



TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF BUSINESS

MANAGEMENT SCIENCE

UNIVERSITY EXAMINATION FOR:

BACHELOR OF BUSINESS AND OFFICE MANAGEMENT/BACHELOR OF SCIENCE IN MARITIME
MANAGEMENT.

BMS 4103: BUSINESS MATHEMATICS

END OF SEMESTER EXAMINATION

SERIES: JANUARY – APRIL 2022

TIME: TWO HOURS

DATE: APRIL 2022

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of five questions. Attempt question one and any other two questions

Do not write on the question paper.

QUESTION ONE

1.(a In a group of students, 15 are taking Calculus, 11 are taking Business studies, 9 are taking both Calculus and Business studies and 3 are not taking either course.

- (i) How many students are taking only calculus [2Marks]
- (ii) How many students are taking only business [2Marks]
- (iii) How many students are in the entire group [2Marks]

(b) A corporation wants to establish a sinking fund beginning at the end of this year. Annual deposits will be made at the end of this year and for the following 9 years. If deposits earn interest at the rate of 8 % per year compounded annually, how much money must be deposited each year in order to have \$ 12 million at the time of the 10th deposit.? How much interest will be earned?

[4 Marks]

(c) In an opinion poll, 30% are found to favour party A and 70% opposed to A. A month later 20% of those originally in favour are now opposed to A and 30% of those originally opposed are now in favour of A. How have the opinion polls changed? [4 Marks]

(d) Suppose a certain commodity has linear function going through the following points
 when P = 9600 Q = 600 units
 P = 4200 Q = 300 units

Required:

- (i) Obtain the linear function that go through the points given above. Assume this is a normal commodity: (4Marks)
- (ii) Explain whether it is a demand or supply function (1Marks)

QUESTION TWO

2(a) Use the matrix of co-factors to find inverse of a matrix

[5marks]

$$A = \begin{bmatrix} 2 & 3 & 4 \\ 4 & 3 & 1 \\ 1 & 2 & 4 \end{bmatrix}$$

2(b) Find the sum of the first 9 terms of the series: 72.0, 57.6, 46.08

[3marks]

2 (c) A Microfinance project involves an initial outlay of £900 now and a return of £1800 in 5 years time. Money can be invested at 9% what is the NPV. [4marks]

2(d) Find the inverse matrix A^{-1} for $A = \begin{bmatrix} 20 & 5 \\ 6 & 2 \end{bmatrix}$ using the matrix of cofactors. [4marks]

2(e) In a survey of 100 students, it was found that 50 used the college library, 40 had their own library and 30 borrowed books. Of these 20 used both the college library and their own. 15 used their own and borrowed books and 10 used the college library and borrowed books. How many students used all the three sources of books [4marks]

QUESTION THREE

(a) Mrs Muli bought a plot of land at Ksh 450,000 and five years later sold it at kshs 700,000. Determine

i) the rate of appreciation for the plot. (2 marks)

ii) an expression for value of the land after t years (2 marks)

iii) the value of the plot after eight years (2 marks)

(b) Solve $3x^3 + 5x^2 > 4x^2$ and graph the solution. (4marks)

3(c) If shs 2500 is invested at a compound interest of 6% per annum, determine the value after 12 years. [5 Marks]

(d) Min $z = 200x_1 + 400x_2$

Subject to: $x_1 + x_2 \geq 200$

$$x_1 + 3x_2 \geq 400$$

$$x_1 + 2x_2 \leq 350$$

d) The value of ABC Ltd's property can be described by the function:

$$C(t) = 1,900,000e^{0.08t}$$

Where $c(t)$ is value in shillings and t is the time in years.

Required:

- (i) Compute the total gain in value of the property between the 3rd and 6th year.(5Marks)

QUESTION FOUR

4(a)A survey of 600 Juakali workers showed that 310 regularly listened to the seven o'clock news on radio and that 370 regularly listened to late night news on radio, while 120 regularly listened to both news casts.

Required:

a) The number of workers who listened to:

- i. The seven o'clock news but not the late night news [2 Marks]
ii. The late night news but not the seven o'clock news [2 Marks]
iii. The number of workers who did not listen to either of the news broad casts. [2 Marks]

(b)If shs 9000 is invested at a compound interest of 6% per annum, determine the value after 15 years. [4 Marks]

(c) A Car dealer sells a single product for \$90 per unit. Variable costs are \$ 30 for materials and \$40.00 for labour. Annual fixed costs are \$100,000.

Required:

- i) Construct the profit function stated in terms of x, the number of units produced and sold. [5 Marks]
ii) Determine the profit earned if annual sales are 40,000 units. [5 Marks]

i) Profit function

Total revenue $R = 90x$

Total annual cost is made of material costs, labour costs and fixed costs.

$$C = 30x + 40x + 100,000 = 70x + 100,000$$

$$\text{Profit function } P = R - C = 90x - (70x + 100,000)$$

$$P = 20x - 100,000$$

ii) Profit if annual sales are 40,000 units during the year

$$P = 20x - 100,000$$

$$P = 20(40,000) - 100,000$$

$$= 800,000 - 100,000$$

$$= 700,000$$

QUESTION FIVE

5 (a) A company sets up a sinking fund and invests Shs. 125,000 each year for 8 years at 12% compound interest. What will the fund be worth after 8 years? [5 Marks]

(b) What is the present value of receiving Shs. 2,000 in one years' time, Shs. 5,000 in two years' time and Shs. 8,000 in three years' time when the discount rate is 10%. [5Marks]

(c) Find the inverse of the following matrix [5 Marks]

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 4 & 5 \\ 1 & 0 & 6 \end{bmatrix}.$$

(d) What is the present value of shs 50,000 to be received in 5 years time discounted half-yearly at 10% per annum. [5 Marks]