# NAMIBIA UNIVERSITY
## OF SCIENCE AND TECHNOLOGY

**FACULTY OF HEALTH, APPLIED SCIENCES & NATURAL RESOURCES**

**DEPARTMENT OF MATHEMATICS AND STATISTICS**

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| **QUALIFICATION:** Bachelor of Science in Applied Mathematics and Statistics | |
| **QUALIFICATION CODE:** 07BAMS | **LEVEL: 6** |
| **COURSE CODE**: FIM601S | **COURSE NAME:** Financial Mathematics 2 |
| **SESSION: JUNE 2022** | **PAPER:** THEORY |
| **DURATION:** 3 HOURS | **MARKS: 100** |

| FIRST OPPORTUNITY EXAMINATION QUESTION PAPER | |
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| **EXAMINER** | Mrs. H. Y. Nkalle <br><br> Dr. V. Katoma |
| **MODERATOR:** | Prof. A.S. Eegunjobi |

| INSTRUCTIONS |
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| 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. |

**PERMISSIBLE MATERIALS**

1. Non-programmable calculator without a cover.

**THIS QUESTION PAPER CONSISTS OF 4 PAGES (Including this front page)**

## Question 1

What is derivative? And mention two purposes of derivatives. [3]

## Question 2

Mention 4 elements under fixed interest government borrowings. [4]

## Question 3

Suppose a stock that pays no dividend is worth N$60.00. The annual compounding interest rate is 5%. What is the one-year forward price of the stock? [4]

## Question 4

Consider a Put Option with a strike of N$500.00.

(a) What would be the payoff to the buyer if the spot price at the expiration date is N$ 550.00? [4]

(b) What would be the payoff to the buyer if the spot price at the expiration date is N$ 450.00? [3]

## Question 5

Consider a 3 × 9 FRA for £2000.00 with an FRA rate of 5%. Suppose the reference rate is LIBOR and the 6-month LIBOR on the effective date is 6%. Assume ACT/360 and the loan is for a period of 120 days. Find how much the borrower receives from the lender on the effective date.

## Question 6

Consider the cash-flow sequences $e = (e_0, \ldots, e_n)$ and $m = (m_0, \ldots, m_n)$. When is the cashflow $"e"$ preferable to $"m"$? [4]

## Question 7

Consider the cash flow sequence, $a = (5, 9, 20, 4, 2), b = (6, 7, 3, 1, 36)$ $at\ time\ t = 0, \ldots, 4.$ Find the Net Present Value (NPV) of the cash flow assuming an interest rate of 7%. [6]

## Question 8

VK Investment cc has an existing debt of N$ 2000000 on which it makes annual payments at an annual effective rate of LIBOR plus 0.5%. VK Investment cc decides to enter a swap with a notional amount of N$ 2000000 on which it makes annual payments at a fixed annual

effective rate of 3% in exchange for receiving annual payments at the annual effective LIBOR rate. The annual effective LIBOR rates over the first and second years of the swap contract are 2.5% and 4% respectively. VK Investment cc does not make or receive any other payments. Calculate the net interest payment that VK Investment cc makes in the second year. [8]

## Question 9

An investor is considering whether to invest in either or both of the following loans:
**Loan A:** *For a purchase price of N$ 10000, the investor will receive N$ 1000 per annum payable quarterly in arrear for 15 years.*

**Loan B:** *For a purchase price N$ 11000, the investor will receive an income of N$605 per annum, payable annually in arrear for 18 years, and a return of his outlay at the end of this period.*
The investor may borrow money at 4% per annum. Would you advise him to invest in either loan, and if so which would be the more Profitable? [8]

## Question 10

Consider the following two cash-flow sequence:

| Time (Year) | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| Project A | -80 | 96 | 1 | 5 |
| Project B | -80 | 10 | 10 | 90 |

Find the Internal Rate of Return $(IRR)$ of project A and Project B. And show that $IRR(A) > IRR(B)$. [8]

## Question 11

A project requires an initial investment of N$ 225000 and is expected to generate the following Net cash inflows.
Year 1: N$95000, Year 2: 80000, Year 3: 60000, Year 4: 55000. Computer NPV of the project if the minimum desired rate of return is 12%. [5]

## Question 12

Suppose that $A(t) = at^2 + 10\beta$. If X invested at time 0 accumulates to N$ 500.00 at time 4, and to N$1000.00 at time 10, find the amount of the original investment X. [10]

## Question 13

A loan is being repaid by 10 equal annual payments of N$ 400. Suppose the effective annual interest rate is 12%. Find the loan outstanding immediately after the payment at the end of the year 6. [5]

## Question 14

A debt of $10,000 is amortized by making equal payments at the end of every six months for three years, and interest is 6% compounded semi-annually. Construct an amortization schedule. [12]

## Question 15

Golda is considering a project which requires an amount of $N\$3000.00$ and another amount of $N\$1000.00$ $after$ $1$ $year$. In two years', time, when the project ends, she expects an inflow of $N\$4500.00$. what is the internal rate of return $(IRR)$ of this project? Is the above Investment profitable? Assume that Golda can lend and borrow at the same fixed rate of 7.13% per annum. [10]

**End of paper**

**Total marks:100**