



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

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| QUALIFICATION: Bachelor of Technology : Accounting and Finance, Advanced Diploma in the Theory of Accounting, Bachelor of Accounting and Diploma in Accounting and Finance | |
| QUALIFICATION CODE: 23BACF;07BACP; 06BDAF; 07ADTA | LEVEL: 5 |
| COURSE CODE: QTM511S | COURSE NAME: QUANTITATIVE METHODS |
| SESSION: JUNE 2023 | PAPER: THEORY |
| DURATION: 3 HOURS | MARKS: 100 |

| FIRST OPPORTUNITY EXAMINATION QUESTION PAPER | |
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| EXAMINER | Mrs. H.Y. Nkalle; Mrs. A. Sakaria; Dr. D. Ntirampeba; Mr. A. Mpugulu |
| MODERATOR: | Dr. D.B.GEMECHU |

| INSTRUCTIONS |
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| 1. Answer ALL the questions. 2. Write clearly and neatly. 3. Number the answers clearly. |

PERMISSIBLE MATERIALS

1. Non-Programmable Calculator without the cover

ATTACHMENTS

2. Formula Sheet

THIS QUESTION PAPER CONSISTS OF 8 PAGES (Including this front page and formula sheet)

Question 1 [5, 4, 3 Marks]

On March 01, John joined a Christmas club. His bank will automatically deduct N\$210 from his checking account at the end of each month, and deposit it into his Christmas club account, where it will earn $5\frac{1}{4}\%$ annual interest compounded monthly. The account comes to term on December 01, the same year.

1.1 Find the future value of John's Christmas club account.

1.2 Find John's total contribution to the account.

1.3 Find the total interest earned on the account.

Question 2 [9 Marks]

Dix want to be able to withdraw N\$10 000 for his graduation at the end of 5 years and withdraw N\$20 000 for his wedding at the end of 8 years, leaving zero balance in the account after the last withdrawal. If he can earn 5% p.a compounded yearly on the balance. How much should he deposit to meet his withdrawal needs?

Question 3 [7 Marks]

Bank A offers 12.25% compounded semi-annually on its savings accounts and Bank B offers 12% compounded monthly. Determine which bank offers the higher effective rate.

Question 4 [6 Marks]

As on July 1, a man owes N\$ 2,000. He paid N\$ 500 on August 30 and N\$ 600 on September 29. Find the balance on October 29 of the same year, by the Merchants' Rule if money is worth 6% p.a. Use ordinary interest

Question 5 [6 Marks]

A sum of money amounts to N\$ 9800 after 5 years and N\$ 12005 after 8 years at the same rate of simple interest. What is the rate of interest?

Question 6 [9 Marks]

Tania is planning for her marriage after six years. She decided to deposit a sum of N\$12000 at the end of each year for five years into a fund that earn interest at 5% p.a. compounded monthly. Find how much the amount of the deposits will be at the end of six years after the last deposit was made.

Question 7 [4 Marks]

Find the effective interest rate equivalent to a nominal rate of 10% compounded monthly?

Question 8 [4, 2, 6, 5 Marks]

The data below shows the shipments (in millions of dollars) for electric lighting and wiring equipment over a 12-month period. Use the data to solve the questions that follow.

| Months | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------|------|------|------|------|------|------|------|------|------|------|------|------|
| Shipment | 1056 | 1345 | 1381 | 1191 | 1259 | 1361 | 1110 | 1334 | 1416 | 1282 | 1341 | 1382 |

- 8.1 Draw a time series plot for the data
- 8.2 Is there any evidence of trend in the data? Explain
- 8.3 Compute a 3-month moving average for all available months
- 8.4 Plot the 3-month moving average results on the same graph in (a) above?

Question 9 [3, 5, 2, 2 Marks]

The Statistics Department at NUST randomly selected 22 students and recorded their dairy expenses during the holiday. The result are as follows, Use this dataset to compute the following summary statistics.

210, 221, 217, 221, 213, 217, 218, 207, 210, 214, 210, 199, 209, 202, 208, 212, 200, 210, 215, 203, 218, 208

- 9.1 Compute their average expenses
- 9.2 Compute the variance
- 9.3 Compute the standard deviation
- 9.4 compute the coefficient of variation

Question 10 [6, 5, 7 Marks]

First National Bank recently surveyed a sample of employees to determine how far they lived from their corporate headquarters. The results are shown below.

| Distance (in Km) | Number of days |
|------------------|----------------|
| 0 up to 5 | 4 |
| 5 up to 10 | 15 |
| 10 up to 15 | 27 |
| 15 up to 20 | 18 |
| 20 up to 25 | 6 |

10.1 Compute and interpret the modal distance.

10.2 Find the minimum distance associated with the 25% of employees living further away from First National headquarter.

10.3 Compute the interquartile range.

End of paper

Total marks: 100

Formula(s) sheet

$$I = prt$$

$$A = P(1 + rt)$$

$$t = \frac{N-1}{r} \text{ for } N \geq 2$$

$$D = Adt$$

$$P = A(1 - dt)$$

$$D = A - P$$

$$r_{\text{eff}} = \left(1 + \frac{r}{m}\right)^m - 1$$

$$A = P\left(1 + \frac{r}{m}\right)^{mt}$$

$$r = \frac{d}{1-dt}$$

$$r_{\text{eff}} = \frac{r}{1-rt}$$

$$d = \frac{r}{1+rt}$$

$$t = \frac{\log A - \log P}{m \log \left(1 + \frac{r}{m}\right)}$$

$$t = \frac{\log 2}{m \log \left(1 + \frac{r}{m}\right)}$$

$$S_n = R \left[\frac{(1+i)^n - 1}{i} \right]$$

$$A_n = R \left[\frac{1 - (1+i)^{-n}}{i} \right]$$

$$\text{paasche} = \left[\frac{\sum_{i=1}^n (p_1 \times q_1)}{\sum_{i=1}^n (p_0 \times q_1)} \right] \times 100$$

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$$\text{Laspeyers} = \left[\frac{\sum_{i=1}^n (p_1 \times q_0)}{\sum_{i=1}^n (p_0 \times q_0)} \right] \times 100$$

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$$s_x^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n-1} = \frac{\sum_{i=1}^n x_i^2 - n\bar{x}^2}{n-1}$$

$$s_x^2 = \frac{\sum_{i=1}^n f_i (x_i - \bar{x})^2}{n-1} = \frac{\sum_{i=1}^n f_i x_i^2 - n\bar{x}^2}{n-1}$$

$$M_k = I + \frac{h}{f} \left(\frac{kn}{4} - F \right)$$

$$\begin{aligned} M_o &= l_{M_o} + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h \\ &= I_{M_o} + \frac{f_1 - f_0}{(f_1 - f_0) + (f_1 - f_2)} \end{aligned}$$

$$M_d = I_{M_d} + \frac{h}{f} \left(\frac{n}{2} - F \right)$$

$$\bar{x} = \frac{\sum_{i=1}^n f_i x_i}{\sum_{i=1}^k f_i}$$

$$P(B \setminus A) = \frac{P(A \cap B)}{P(A)}$$

$$b = \frac{n \sum xy - \sum x \sum y}{n \sum x^2 - (\sum x)^2}$$

$$a = \frac{\sum y - b \sum x}{n}$$

$$b = \frac{\sum xy}{\sum x^2}$$

$$a = \frac{\sum y}{n}$$

$$\bar{x} = \frac{\sum x_i}{n}$$

$$s_x = \sqrt{s_x^2}$$

$$CV = \frac{s_x}{\bar{x}} \times 100$$