GARISSA UNIVERSITY COLLEGE

(A Constituent College of Moi University)

UNIVERSITY EXAMINATION 2016/2017 ACADEMIC YEAR ONE SECOND SEMESTER EXAMINATION

SUPPLEMENTARY/SPECIAL EXAMINATION

SCHOOL OF BUSINESS AND ECONOMICS

FOR THE DEGREE OF BACHELOR OF BUSINESS MANAGEMENT

COURSE CODE: BBM 115

COURSE TITLE: BUSINESS MATHEMATICS II

EXAMINATION DURATION: 3 HOURS

DATE: 25/09/17 **TIME: 09.00-12.00 PM**

INSTRUCTION TO CANDIDATES

- **The examination has SIX (6) questions**
- **Question ONE (1) is COMPULSORY**
- **Choose any other THREE (3) questions from the remaining FIVE (5) questions**
- **Use sketch diagrams to illustrate your answer whenever necessary**
- **Do not carry mobile phones or any other written materials in examination room**
- **Do not write on this paper**

This paper consists of TWO (2) printed pages ***please turn over***

QUESTION ONE (COMPULSORY)

(a) Define the following terms as used in business:
Consumers' surplus **(1 mark)**
Producers' surplus**(1 mark)**
Loan amortization**(1 mark)**

(b) The output, Q for a firm over time, t in years is given by the function

$$Q = \frac{t^3}{30} - \frac{t^2}{5} + \frac{3t}{10} + 120$$

Determine the years in which the output is at maximum and minimum.**(5 marks)**

(c) The production function, Q of a commodity is given by

$Q = 10L + 5K - L^2 - 2K^2 + 3KL$

Where: L is the labour input

i. K is the capital input

Find the marginal product of labour (MPL) and marginal product of capital (MPK) when L=1 and K=2. **(4 marks)**

(d) The marginal cost (MC) function is given by $MC = 18 + 12Q - 9Q^2$ and $TC = 100$ when $Q = 0$.

Find the total cost (TC) function**. (3 marks)**

(e) The demand and supply function curves for a good are given respectively by the equations:

$P = 300e^{-0.2Q}$ and $P = 2e^{0.8Q}$

Find the equilibrium price P and quantity Q. **(4 marks**)

(f) A manufacturer makes two products x_1 and x_2. The first requires 5 hours for processing, 3 hours for assembling and 4 hours for packaging. The second requires 2 hours for processing, 12 hours for assembling and 8 hours for packaging. The plant has 40 hours available for processing, 60 hours for assembling and 48 hours for packaging. The profit margin for x_1 is \$7 and for x_2 it is \$21.Express the data in equations and inequalities necessary to determine the output mix that will maximize profits.

(6 marks)

QUESTION TWO (15 MARKS)

The demand function for a good is given by $P = 50 - 2Q$, while the total cost(TC) is given by $TC = 160 + 2Q$, where P is the price and Q is the quantity

Required:

i. Write down expressions for the total revenue (TR) and the profit function (π) **(2 marks)**

ii. Sketch the TC and TR functions on the same diagram**(4 marks)**

iii. Find algebraically, in terms of Q, when the firm breaks even, makes a profit and makes a loss**. (5 marks)**

iv. Determine the maximum profit and the value of Q at which profit is maximum.**(4 marks)**

QUESTION THREE

(a) A firm employing labour(L) as the only factor input has the following production function.

$Q = f(L) = Le^{-0.2L}$

Required:

i. Find the critical value of L.**(3 marks)**

ii. Confirm that the critical value of L maximizes Q. **(4 marks)**

(b) The total revenue and total cost of a multinational firm are given as follows:

$$TR = 12In(Q + 1)$$
$$TC = 4Q$$

Required:

i. Find the profit (π) function. **(1 marks)**

ii. Determine the critical values of Q for the profit function.**(3 marks)**

iii. Confirm that the critical value maximizes profit **(4 marks)**

QUESTION FOUR(15 MARKS)

(a) Find the cross-partial derivatives of the function $z = x^3 y^4$ **(3 marks)**

(b) For a multinational company, the number of units produced when using x units of labour and y units of capital is given by

$$f(x, y) = 80 x^{\frac{1}{4}} y^{\frac{3}{4}}$$

Required:

i. Find the equations for both marginal productivities (MPL and MPK) **(2 marks)**

ii. Evaluate and interpret the results in **(i)** when 625 units of labour and 81 units of capital are used**.** **(4 marks)**

(c) A production function is given by the equation $Q = 8K^{\frac{1}{2}} L^{\frac{1}{4}}$ where K is the capital input and L the labour input.

Required:

i. Find the marginal production of labor and marginal production of capital.**(2 marks)**

ii. Determine whether or not the function is characterized with diminishing returns to factor inputs. **(4 marks)**

QUESTION FIVE (15 MARKS)

(a) Evaluate $\int_1^3 \frac{1}{2} x^2 dx$ (**2 marks)**

(b) The marginal cost function is given by the equation $MC = 15 + 10Q - 6Q^2$. Find the total cost function (TC) given that TC=50 when Q=2. **(3 marks**

(c) The supply function is given by the equation $P = Q^2 + 6Q$ where Q is the quantity of goods.

Required:
Calculate the producers' surplus whenthe market equilibrium price $P_e = 40$ units. Graph the the supply function and shade the producers' surplus. **(5 marks)**

(d) The demand function is given by the equation $P = \frac{100}{Q + 2}$ where Q is the quantity of goods.

Required:

i. Calculate the consumers' surplus when the market equilibrium price $P_e = 20$ units. Graph the the demand function and shade the consumers' surplus. **(5 marks)**

QUESTION SIX (15 MARKS)

(a) To provide for future education costs, a family considers various methods of savings. The savings will continue for a period of 10 years at an interest rate of 7.5% p.a.

Required:

(i) Calculate the value of the fund at the end of 10 years when a single deposit of $2000 is made annually. **(2 marks)**

(ii) How much should be deposited each year if the final value of the fund is $40000. **(2 marks)**

(iii) How much should be deposited each month if the final value of the fund is $40000. **(3 marks)**

(b) Halima intends to amortize a loan of $10000 at a rate of 7% p.a in six years. She decides to make annual equal payments at the end of each year.

Required:

(i) How muchwill Halima pay annually? **(2 marks)**

(ii) Prepare a loan amortization schedule for the loan?**(6 marks)**