



<b>QUALIFICATION : BACHELOR of SCIENCE IN APPLIED MATHEMATICS AND STATISTICS</b>	
<b>QUALIFICATION CODE: 07BSAM</b>	<b>LEVEL: 5</b>
<b>COURSE: FINANCIAL MATHEMATICS 1</b>	<b>COURSE CODE: FIM502S</b>
<b>DATE: JANUARY 2024</b>	<b>SESSION: 1</b>
<b>DURATION: 3 HOURS</b>	<b>MARKS: 100</b>

**SECOND OPPORTUNITY / SUPPLEMENTARY: EXAMINATION QUESTION PAPER**

**EXAMINER:** *Dr, Victor Katoma*

**MODERATOR:** *Prof, Adetayo Eegunjobi*

**INSTRUCTIONS:**

1. Answer all questions on the separate answer sheet.
2. Please write neatly and legibly.
3. Do not use the left side margin of the exam paper. This must be allowed for the examiner.
4. No books, notes and other additional aids are allowed.
5. Mark all answers clearly with their respective question numbers.

**PERMISSIBLE MATERIALS:**

1. Non-Programmable Calculator

**This paper consists of 4 pages including this front page**

### Question 1 [25 Marks]

1.1 Define the following

1.1 Sinking fund [2]

1.2 Perpetuity [2]

1.3 Accumulation factor [3]

1.4 Force of interest [3]

1.5 Why would a Bank prefer compounded interest to simple interest [4]

1.2 Show that  $\ddot{a}_n = \frac{1-(v)^n}{d}$  [4]

1.3 Show that  $S_n = \frac{(1+i)^n - 1}{i}$  [7]

### Question 2 [25 Marks]

2.1 The Jacksons have determined that, after making a down payment, they could afford at most \$2000 for a monthly house payment.

The bank charges interest at a rate of 7.2% per year on the unpaid balance, with interest computations made at the end of each month.

If the loan is to be amortized in equal monthly instalments over 30 years, what is the maximum amount that the Jacksons can borrow from the bank? [8]

2.2 Nelago is 35 years old and decides to start saving N\$5000 each year, with the first deposit one year from now. The account is awarding 8% p.a. Nelago decides that he will make his last deposit 30 years from now and hence retire at the age of 65. During retirement he plans to withdraw funds from the account at the end of each year (first withdrawal at age 66). What yearly amount will Nelago be able to withdraw to last him to the age of 90? [10]

2.3 If Nelago's bank above decides to change the interest rate to  $9\frac{1}{5}\%$  in the last 10 years of his turning 65, how much will he have in this account upon retirement? [7]

**Question 3 [25 Marks]**

3.1 Ndapandula Investment Company owns an office building located in the commercial district of Windhoek. As a result of continued success of an urban renewal program, local business is enjoying a mini-boom. The market value of Ndapandula property is  $V(t) = 300,000Exp[\sqrt{t}/2]$  where  $V(t)$  is measured in dollars and  $t$  is the time in years from the present. If the expected rate of appreciation is 9% compounded continuously for the next 10 years.

3.1.1 Find an expression for the present value  $P(t)$  of the market price of the property that will be valid for the next 10 years. [4]

3.1.2 Compute  $P(7)$ ,  $P(8)$  and  $P(9)$  and interpret the results. [7]

3.2 The proprietor of Carson Hardware has decided to set up a sinking fund for the purpose of purchasing a truck in 2 years' time. It is expected that the truck will cost \$30,000. If the fund earns 10% interest per year compounded quarterly, determine the size of each (equal) quarterly instalment the proprietor should pay into the fund. [6]

3.3 As a savings program towards Alberto's college education, his parents decide to deposit N\$100 at the end of every month into a bank account paying interest at the rate of 6% per year compounded monthly. If the savings program began when Alberto was 6 years old, how much money would have accumulated by the time he turns 18? [8]

**Question 4 [25 Marks]**

4.1 How long will it take N\$10,000 to grow to N\$15,000 if the investment earns an interest rate of 12% per year compounded quarterly? [3]

4.2 Anna set up an annuity to save for her retirement. She arranged to have N\$800 taken out of each of her monthly wages and deposited into this account; it will earn annual interest of 4.5% compounded monthly. She just had her thirtieth birthday, and her ordinary annuity comes to term when she is sixty-five. Find the following

4.2.1 The future value of the account [5]

4.2.2 Anna's total contribution to the account [2]

4.2.3 The total interest

[3]

4.5 Rudy buys a piece of land for N\$110,000. He makes 20% down payment and for the balance he takes a loan for 25 years that charges an annual interest rate of 5% compounded monthly.

Find the

4.5.1 Monthly payments

[6]

4.5.2 Total amount of interest that will be paid

[3]

4.5.3 Amount of the loan that will have already been paid after 10 years

[3]

**END of EXAM**