



MACHAKOS UNIVERSITY

University Examinations for 2018/2019 Academic Year

SCHOOL OF BUSINESS AND ECONOMICS

DEPARTMENT OF ECONOMICS

FIRST YEAR SUPPLEMENTARY EXAMINATION FOR

BACHELOR OF ECONOMICS AND STATISTICS

BACHELOR OF ECONOMICS

BACHELOR OF ARTS

EES 100: MATHEMATICS FOR ECONOMISTS I

DATE: 27/9/2019

TIME: 8:30 – 10:30 AM

INSTRUCTIONS

Answer Question **ONE** and Any Other **TWO** Questions

QUESTION ONE (COMPULSORY) (30 MARKS)

- a) What is an identity? (2 marks)
- b) Differentiate between the following terms:
- i) Null set and finite set
 - ii) Autonomous and induced consumption
 - iii) Total revenue and marginal revenue
 - iv) Endogenous and exogenous variables (8 marks)
- c) For the following average total cost and the average revenue functions:
- $$3 + ATC - \frac{15}{Q} - Q = 0$$
- $$AR + \frac{4}{9}Q = 12$$
- Determine the total costs, average variable costs, average fixed costs and total revenue functions (8 marks)
- d) The money market for an economy is given by the following equations:
- $$MDT = \frac{1}{2}Y$$
- $$MDS = 100 - 10r$$
- $$MS = 1500$$
- i) Derive the LM function for this economy
 - ii) Find the equilibrium r when $Y = 3000$
 - iii) Find the equilibrium Y when $r = 5$ (6 marks)

- e) A production function is given by:

$$Q = 3L - \frac{1}{2}L^2$$

Where Q is output and L is labour input

- i) Determine the average product of labour
 - ii) What is the corresponding marginal product of labour? (4 marks)
- f) Find the $MRTS_{L,K}$ given the following production function: (2 marks)

$$Q = L^{1/4} K^{3/4}$$

QUESTION TWO (20 MARKS)

- a) For the universal set $T = \{1,2,3,4,5\}$ and its subsets $A = \{2,3\}$ and $B = \{5\}$ find
- i) A'
 - ii) $(A')'$
 - iii) $(B')'$
 - iv) $A \cup B$
 - v) $A' \cup B'$ (5 marks)
- b) A researcher interviews 150 students in science: 70 were Physics students; 50 were registered in Chemistry; 90 were Biology students; 30 were registered in Physics and Chemistry; 20 registered in Chemistry and Biology; 30 registered in Physics and Biology and 10 registered in Chemistry, Biology and Physics. Use the Venn diagram, find the following:
- i) the number of students registered in two courses only
 - ii) the number of students registered in only one course
 - iii) the number of students registered in none of the three courses
 - iv) the number of students registered in at least two courses (10 marks)
- c) Explain the following by applying suitable logarithmic rules
- i) $\log_3(27)(81)$
 - ii) $\log_5\left(\frac{125}{625}\right)$ (5 marks)

QUESTION THREE (20 MARKS)

- a) Distinguish between behavioural and technical functions. Give examples of each. (4 marks)
- b) You are given the following consumption function:
- $$C = 2.4 + 0.75Y^d$$
- Where Y^d is disposable income
- You are given the following information:
- $$Y^d = Y - T$$
- $$T = tY$$
- Where Y is the total income; T, total tax; and t, tax rate
- i) Express consumption C, as a function of total income, Y
 - ii) Find the level of C if $t = 0.3$ and $Y = 100$ (6 marks)

c) Consider the following functions:

$$S = -130 + 0.15Y \quad (\text{Saving function})$$

$$M = 85 + 0.13Y \quad (\text{Import function})$$

$$X = 145 \quad (\text{Export function})$$

- i) Explain the negative savings (-130) in the savings function
- ii) What is the value if the marginal propensity to import (MPM)? Explain the meaning of the magnitude of the MPM.
- iii) What is the level of balance of trade at $Y = 0$?
- iv) At what level of Y is equilibrium balance of trade achieved? (10 marks)

QUESTION FOUR (20 MARKS)

- a) At an output of 10 units, a firm has total costs of 330 units and fixed costs of 30 units.
 - i) If the firm has a quadratic total cost function of the form $TC = \alpha + \beta Q^2$
 - 1) Determine the total cost function for the firm
 - 2) What are the average total cost, average fixed cost and average variable cost functions for the firm?
 - ii) If the firm's total cost function remains the same and the level of output and fixed costs also remain the same while total costs change to 500
 - 1) Determine the corresponding total cost function.
 - 2) Compute the corresponding average total cost, average fixed cost and average variable cost functions (12 marks)
- b) The Ministry of Education limits class enrolment to 42 students per teacher. However, it will cancel classes in which enrolments are less than 5 students per teacher. Develop relations that will describe these limitations (8 marks)

QUESTION FIVE (20 MARKS)

- a) Find the derivatives of the following:
 - i) $y = (3x^2 + x)^{2/3}$
 - ii) $y = \frac{x}{3+x^2}$
 - iii) $y = (4x)^3$ (6 marks)
- b) the demand function for a commodity is given by the following:
 $P = 50 - 0.5Q$
The cost of producing a commodity is made up of fixed cost of 200 shillings and the variable cost of 0.2 shillings per unit.
 - i) Find the profit function (π) for the commodity
 - ii) Determine the output level at which $\frac{d\pi}{dQ} = 0$ (6 marks)
- c) Consider the following demand function:
 $Q = 1/P^k$
 - i) Determine $\epsilon_{d,p}$, the price elasticity of demand for the function
 - ii) Show that the relation
 $MR = P \left(1 + \frac{1}{\epsilon_{d,p}}\right)$
Between marginal revenue and elasticity of demand is valid for this function. (8 marks)