



**NAMIBIA UNIVERSITY  
OF SCIENCE AND TECHNOLOGY**

**FACULTY OF HEALTH, NATURAL RESOURCES AND APPLIED SCIENCES  
SCHOOL OF NATURAL AND APPLIED SCIENCES**

**DEPARTMENT OF MATHEMATICS, STATISTICS AND ACTUARIAL SCIENCE**

<b>QUALIFICATION:</b> Bachelor of science ; Bachelor of science in Applied Mathematics and Statistics	
<b>QUALIFICATION CODE:</b> 07BSAM	<b>LEVEL:</b> 6
<b>COURSE CODE:</b> FIM601S	<b>COURSE NAME:</b> FINANCIAL MATHEMATICS 2
<b>SESSION:</b> JULY 2023	<b>PAPER:</b> THEORY
<b>DURATION:</b> 3 HOURS	<b>MARKS:</b> 100

<b>SECOND OPPORTUNITY EXAMINATION QUESTION PAPER</b>	
<b>EXAMINER</b>	Dr V. Katoma Mrs. H.Y Nkalle
<b>MODERATOR:</b>	Prof. A.S. Eegunjobi

<b>INSTRUCTIONS</b>
<ul style="list-style-type: none"><li>• Answer ALL the questions in the booklet provided.</li><li>• Show clearly all the steps used in the calculations.</li><li>• All written work must be done in blue or black ink and sketches must be done in pencil.</li></ul>

**PERMISSIBLE MATERIALS**

- Non-programmable calculator without a cover.

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

**Question 1 [25]**

**1.1** What is derivative? Mention two (2) purposes of derivatives. [3]

**1.2** Mention four (4) elements under fixed interest government borrowings. [4]

**1.3** 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]

**1.4** 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]

**1.5** Consider a  $3 \times 9$  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. [7]

**Question 2 [25]**

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

**2.2** Consider the net cash flow sequences

$A = (50, 51, -4)$ ,  $B = (50, 528, -22)$ , at time  $t = 0, 1, 2$ . Suppose the net present value for A is 108 and that of B is 594 at time 2. Find the internal rate of return for each outlay. Suppose the interest of both cash flows is 7%, which one is a more viable investment?

[7]

**2.3** 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.

[10]

**2.4** Explain the dangers of derivatives

[5]

**Question 3 [25]**

**3.1** Suppose a certificate of deposit is issued with a face value of N\$ 500000.00 and a coupon of 6% for 90 days. After 30 days, its yield has fallen to 5.75%. What is the price? [8]

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

**3.3** Suppose a loan size of  $l_0$  is repaid by  $nm$  equal installments of size  $x$  at times  $\frac{1}{m}, \frac{2}{m}, \dots, \frac{nm}{m} = n$ . Suppose the interest rate charged is  $i\%$  per annum effective. Find an expression for the capital repayment for the  $k^{th}$  installment. [5]

**3.4** Calculate the present value of an annuity of amount N\$ 100.00 paid annually for 5 years at the rate of interest of 9%. [5]

**Question 4 [25]**

**4.1** An investment of N\$ 200.00 returns N\$ 120.00 at the end of 1<sup>st</sup> year and N\$ 100.00 at the end of 2<sup>nd</sup> year. What is the internal rate of return (*IRR*)? [5]

**4.2** Explain the difference between a negotiable and non-negotiable financial instrument and give an example [3]

**4.3** Frans is considering a project which requires an amount of N\$3000.00 and another amount of N\$1000.00 *after one 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 Frans can lend and borrow at the same fixed rate of 7.13% per annum. [9]

**4.4** Consider the following two cash-flow sequences:

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]

**END of EXAM**