



MACHAKOS UNIVERSITY

University Examinations for 2017/2018 Academic Year

SCHOOL OF BUSINESS AND ECONOMICS

DEPARTMENT OF BUSINESS, ENTREPRENEURSHIP & MANAGEMENT SCIENCE

FIRST YEAR FIRST SEMESTER EXAMINATION FOR BACHELOR OF COMMERCE

BMS 100: MANAGEMENT MATHEMATICS I

DATE: 14/12/2017

TIME: 2.00-4.00 PM

INSTRUCTIONS

Answer Question ONE and Any Other Two Questions

QUESTION ONE (COMPULSORY) 30 MARKS

a) Name four areas where business mathematics is applicable (4 marks)

b) Using the quotient rule, differentiate (3 marks)

$$\frac{X^{3/4}}{2+X^3}$$

c) Find the equation of a curve passing through(4,1) if its slope is derivative

$$\frac{dy}{dx} = \frac{x^2-4}{x^2} \quad (3 \text{ marks})$$

d) Find $\frac{dy}{dx}, \frac{d^2y}{dx^2}$, for $2x^2-3x, x+x^2$ (3 marks)

e) Mark the following statements as either True or FALSE. (5 marks)

- i) The empty set is a subset to every set
- ii) A set with two elements has more than two subsets
- iii) Second order conditions are sufficient to identify the nature of a turning point
- iv) $y = 10x^2 + 15e - 0.03$ is an exponential function
- v) A multi-variate function has more than one dependent variable

- e) A bus travels from Nairobi to Makindu at a speed of x km/h a distance of 320 km. If the speed is reduced by 20 km/h the bus will take 48 minutes. Represent the information as a quadratic equation and solve using the formula method (4 marks)
- f) Kamau borrowed a 3 year loan of shs.100,000 at an interest rate of 9 percent p.a. The repayment is to be made in 3 equal installments at the end of each year.

Required

- Prepare a loan harmonization schedule (8 marks)
- g) What are the disadvantages of non-discounted techniques of project appraisal (3 marks)

QUESTION TWO (20 MARKS)

A firm finds that the marginal revenue is given by the expression $20 - 2q$ while marginal cost is given by the expression $4q - 10$. Its fixed cost is shs.30. q represents quantities of output produced and sold.

required

- a) i) Total revenue (2 marks)
- ii) Total cost (2 marks)
- iii) Profit function (2 marks)
- b) Profit maximizing
- i) Output (2 marks)
- ii) Price (3 marks)
- iii) The maximum profit (2 marks)
- c) The average total cost at profit maximizing output. (3 marks)
- d) Break even point (3 marks)

QUESTION THREE 20 MARKS

- a) A firm intends to borrow ksh.1,000,000 to be invested in either project 1 or project 2. The annual interest payable is 15 percent. The following are the expected cash flows for the two projects

Period	Project 1(ksh)	Project 2(ksh)
1	500,000	600,000
2	300,000	500,000
3	400,000	400,000
4	550,000	450,000
5	600,000	300,000

Required

- i) Profitability Index
- ii) Net present value
- iii) Advise the management on the best project to invest in. Give reasons
- b) What are advantages of using internal rate of return IRR as a project appraisal technique
- c) A shopkeeper has articles for sale. After selling a number a number of articles at shs.5 each, he sells the remainder at shs.4 each and his total receipts are 11 pounds. If total receipts come to 11 pounds and shs 10. calculate the number sold at each of the prices and the number of articles sold together in total how many were sold (5 marks)
- d) factorize $pq-8r-2p+4rq$

QUESTION FOUR 20MARKS

- a) Chapati Mix ltd conducted a market survey to investigate customers loyalty to the companies three brands of flour namely Ngano ,Chapo and Super flour. The survey covered a total of 140 households. The following results were obtained from the survey
- 53 of the households were loyal to the Ngano brand
 - 52 of the households were loyal to the Chapo brand
 - 54 of the households were loyal to the super flour brand
 - 15 of the households were loyal to both the Ngano and Chapo brands
 - 10 of the households were loyal to both the Ngano and super flour brands
 - 12 of the households were loyal to both the Chapo and super flour brands
 - 13 of the households were not loyal to any of the three brands

Required

- i) present the above information in a venn diagram (5 marks)
- ii) the number of households that were loyal to all the three brands (5 marks)
- iii) The number of household that were loyal to exactly two brands (5 marks)
- iv) The number of households that were loyal to the Ngano brand (5 marks)
- v) The number of households that were loyal to at most one brand (5 marks)
- b) How is set theory useful in business (5 marks)

QUESTION FIVE 20MARKS

- a) Jaribu ltd manufactures 2 types of milling machines, ace, and champion which costs shs .10 and shs.15 respectively per unit. There is a budget constraint of shs.850. if it has been established that the profit function is

$$\pi r^2 = 60x + 150y - x^2 - 3y^2$$

Required

Determine the optimal number of machines if x and y are the respective number of ace and champion to be produced (10 marks)

- b) A firm conducted a survey on the demand of one of its products and established that the demand function to be $p = 500q + 12,500$ where q is the number of units demanded at price p. The estimated fixed cost to produce one unit of the product was ksh.6000 while the variable cost was shs.5 per unit

Calculate

- i) Quantity that would be produced to maximize profits. (5 marks)
- ii) The selling price per unit that would maximize profits (5 marks)