MACHAKOS UNIVERSITY

University Examinations for 2017/2018 Academic Year

SCHOOL OF BUSINESS AND ECONOMICS

DEPARTMENT OF ECONOMICS

FIRST YEAR FIRST SEMESTER EXAMINATIONS FOR BACHELOR OF ECONOMICS AND ECONOMICS AND FINANCE

EES 100: MATHEMATICS FOR ECONOMISTS I

DATE: 7/12/2017 **TIME: 2:00 – 4:00 PM**

INSTRUCTIONS TO CANDIDATES

Answer Question **ONE** and any other **TWO** questions

QUESTION ONE (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:

$Q = L^{1/4} K^{3/4}$ (2 marks)

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 B

v) A' 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) $Log_5(\frac{125}{625})$ (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 Yd 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 (Saving function)

M = 85 + 0.13Y (Import function)

X = 145 (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 $TC = \alpha + \beta Q^2$

i) Determine the total cost function for the firm

ii) What are the average total cost, average fixed cost and average variable cost functions for the firm?

ii) If the firms total cost function remains the same and the level of output and fixed costs also remain the same while total costs change to 500

i) Determine the corresponding total cost function.

ii) 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) $y = \frac{x}{3+x2}$

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 $\varepsilon_{d,p}$, the price elasticity of demand for the function

ii) Show that the relation

$MR = P\left(1 + \frac{1}{\varepsilon d,p}\right)$

Between marginal revenue and elasticity of demand is valid for this function.

(8 marks)