



MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)
University Examinations for 2015/2016 Academic Year

SCHOOL OF BUSINESS AND ECONOMICS

DEPARTMENT OF BUSINESS ENTREPRENEURSHIP AND MANAGEMENT
SCIENCES

FIRST SEMESTER EXAMINATION FOR DEGREE IN BACHELOR OF COMMERCE

BMS 100: MANAGEMENT MATHEMATICS 1

Date: 1/12/2015

Time: 11:00 – 1:00 PM

INSTRUCTIONS

Answer Question One and Any Other Two Questions

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

$$\frac{X^{Y_3}}{2 + X^5})$$

- b) Using the quotient rule, differentiate

- c) find $\frac{dy}{dx}$, $\frac{dy}{dx^2}$, for

$$y = 2x_1^2 - 3x_1, x_2 + x_2^2 \quad (2 \text{ marks})$$

- d) find the equation of a curve passing through (4,1)

$$\text{if it's slope is } \frac{dy}{dx} = \frac{x^2 - 4}{x^2} \quad (3 \text{ marks})$$

- e) Answer the following questions by stating TRUE or FALSE

- (i) given that $A = \{0, 1, 2, 3, 0, 6\}$

A is a well defined set

- (ii) a set with two elements has more than two subsets

(iii) $y = x_2^{10}$ is a polynomial function

(iv) $y = 10x^2 + 15e^{-0.03}$ Is an exponential function.

(v) Second order conditions are sufficient to identify the nature of a turning point.
(5 marks)

- f) Jesse borrowed sh. 600000 from a bank and agreed to pay sh. 12000 per month plus 2% interest per month on the outstanding balance .

Required.

the total interest paid on the loan over 48 months. (4 marks)

- g) A bus travels from Nairobi to MutitoAndei at a speed of x km/h a distance of 320km. 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. (5 marks)

- h) Kamau borrowed a 3 yr loan of shs. 100,000 at an interest rate of 9% p.a. The repayment is to be made in 3 equal installments at the end of each year. Required. Prepare a loan harmonization schedule showing;-

- annual installments
- interest
- principal repayment
- the outstanding balance

(5 marks)

2. A firm finds that the marginal revenue is given by the expression $20 - 2q$ while the 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 (2 marks)

(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)

3. a) A firm intends to borrow ksh. 1000 000 to be invested in either project 1 or project 2. the annual interest payable is 15%. 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 (3 marks)
(ii) Net present value (6 marks)
(iii) Advise the management on the best project to invest in. Give reasons. (2 marks)
- b) What are the advantages of using internal rate of return (IRR) as a project appraisal technique. (3 marks)
- c) Factorize the function (3 marks)

$$pq - 8r - 2p + 4rq$$

- d) A shop keeper has articles for sale. After selling a number of articles at 5/= each, he sells the remainder at sh. 4 each and his total receipts are £11 pounds. If total receipts come to £11 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. (3 marks)
4. a) ChapatiMix 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 t 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

- Present the above information in a venn diagram (5 marks)
 - The number of households that were loyal to all the three brands (4 marks)
 - The number of households that were loyal to exactly two brands (3 marks)
 - The number of households that were loyal to the ngano brand (2 marks)
 - The number of households that were loyal to at most one brand (3 marks)
- b) How is set theory useful in business (3 marks)
5. a) Jaribu Ltd Manufactures 2 types of milling machines ; Ace and Champion which cost 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

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

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 the demand function to be $P = 500q + 12500$

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

- Quantity that would be produced to maximize profits (5 marks)
- Selling price per unit that would maximize profits. (5 marks)