



FACULTY OF HEALTH SCIENCES **PANIPIA UNIVERSITY** AND APPLIED
OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF MATHEMATICS AND STATISTICS

QUALIFICATION: Bachelor of science ; Bachelor of science in Applied Mathematics and Statistics	
QUALIFICATION CODE: 07BSOC; 07BAMS	LEVEL: 5
COURSE: FINANCIAL MATHEMATICS 1	COURSE CODE: FIM502S
SESSION: NOVEMBER 2019	SESSION: THEORY
DURATION: 3 HOURS	MARKS: 100

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
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INSTRUCTIONS
<ol style="list-style-type: none">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 3 PAGES (Including this front page)

QUESTION 1 [25 MARKS]

1.1 Derive compound interest formula from simple interest [4]

1.2 Define nominal rates of interest [2]

1.3 Derive the formula for continuous compounding from compounding interest [6]

1.4 Define effective rates of interest [3]

1.5 Blakely 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 Blakely property is $V(t) = 300,000 \text{Exp}[\sqrt{t}/2]$ 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:

1.5.1 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]

1.5.2 Compute $P(7)$, $P(8)$ and $P(9)$ and interpret the results. [6]

QUESTION 2 [25 MARKS]

2.1 Show that $\frac{1}{s_{\overline{n}|}} + i = \frac{1}{a_{\overline{n}|}}$ [6]

2.2 Show that $\ddot{a}_{\overline{n}|} = \frac{1-v^n}{d}$ [5]

2.3 Prove that $a_{\infty|} = \lim_{n \rightarrow \infty} a_{n|} = 1/i$ [5]

2.4 Demonstrate that $S_{\overline{n}|} = a_{\overline{n}|} (1+i)^n$ [5]

2.5 Given that $d = 6\%$, compute the value of $i^{(12)}$ [4]

QUESTION 3 [25 MARKS]

- 3.1 Define annuity [3]
- 3.2 A loan of N\$ 10, 000.00 is to be repaid over 10 years by a level annuity payable monthly in arrears. The amount of the monthly payment is calculated on the interest rate of 1% per month effective. Find
- 3.2.1 The monthly repayment. [6]
- 3.2.2 The total capital repaid and interest paid in the 1st and last years respectively. [6]
- 3.3 A loan of N\$ 100 000.00 is being considered over a term of 10 years at an interest rate of 9% p.a. with monthly repayments. Repayments on loan are made at the end of the month, so this is annuity immediate.
- 3.3.1 Construct an amortization table that shows the payments up to 6 months. [6]
- 3.3.2 Calculate the total amount paid over the 10 years. [4]
- 3.3.3 Calculate the amount of principle outstanding after 25th months. [3]

QUESTION 4 [25 MARKS]

- 4.1 What is amortization? [2]
- 4.2 An investor wishes to purchase a level annuity of N\$ 120.00 per annum payable quarterly in arrear for five years. Find the purchase price, given that it is calculated on the basis of an interest rate of 12% per annum
- (a) Effective [4]
 (b) Convertible half-yearly [4]
- 4.3 Chris 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. Chris 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).
- 4.3.1 What yearly amount will Chris be able to withdraw to last him to the age of 90? [9]
- 4.3.2 If Chris'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? [5]

--END OF EXAMINATION--