NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF HEALTH, APPLIED SCIENCES AND NATURAL RESOURCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

QUALIFICATION: BACHELOR OF ECONOMICS	
QUALIFICATION CODE: 07BECO	**LEVEL:** 5
COURSE CODE: MFE511S	**COURSE NAME:** MATHEMATICS FOR ECONOMISTS 1A
SESSION: JUNE 2022	**PAPER:** THEORY
DURATION: 3 HOURS	**MARKS:** 100

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
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MODERATOR:	MR I.D.O NDADI

INSTRUCTIONS
1. Answer **ALL** the questions in the booklet provided.
2. Show **clearly** all the steps used in the calculations.
3. All written work must be done in **blue** or **black** ink and sketches must be done in pencil.
4. Decimal answers must be rounded to **4** decimals places

PERMISSIBLE MATERIALS

1. Non-programmable calculator without a cover.

THIS QUESTION PAPER CONSISTS OF 3 PAGES (Including this front page)

QUESTION 1 (25 marks)

1.1 Simplify the following expressions.

1.1.1 $\left(\frac{a+b}{2a-2b}-\frac{a-b}{2a+2b}-\frac{2b^2}{b^2-a^2}\right)\left(\frac{1}{b}-\frac{1}{a}\right)$ [6]

1.1.2 $\frac{3^{n+1}+9}{3^{n-1}+1}$ [4]

1.1.3 $\log_3 81^{-1}+\log_6 36-\log_2\sqrt{4^2}$ [5]

1.2 Solve each of the following equations without using a calculator:

1.2.1 $\log_2 x-\log_8 x=4$ [5]

1.2.2 $\left[\left(\frac{1}{20}\right)^{2+x}\times\left(\frac{1}{20}\right)^{8x}\right]^2=1$ [5]

QUESTION 2 (25 marks)

2.1 Rite-Cut riding lawnmowers obey the demand equation $p=-\frac{1}{20}x+1070$. The cost of producing x lawnmowers is given by the function $C(x)=110x+6000$.

2.1.1 Express the revenue function, R as a function of x. [2]

2.1.2 Express the profit, P as a function of x. [3]

2.1.3 Use a vertex approach to find the value of x that maximizes profit, hence find the maximum profit? [5]

2.1. 4 What prices should be charged to maximise profit? [2]

2.2 The Income Determination model for a **3-sector** economy is given as

$$Y=C+I+G;\ C=C_0+bY,\ \ I=I_0,\ \ G=120$$

$Where\ Y\ =\ Income, C\ =\ Consumption, I\ =\ Investment\ and\ G$
$=\ Government\ expenditure$

With the above information determine showing all necessary steps

2.2.1 the reduced form of $\boldsymbol{Y}$ [5]

2.2.2 the numerical value of income, $\boldsymbol{Y}$ given that:
$C_0=220,\ b=0.55,\ I_0=110$ [3]

For this same economy, the LM (money market) model is given by
$M_s=500;\ M_d=L_1+L_2,\ L_1=0.2Y+200\ and\ L_2=150-200i$

2.2.3 With this additional information determine the ***interest rate i*** for this economy [3]

2.2.4 Calculate the autonomous expenditure multiplier for this economy [2]

QUESTION 3 (25 marks)

3.1 The demand function for a certain commodity is $p(x) = 10 - 0.001x$, where p is measured in $N\$$ and x is the number of units. The total cost of producing x items is $C(x) = 50 + 5x$.
By using a derivative approach, determine the level of production that maximises the profit? [8]

3.2 A firm's production function is $Q(L,K) = L^{\beta}K^{\alpha}$, so that the $MP_L = \beta L^{\beta-1}K^{\alpha}$ and $MP_K = \alpha L^{\beta}K^{\alpha-1}$. Let $\alpha = \frac{2}{3}$ and $\beta = \frac{1}{3}$. Let the slope of the isocost line be $-\frac{w}{r}$, and let $w = N\$\ 4$ and $r = N\$\ 27$.

3.2.1 Find the marginal rate of technical substitution (MRTS). [3]

3.2.2 What is the lowest cost at which it can produce 1080 units? [8]

3.3 Use implicit differentiation to determine $\frac{dy}{dx}$ for the implicit function $3x^3 + 5xy^2 - 4y^3 = 8x^2$ and determine the slope of this curve at $(1,1)$. [6]

QUESTION 4 (25 marks)

4.1 Determine the following integrals:

4.1.1 $\int \left(\frac{5}{x} - 2\sqrt[3]{x^2}\right) dx$ [4]

4.1.2 $\int_0^5 e^{-2t}\, dt$ [4]

4.2 An investment flow is $I(t) = 900\sqrt{t}$, where t is measured in years.

4.2.1 Calculate the total capital formation during the first four years? [5]

4.2.2 Calculate the total capital formation from the end of the second year to the beginning of the beginning of the sixth year. [5]

4.2.3 Find an expression for the total capital formation during the first N years and hence find the year in which the total capital formation reaches N$ 16 200. [7]

.....END OF EXAM.....