



PAN AFRICA CHRISTIAN UNIVERSITY

SCHOOL OF HUMANITIES AND SOCIAL SCIENCES

**END OF SEMESTER EXAMINATION FOR THE DEGREE OF
BACHELOR OF COMMERCE**

DIPLOMA IN ENTREPRENEURSHIP MANAGEMENT

JANUARY-APRIL 2019 SEMESTER

CAMPUS: ROYSAMBU

DEPARTMENT: BUSINESS STUDIES

COURSE CODE: BCM105|DENT0112

COURSE TITLE: QUANTITATIVE TECHNIQUES

EXAM DATE: MONDAY 8TH APRIL 2019

TIME: 9.00AM-12.00PM

INSTRUCTIONS

- Read the instructions and questions carefully before you write the answers.
- Write your **STUDENT NUMBER** in the Answer Booklet given
- This paper consists of **five questions**.
- Answer Question **ONE** and any other **FOUR** questions
- *Write clearly and legibly.*
- *ALL PAC University's examination rules and regulations apply*

QUESTION ONE: COMPULSORY

a) Highlight three uses of calculus in the business world (3 Marks)

b) Explain any three assumptions of liner programing model (6 Marks)

c) Determine the maximum and minimum points of the following functions

i. $Y = 8x^3 - 21x^2 + 18x + 12$ (4 marks)

ii. $Y = 12(x + 1)^3 + 6$ (5 Marks)

d) Using Matrices evaluate the following function

i. $2x + 4y - 3z = 12$

$$3x - 5y + 2z = 13 \quad (6 \text{ Marks})$$

$$-x + 3y + 2z = 17$$

ii. $5x + 9y = -30$

$$6x - 2y = 28 \quad (3 \text{ Marks})$$

e) A shop stocks two types of Jembes, Type 1 and Type II. Twelve type 1 and five type II Jembes cost shs 1,260 while nine type I and fifteen type II Jembes cost shs 1,620. A farmer bought ten Type 1 and ten Type II Jembes. Determine the amount he paid for them using matrices (5 Marks)

f) A manufacturing company has the following average cost function (AC) and average revenue (AR) functions

$$AC = 1/2Q^2 - 5/2Q + 50 + 500/Q$$

$$AR = 800 - 2Q^2$$

Where Q is the output produced

Required

Determine

i. The profit function (3 Marks)

ii. The output required to maximize profit (3 Marks)

iii. The maximum profit (2 Marks)

QUESTION TWO

- a) Integrate each of the following functions with respect to x
- i. $\int 1/3\sqrt{x} \, dx$ (3 Marks)
 - ii. $\int (6x^6 + 4x^{2/3} + 8) \, dx$ (3 Marks)
- b) Differentiate each of the following functions with respect to x
- i. $Y = \frac{3x^3 + 3x^2 + 3}{2x}$ (3 Marks)
 - ii. $Y = (4x^2 - 3x)^{1/2}$ (3 Marks)
 - iii.
 - iv. $Y = (7x + 3)(4x^2 + 5)$ (3 Marks)

QUESTION THREE

- a) A firm has analyzed their operating condition and has developed the following functions
- $$\text{Total Revenue (TR)} = 400Q - 4Q^2$$
- $$\text{Total Cost (TC)} = Q^2 + 10Q + 30$$
- Where Q is the number of units sold

Required

Determine the level of output (Q) that the firm should sell in order to maximize profit (5 Marks)

- b) A company manufactures large scale units. It has been shown that the marginal cost is $Mc = (92 - 2x)$ Shs. thousands, where x is the number of units of output per annum. The fixed costs are Shs. 800,000 per annum. It has also been shown that the marginal revenue function is $MR = (112 - 2x)$ Shs. thousands.

Required

- i. Determine the profit function (5 Marks)
- ii. Determine the number of units of output that would maximize profit (3 Marks)
- iii. The maximum profit (2 Marks)

QUESTION FOUR

- a) Two manufactures X and Y are competing in a certain market. The state transition matrix for the markets summaries the probabilities that customers will move from one manufacture to the other in a given month.

	X	Y
X	0.9	0.1
Y	0.4	0.6

Required

Interpret the state transition matrix in terms of

i. Retention and losses (3 Marks)

ii. Retention and gains (3 Marks)

- b) Two soft drink products Gleem and Sparkle are competing in the market and their current market share is 60% and 40% each respectively.

Each week the customers of each product switch the product they are consuming. Of those who bought Gleem the previous week 70% will consume the product again this week and the rest will switch to Sparkle. Of those who consumed Sparkle the previous week 80% will consume it this week and the rest will switch to Gleem.

Required:

- i. Determine the state transition matrix (1 Mark)
- ii. Determine the percentage that will be consuming the two products this week (2 Marks)
- iii. Determine the percentage that will be consuming the two products next week (2 Marks)
- iv. If this process persists long enough, determine the equilibrium market share of the two products. (4 Marks)

QUESTION FIVE

- a) Solve the following inequalities

i. $-3x + 2 \leq 7$ (2 Marks)

ii. $5x^2 + 3x \geq 3x^2 + 2$ (3 Marks)

- b) Consider the following linear programming problem;

Maximize $Z = 4x + 3y$

Subject $4x + 3y \leq 24$

$x \leq 45$ and $y \leq 6$

$x, y \geq 0$

Required

Use graphical method to find the optimal solution for the problem (10 Marks)

QUESTION SIX

- a) Explain the following terms as used in networking analysis
- i. Activity (2 Marks)
 - ii. Event (2 Marks)
 - iii. Dummy activities (2 Marks)
- b) The project of constructing a footbridge over a dual carriage way has been broken down into activities and their duration in the precedence table below. Use it to answer the questions that follow

<u>Activity</u>	<u>Preceding Activity</u>	<u>Duration (weeks)</u>
A	-	10
B	A	12
C	A	8
D	B	8
E	B	14
F	C	6
G	C	15
H	E, F	10
I	D, H	6
J	G	12
K	I, J	10

Required

- i. Construct a network for the project represented by the precedence table (7 Mark)
- ii. Determine the critical path of the project (2 Marks)