KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2019/2020

FIRST SEMESTER EXAMINATION FOR THE DEGREE OF

BACHELOR OF SCIENCE IN CONSTRUCTION MANAGEMENT

BCM 103: MATHEMATICS FOR CONSTRUCTION I

DATE: Wednesday, 18th December 2019 **TIME:** 2.00 p.m. - 4.00 p.m.

INSTRUCTIONS:

1. *Answer questions ONE (section A) and any other TWO questions in section B.*
2. *Be neat and show all your workings.*
3. *All questions except question one carry equal marks.*

QUESTION ONE (20 MARKS)

a) A company establishes that the total cost of producing x items is given by

$e(x) = 4{,}000 + 5x + \frac{x^2}{1000}$ find:

i. The total cost the marginal and the average cost at production levels 1.000 items 2,000 items and 3,000 items. (5 marks)

ii. At what production level is the average cost minimum and what is the corresponding minimum average cost. (4 marks)

b) A two digit number is such that the sum of the digits is seven. When the digits are reversed the value of the number obtained is 9 greater than the value of the original number. Find the original number. (6 marks)

c) Two time Mary's age plus the age of John is equal to 8. Three times John's age plus four times Mary's age is equal t o18. Find the age of Mary and John. (5 marks)

d) A tycoon has 3 house girls who he pays Ksh 4,000 each per month, 2 watch men who he pays Ksh. 5000 each and some garden men who receives Ksh. 7,000 each. If he pays out an average of Ksh. 5,700 per month to these people, find the number of garden men. (5 marks)

e) Two programs were broadcast on television at the same time, one was Big games and the other was Ice stars. The XYZ Ratings company uses boxes attached to television sets to determine what shows are actually being watched. In its survey of 1000 homes at the

midpoint of the broadcasts, their equipment showed that 53 households were watching both shows, 736 were watching the Big game and 55 households were not watching either. How many households were watching only the Ice stars? Determine the percentage of the households that was not watching either broadcast. (5 marks)

QUESTION TWO (MARKS)

a) Gymnast Clothing manufactures expensive hockey jerseys for sale to college bookstores in runs of up to 150. Its cost (dollars) for a run of hockey jerseys is

$c(x) = 1500 + 10X + 0.2x^2$. Gymnast Clothing sells the jerseys at 9000 each. Find:

i. The revenue function. (3 marks)

ii. Profit function (3 marks)

iii. The number of Jerseys that Gymnast Clothing manufacture to make a profit. (3 marks)

b) Evaluate the following limits

i) $\lim_{l \to 4} \left(\frac{2x^2 - 7x - 4}{x^2 - 16} \right)$

ii) $\lim_{x \to \infty} \sqrt{x^2 + x}$ - x

iii) $\lim_{x \to 0} \frac{x^2}{1 - cos2x}$

(7 marks)

c) Using the 1st principle, obtain the derivative of $f(x) = \sqrt{3x + 12}$. (4 marks)

QUESTION THREE (20 MARKS)

a) The cost sh C and the number of items x to be produced each day are related by the formula $C(x) = \$\left[\frac{3600}{x}\right]$.

b) Determine the marginal cost and the total cost at production level x = 40 items. (4 marks)

c) Determine the equation of the curve that passes through the point (1.6) and whose gradient function is given by $\frac{dy}{dx} = 3x^2 - 4x + 5$. (3 marks)

d) Determine $\frac{dy}{dt}$ fot the function. $y = \left(t^2 + \sqrt{t}\right)\left(\frac{I}{t} - I\right)$ (4 marks)

e) The value \$V of a share t years after the initial public offer (IPO) is given by the equation $V(t) = 10e^{-0.1l}$

i. Write down the initial value of the share. (2 marks)

ii. Determine the time t when the value of the share will fall to half it's initial value. (2 marks)

iii. Determine the rate of change of the value of the share at the time when the share is half it's initial value. (2 marks)

QUESTION FOUR (20 MARKS)

a) The value of a car $v is related to its age t years by the formular $v = \frac{2000000}{4t+5}$. Find value of the car and its rate of depreciation at t=0.75 years. (5 marks)

b) A product is offered for sale over a period of 5 years in a large store. The value of the sale sh S at time t years after launching is given by the equation $S(t) = 3000(t^2 - 2t + 3)$.

i. Determine the value of the sale at the time of launching and also 3 years after launching. (3 marks)

ii. Determine the value of t when the sale have their least value and also determine the least value of the sales. (3 marks)

c) In a recent survey people were asked if they watched citizen KTN or NTV news. The results were 73 watched Citizen News, 51 watched KTN news, 27 watched NTV news and 2 said they did not watch any of the news stations. Also 10 watched all the three news stations. 33 watched citizen and KTN news. 18 watched KTN and NTV news while 5 watched both citizen and NTV news. Determine:

i. The number of people that were surveyed. (2 marks)

ii. The number of people that watched exactly two news stations. (4 marks)

iii. The number of people that watched utmost one time of the year. (3 marks)

QUESTION FIVE (20 MARKS)

a) For the following costfunction:

b) $C = 1000 + 100Q - 15Q^2 + Q^3$.

Compute:

i. Total cost, average cost and average fixed cost, when output is 10. (6 marks)

ii. Marginal cost of the 8^{th} unit of output. (2 marks)

c) Given that A is the set of odd numbers less than 20, and B is the set of prime numbers less than 20, list the members of $A, B, A \cap B, A \cup B$. (4 marks)

d) List the members of the set of real numbers for which the expression holds. (3 marks)

$$\frac{1}{(x-1)\,(x-2)(x-3)}$$

e) In a group of 150 health experts, 85 are dishonest, 57 have been accused of corruption and 35 of those accused were really guilty. Determine the number of honest health experts that have not been accused. (5 marks)