



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2017/2018

FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF  
COMMERCE

BMS 100: MANAGEMENT MATHEMATICS I

DATE: MONDAY 27<sup>TH</sup> NOVEMBER 2017

TIME: 8.00 A.M. – 10.00 A.M.

INSTRUCTIONS: Answer question ONE and any other TWO questions

QUESTION ONE (COMPULSORY) - 30 MARKS

- a. Identify four types of equations applicable in business, giving examples (4 marks)
- b. An efficiency study of the morning shift at a certain factory indicates that an average worker who arrives on the job at 8.00 am will have produced  
 $Qt = -t^3 + 6t^2 + 24t$  units in  $t$  hours later
- i) Compute the workers rate of production at 11.00 am (3marks)
- ii) At what rate is the workers rate of production changing with respect to time at 11.00 am? (2marks)
- c. The number of students enrolled in a Lorraine university campus is 200. Out of these 89 students take Economics, 57 students take Law, 47 students take Statistics, 11 students take both Economics and Law but not Statistics, 3 students take all the three subjects, 5 students take Economics and Statistics but not Law, 8 students take Statistics and Law but not Economics.
- Required:
- i) Present the above information using a Venn diagram (2 marks)
- ii) determine the number of students who take Law only (2 marks)
- iii) determine the number of students who take at least two subjects (2 marks)
- iv) determine the number of students who take none of the three subjects (2 marks)
- d. Mmachinga sells exercise books and pencils at Mwembe Tayari. Each exercise book sells at Sh.20 and a pencil sells at Sh.15. During the month of September 2017, Mmachinga's total sales were Sh. 3,450. Customers bought 5 times as many books as pencils.
- Required:
- i) The number of pencils sold by the hawker in September 2017 (3 marks)
- ii) The number of exercise books sold by the hawker in September 2017 (1 mark)
- e. Differentiate between the following terms
- i) Annuity due and perpetuity (2 marks)
- ii) Simple interest and compound interest (2 marks)

- f. An environmental study of a certain community suggests that the average daily level of carbon monoxide in the air will be  $C(p) = 0.5p + 1$  parts per million when the population is  $p$  thousand. It is estimated that  $t$  years from now the population of the community will be  $P(t) = 10 + 0.1t^2$  thousand.

i) Express the level of carbon monoxide in the air as a function of time

(3 marks)

ii) When will the carbon monoxide level reach 6.8 parts per million?

(2marks)

### **QUESTION TWO - 20 MARKS**

- a. Basel Company limited specializes in manufacturing refrigerators. The total cost of producing  $x$  refrigerators per week is given by  $300x + 2000$ . The demand function is estimated as  $500 - 2x$ .

i) Derive the revenue function,  $R$

(2marks)

ii) Obtain the total profit function

(2marks)

iii) How many units per week should be produced in order to maximize profit?

(4marks)

iv) What is the maximum profit available?

(1mark)

- b. Mary wants to save Kshs. 800,000 over the next 7 years and then use this amount as a down payment on a house. She wants to be depositing the money after every three months (i.e. on quarterly basis). In order to arrive at this goal, how much money must she deposit at the end of each quarter into an account that earns interest at a rate of 5%, compounded quarterly?

(5 marks)

- c. A company manufactures two products: product I and product II. Each unit of product I require 3 labour hours and each unit of product II requires 5 labour hours. Daily manufacturing capacity is 150 labour hours.

i) If  $X$  units of product I and  $Y$  units of product II are manufactured each day and all labour hours are to be used, determine the linear equation that requires the use of 150 labour hours per day.

(2 marks)

ii) How many units of A can be made each day if 25 units of B are manufactured each day?

(2 marks)

iii) How many units of A can be made each week if 12 units of B are manufactured each day? (Assume a 5-day work week).

(2 marks)

### **QUESTION THREE - 20 MARKS**

- a. Kabaroo has been a tenant at Sunrise flats in town. He used to pay a fixed constant annual increase, but he paid KSh. 10,000 on the 12<sup>th</sup> year. The total amount he had paid to the landlord for the last 12 years is KSh. 90,000. Determine the initial rent on first year and the fixed rate of increase

(5 marks)

- b. A company which has five regular customers: Agnes (A), Beth (B), Carol (C), Daniel (D), and Edna (E) stocks products  $a, b, c, d, e, f, g, h, i, j$  and  $k$ . Agnes buys products  $a, b, c, e$  and  $j$  only. Beth buys products  $a, c, e, f, g, h$  and  $k$ , Carol buys products  $a, c, f$  and  $g$ . Daniel buys products  $a, e$ , and  $f$ . Edna buys products  $a, e, f$  and  $g$ . Specify the elements of each of the following sets.
- The universal set  $U$ , for A, B, C, D, and E. (2 marks)
  - $C \cup D$  (2 marks)
  - $E \cap B$  (2 marks)
  - $(A \cup C) \cap B^c$  (2 marks)
  - $C^c$  (2 marks)
- c. A company borrows \$ 700000 from the bank at 10% compounded semi-annually. If no repayments are made,
- How much is owed after 6 years? (3 marks)
  - Calculate the compound interest earned (2 marks)

#### **QUESTION FOUR - 20 MARKS**

- a) Malago Business Consultants (MBC) is giving business advice to their clients. They have estimated the demand curve for their client as  $AR = 200 - 8Q$  where  $AR$  is average revenue in millions of shillings and  $Q$  is the output in units. Investigations into the client's cost profile shows that marginal cost ( $MC$ ) is given by  $MC = Q^2 - 28Q - 211$ . Further investigations have shown that the client's cost when not producing output is Ksh. 10 million.
- Required:
- Total cost equation function (5 marks)
  - Total revenue function (2 marks)
  - Total profit function (3 marks)
  - The level of output that maximizes profit (4 marks)
- d. A company produces three products, each of which must be processed through different three departments. The table below summarizes the hours required per unit of each product in each department. Monthly labour-hour capacities for the three departments are 1600, 800 and 1800 hours respectively. Determine whether there is a combination of the three products which could be produced monthly to consume all the labour-hours in each department.

| Department | Product 1 | Product 2 | Product 3 |
|------------|-----------|-----------|-----------|
| A          | 4         | 5         | 2         |
| B          | 3         | 2         | 3         |
| C          | 1         | 4         | 2         |

(6 marks)