$$P = \{1, 2, 5\}, \quad Q = \{1, 5, 7, 8\}, \quad T = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$$

Show that:

i) $P' \cup Q' = (P \cap Q)'$ (3 marks)

ii) $(P \cup Q)' = P' \cap Q'$ (3 marks)

QUESTION THREE (20 MARKS)

- a) Consider the multivariate demand functions

$$Q_m = 2.2 - 1.8P_m + 1.2P_n - 0.7Y$$

$$Q_n = 1.7 - 1.1P_m - 1.3P_n - 0.9Y$$

- i) Are good: “m” and “n” complementary or substitutes? (2 marks)
- ii) Is good “m” normal or inferior? Explain (1.5 marks)
- iii) Is good “n” normal or inferior? Explain (1.5 marks)
- b) Prove that $P = \frac{1}{\alpha Q}$ demand function has a unitary elasticity (3 marks)
- c) The AR and TC for a firm are given by:

$$AR = 3\frac{1}{2} - \frac{1}{2}Q$$

$$TC = \frac{1}{20}Q^3 - \frac{3}{10}Q^2 + 2Q + 1$$

Find:

- i) The price elasticity of demand at $P = 4$ (3 marks)
- ii) At what level of Q is ATC at a minimum? (3 marks)
- iii) When is $ATC = MC$ (2 marks)
- iv) What do you notice (1 mark)
- v) The profit maximizing Q if a tax of 2 per unit is imposed on the quantity produced (3 marks)

QUESTION FOUR (20 MARKS)

You are given the following information about the commodity and money market of a closed economy without government

The commodity market

The following information relate to the commodity and money market of the economy in Kenya

$Y=C+I$ (national income function)

$C=89+0.3Y$ (consumption function)

$I=120-150r$ (investment function)

The money market

$M_s=250$ (money supply function)

$M_{ds}=240-250r$ (speculative demand for money function)

$M_{dt}=0.1Y$ (transactionary demand for money function)

Required

- i) Derive the IS and LM equations (3 marks)
 - ii) Determine the equilibrium levels of income and rate of interest. (8 marks)
 - iii) Determine the equilibrium money demand function (3 marks)
- b) A two commodity market model is defined by the following:

$$Q_{d1} = 4 - P_1 + \frac{1}{2} P_2$$

$$Q_{d2} = 10 + P_1 - P_2$$

$$Q_{s1} = -3 + 4P_1$$

$$Q_{s2} = -18 + 4P_2$$

Determine equilibrium prices and quantities for the two commodities (6 marks)

QUESTION FIVE (20 MARKS)

Write short notes on the following topics as used in mathematics for economists. Illustrate your work where necessary.

- i) The laws of set Algebra
- ii) Autonomous tax and Induced tax
- iii) Production transformation curve
- iv) Normal and Inferior goods
- v) IS-LM models
- vi) Relationship between price elasticity of demand and marginal revenue
- vii) Minimization of average variable cost
- viii) Demand and supply of money
- ix) Partial and General equilibrium
- x) Import and export functions.