360

(University of Choice)

MASINDE MULIRO UNIVERSITY OF SCIENCEAND TECHNOLOGY (MMUST)

UNIVERSITY EXAMINATIONS
2023/2024 ACADEMIC YEAR

FIRST YEAR FIRST SEMESTER EXAMINATIONS

FOR THEDEGREE OF

BACHELOR OF SCIENCE IN ACCOUNTING; BACHELOR OF COMMERCE; AND BACHELOR OF EDUCATION (ARTS)

COURSE CODE: **BCB 114**

COURSE TITLE: **BUSINESS MATHEMATICS**

DATE:TUESDAY, 19TH /12/2023 **TIME: 3:00 – 5:00PM**

INSTRUCTIONS TO CANDIDATES

1. **The Paper Contains Two Sections: Sections I and II**
2. Answer *All Questions in Section I* and *Any Two Questions in Section II*
3. Clearly show your workings for each question

TIME: **2 HOURS**

MMUST observes ZERO tolerance to examination cheating

SECTION I: COMPULSORY (30 MARKS)

(Answer ALL Questions from this Section)

QUESTION ONE

a) Highlight **three** significances of Business Mathematics in the business (03 marks)

b) Solve for X, Y and Z using matrix algebra (10 Marks)

$2x + y - z = 11$
$x - 2y + 2z = -2$
$3x - y + 3z = 5$

c) Differentiate the following equations stating the rule applicable.

i) $Y = (24 + x^2 + 3x^4)^8$ (2 mks)

ii) $Y = (4x^2 + 3x)(8x^3 + 6)$ (2 mks)

d) Given below is the company's total cost and price function:

Total cost (TC) $= 11Q^2 - 1000Q + 800$

Price (P) $= 200 - Q$

Required

i) How many units should the firm produce in order to break-even (2 mks)

ii) Determine the price per unit produced (2 mks)

iii) What is the possible profit realized by the manufacturer, is it maximum or minimum (3 mks)

e) In research carried out by certain media house of 600 citizens who listened to news broadcasts in the radio, 310 regularly listened to the seven o'clock news and 370 regularly listened to late night news on radio, while 120 regularly listened to both news casts.

Required:

i) The number of citizens who listened to late night news but not the seven o'clock news (02 marks)

ii) The number of citizens who listened to at least one of the news broadcasts (02 marks)

iii) The number of citizens who did not listened to either of the news broadcast (02 marks)

SECTION II (40 MARKS)

(Answer Any Two Questions from this Section)

QUESTION TWO

a) A customer deposits ksh250 every 3 months into a building society account that pays interest at a rate of 8% per annum convertible quarterly (i.e. compounded every 3 months). How much money will be in the account at the end of 10 years? (4 marks)

b) A business manager wants to make an investment in a project whose cost is $2 million. The cost is expected to remain constant in nominal terms. He can save $40,000 annually to fulfill his desire. How long should he wait if his savings earned an interest rate of 13%? (6 Mks)

c) An initial cost of a project is sh. 1,000,000. The project is expected to generate sh. 250,000 at the end of year 1, sh. 300,000 at the end of year 2, sh. 310,000 at the end of year 3, and sh. 450,000 at the end of year 4. Assuming that the discounting rate is 15 percent per annum. Using the net present value (NPV) and payback period (PBP) determine if the investment is worthwhile (10 marks)

QUESTION THREE

a) A consumer survey among 2000 consumers conducted by CCK during the month of February 2020 revealed the following switching patterns among 800 users of safaricom, 100 consumers shifted their loyalty to Airtel and 200 consumers shifted their loyalty to Telkom, the rest remained loyal to Safaricom. Among 600 users of Airtel 250 consumers shifted their loyalty to Safaricom, 150 consumers shifted to Telkom while the rest remained steadfast to Airtel. Among 600 users of Telkom, 300 consumers shifted their loyalty to Safaricom and 150 consumers migrated to Airtel while the rest were hard-core royals to Telkom.

Required

i) Transition matrix representing the above switching pattens (2mks)

ii) Respective market shares two months later (6 mks)

iii) Market share in the longrun (6mks)

b) Ten boys are running a race; in how many ways can the first three places be filled if there are no dead heats. (3 mks)

c) Obtain the derivative of Y, $Y = \frac{9x^4 + 2}{X^8}$ (2 mks)

d) Integrate the following function $Y = {}^{3}/_{5}x^{6} + 12x^{3} + 10x$ (1 mks)

QUESTION FOUR

A hypothetical three sector economy has the following input-output technological coefficients.

Product	Firms in the Industry		
	A	B	C
A	0.2	0.3	0.2
B	0.4	0.1	0.2
C	0.1	0.3	0.2

Expected (Final) Demand; A, B, and C (10,000; 5000; 6000)

a) Determine the Leontief matrix (04 mks)

b) Compute the final total output (10 mks)

c) Distribute the output in (b) above among the users (06 mks)

QUESTION FIVE

a) A Human Resource Manager has received requisitions for one employee each from Production, Marketing and Research Departments. There are nine applicants available from which these three positions may be filled. In how many ways three employees be selected from the nine applicants and assigned to the three different openings? (03 marks).

b) In how many ways can you arrange four boxes on a shelf from a group of nine? (03 marks)

c) Quantum Limited has invested in a particular project in which it has been estimated that after x months of operating, the cumulative profit in (thousand shillings) from the project is given by the function $31.5x - 3x^2 - 60$, where x denotes time in months. The project can operate for nine months at most.

i) Derive the graph representing the profit function (08 marks)
ii) The breakeven time points for the project (02 marks)
iii) The initial cost of the project (02 marks)
iv) Estimate using the graph the best time to terminate the project (02 mark)