PAN AFRICA CHRISTIAN UNIVERSITY

SCHOOL OF LEADERSHIP, BUSINESS & TECHNOLOGY

END OF SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF COMMERCE

JANUARY-APRIL 2019 SEMESTER

CAMPUS: VALLEY ROAD

DEPARTMENT: BUSINESS STUDIES

COURSE CODE: BCM105

COURSE TITLE: QUANTITATIVE TECHNIQUES

EXAM DATE: WEDNESDAY 10th APRIL 2019

DURATION: 3 HOURS

TIME: 5:30PM-8:30PM

INSTRUCTIONS

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

QUESTION ONE: COMPULSORY

a) Explain three uses of calculus in business (6 Marks)

b) Solve the following equations using matrices

i. $2x + 4y + z = 8$
$3x + 3y + z = 16$ (6 Marks)
$3x + y + 2z = 8$

ii. $2x + 3y = 13$
$3x + 2y = 12$ (3 Marks)

c) Bunda bakery produces two types of cakes namely; queen cake and black forest. The cost of producing ten queen cakes and eight black forest is shs 4,060 while the cost of producing four queen cakes and seven black forest is shs2,840. Using matrices determine the cost of producing five queen cakes and five black forest. (5 Marks)

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

i. $Y = x^3 - 6x^2 + 9x - 4$ (4 Marks)

ii. $Y = x^3 - 3x + 2$ (4 Marks)

iii. $Y = 1/3x^3 + x^2 - 35x + 10$ (4 Marks)

e) Given that

$TC = Q^3 - 39.5Q^2 + 120Q + 150$

$TR = 45 - 0.5Q^2$

Where Q is the level of output in units

Required

i. Determine the maximizing level of output (6 Marks)
ii. Determine the total amount of profit at the maximizing level of output (2 Marks)

QUESTION TWO

a) Differentiate each of the following functions with respect to x

i. $y = (x^2 + 3)(2x^3 + x^2 - 3)$ (3 Marks)

ii. $y = \frac{6x^2 - 4x}{3x}$ (3Marks)

iii. $y = (9x^2 + 5x)^4$ (3 Marks)

b) Integrate each of the following functions with respect to x

i. $\int(\sqrt{x^3})\,dx$ (3 Marks)

ii. $\int(5x^4 + 8x^3 - 6x^2 + 4x)dx$ (3 Marks)

QUESTION THREE

a) The demand for a commodity is given by P = 400 – Q. The average total cost of producing the commodity is given by
$AC = 1000/Q + 100 - 5Q + Q^2$

Where

P is the price in shillings and Q is the quantity in kilograms.

Required

i. Determine the profit function (3 Marks)
ii. Determine the output that leads to maximum profit. (3 Marks)
iii. Calculate the maximum profit at the level of maximizing profit (2 Marks)

QUESTION FOUR

a) Solve the following using matrices

$x_1 + 2x_2 + 4x_3 = 4$
$2x_1 + x_3 = 3$ (6 Marks)
$3x_1 + x_3 = 2$

b) Given the Average revenue and the Marginal cost functions of a given firm are

$AR = 650-15Q$

$MC = 9Q^2 - 14Q + 180$

Where AR is Average Revenue in Million shs

MC is Marginal Cost in Million shs
Q is level of output

The Fixed cost of production is 25 Million shs

Required

i. Determine the profit function (4 Marks)
ii. Determine the level of output that maximizes the profit (3 Marks)
iii. Determine the amount of profit (2 Marks)

QUESTION FIVE

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	0.6	0.4
Y	0.1	0.9

Required

Interpret the state transition matrix in terms of

i. Retention and losses (3 Marks)
ii. Retention and gains (3 Marks)

b) A marketing division of a tooth paste called Zee manufacturing company has analyzed the market and made the following conclusion. The current market share of Zee toothpaste and Other brands is 70% and 30% respectively.

Each month the customers of each product switch the product they are consuming. Of those who bought 80% of Zee's customers retain the brand while the rest switch to the other brands. While 60% of customers who used the other brand's toothpaste customers were retain while the rest switched to Zee toothpaste.

Required:

i. Determine the state transition matrix (1 Mark)
ii. Determine the percentage that will be consuming the two products this month (2 Marks)
iii. Determine the percentage that will be consuming the two products next month (2 Marks)
iv. If this process persists long enough, determine the equilibrium market share of the two products. (4 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) Wanjenzi Ltd. is a construction company that builds residential houses for sale. In a new site in Kitengela they intent to undertake a project with the following ten activities.

Activity	**Preceding Activity**	**Time (weeks)**
A	-	7
B	-	4
C	A	6
D	A	5
E	A	4
F	C	4
G	D	6
H	B, D, E	6
I	H	3
J	F, G, I	4

Required

i. Draw a network diagram for the project (7 Marks)
ii. Determine the critical path (2Marks)