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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	**NQF LEVEL:** 5
COURSE: QUANTITATIVE METHODS	**COURSE CODE:** QTM511S
DATE: JANUARY 2025	**SESSION:** 2
DURATION: 3 HOURS	**MARKS:** 100

SECOND OPPORTUNITY / SUPPLEMENTARY: EXAMINATION QUESTION PAPER

EXAMINER: Mr. Akser L Mpugulu

MODERATOR: Dr Dibaba Gemechu

INSTRUCTIONS:

1. There are 5 questions
2. Answer ALL questions on the separate answer sheet.
3. Please write neatly and legibly.
4. Do not use the left side margin of the exam paper. This must be allowed for the examiner.
5. All written work must be done in blue or black ink and sketches must be done in pencil.
6. Number all answers clearly and show clearly all the steps used in the calculations.

PERMISSIBLE MATERIALS:

Non-Programmable Calculator without a cover.

This question paper consists of 6 pages including this front page.

1. **Question 1:** **[20 Marks]**

1.1. A principal of N$5000 is invested at a simple interest rate of 7% per annum. How long will it take for the principal to triple in value? (5)

1.2. A loan of N$5,000 is due in 18 months, with a 6.5% interest rate. If the loan is repaid 6 months earlier than the due date, calculate the value of the debt. (6)

1.3. On February 5, a company signed a N$75,000 note with a simple interest rate of 11% for 180 days. The company made payments of N$15,000 on April 12 and N$20,000 on June 20. How much will the company owe on the maturity date? (Use the USA rule). (9)

2. **Question 2:** **[21 Marks]**

2.1. Dr. Amunjela invested N$40,000 in two different schemes, X and Y. Scheme X offers a simple interest rate of 9% p.a., and Scheme Y offers a rate of 5% p.a. The total simple interest earned in 4 years is N$10,800. How much was invested in Scheme X? (7)

2.2. An investor makes monthly payments of N$1,000 into an account that earns 6% interest per annum, compounded monthly, for 5 years.

2.2.1. Calculate the future value of this ordinary annuity. (4)

2.2.2. Explain how would the future value change, If the payments were made at the beginning of each month. (2)

2.3. A business owner takes out a loan of N$100,000, to be repaid over 10 years at an interest rate of 7% per annum, compounded monthly.

2.3.1. Calculate the monthly repayment amount. (4)

2.3.2. How much of the first payment goes toward interest. (2)

2.3.3. What is the total amount repaid over the 10 years. (1)

2.3.4. How much interest paid? (1)

3. **Question 3:** **[14 Marks]**

3.1. Consider the linear system of equations:

$$x + 2y + z = 0$$

$$2x + 4y + 3z = 0$$

$$-x - 2y - 2z = 0$$

3.1.1. Construct the augmented matrix and reduce it to row echelon form. (6)

3.1.2. Discuss the implications of your row reduction results regarding the existence of solutions. (2)

3.2. Solve the following inequality:

3.2.1. $\frac{2x}{x+5} \leq \frac{1}{3} \leq \frac{2x-4}{3x}$ (6)

4. Question 4: **[12 Marks]**

4.1. An investor has a portfolio of real estate properties. The prices and square footage owned in 2015 and 2020 are shown below:

Property	2015 Price (N$)	2015 Area (m^2)	2020 Price (N$)	2020 Area (m^2)
X	300,000	1,000	350,000	950
Y	500,000	1,200	550,000	1,100
Z	450,000	900	480,000	1,000

4.1.1. Calculate the Paasche Price Index for the real estate portfolio using the weighted aggregate method. (7)

4.1.2. Calculate the Laspeyres Quantity Index for the real estate portfolio using the weighted aggregate method. (5)

5. Question 5: **[33 Marks]**

5.1. A restaurant recorded the dining times (in hours) of 80 customers. The frequency distribution is as follows:

Time Interval (hours)	Number of Customers
0.5 – < 1.0	15
1.0 – < 1.5	25
1.5 – < 2.0	20
2.0 – < 2.5	12
2.5 – < 3.0	8

5.1.1. Calculate the estimated average dining time for a customer. (8)

5.1.2. Calculate the modal dinning time. (5)

5.2. The number of units sold for a product over a span of eleven years is recorded. The data is as follows:

Year	Units Sold (1,000)
2005	245
2006	290
2007	303
2008	275
2009	265
2010	281
2011	316
2012	282
2013	272
2014	295
2015	327

5.2.1. Determine the least squares trend line equation for the above dataset. Use the sequential coding method.

Hint: start your coding by assigning 1 for the first time period. (11)

5.2.2. Predict the trend value for the sales of the product for 2017. (3)

5.3. In a local election, 55% of eligible voters are aware of the candidate's campaign. The probability that an aware voter will vote is 80%, while the probability that an unaware voter will vote is 40%.

5.3.1. What is the probability that a randomly chosen voter will vote? (3)

5.3.2. What is the probability that a voter was aware of the campaign, given that they voted? (3)

END OF QUESTION PAPER

SUMMARY OF FORMULAE QTM511S: 2024

Simple Interest: $I = Prt$, $A = P(1+rt)$

Discount: $P = A(1-dt)$, $D = Adt$

Compound Interest: $A = P(1+i)^n$, $A = P\left(1+\frac{r}{m}\right)^{mt}$

Simple discount Rate: $d = \frac{r}{1 + rt}$

Effective Interest Rate: $r_{eff} = \frac{r}{1-rt}$

Effective Interest Rate: $r_{eff} = \left(1+\frac{r}{m}\right)^m - 1$

Nominal Interest Rate: $r = m\left[\left(1+r_{eff}\right)^{\frac{1}{m}} - 1\right]$

Annuity: $S_n = R\left[\frac{\left(1+\frac{r}{m}\right)^n - 1}{\frac{r}{m}}\right] \leftarrow S_{n\rceil i}$ $A_n = R\left[\frac{1-\left(1+\frac{r}{m}\right)^{-n}}{\frac{r}{m}}\right]$

Period: $t = \frac{\log S - \log P}{m \log\left(1+\frac{r}{m}\right)}$, $n = \frac{\log 2}{\log\left(1+\frac{r}{m}\right)}$ $t = \frac{N-1}{r}$ *for* $N \geq 2$

$$n = \frac{\log(\frac{iS_n}{R} + 1)}{\log(1+i)} \qquad n = -\frac{\log(1 - \frac{iA_n}{R})}{\log(1+i)}$$

Measures of Central Tendency

Mean $\bar{x} = \dfrac{\sum x_i}{n}$, $\bar{x} = \dfrac{\sum f_i x_i}{\sum f_i}$

Median $M_d = l_{Md} + h\left(\dfrac{\frac{n}{2} - F}{f}\right)$

Mode $M_0 = l_{Mo} + h\left[\dfrac{f_1 - f_o}{2f_1 - f_o - f_2}\right]$,

Measures of dispersion

$Variance = \dfrac{\sum f_i x_i^2 - n(\bar{x})^2}{n-1}$ or $Variance = \dfrac{\sum\left(x_i - \bar{x}\right)^2}{n-1}$ coefficient of variation $= \left(\dfrac{S}{\bar{x}}\right) \times 10($

Standard deviation$=\sqrt{\text{variance}}$, **Quartile** $M_k = l + \dfrac{h}{f}\left(\dfrac{kn}{4} - F\right)$

Index Numbers

$Laspeyres\ price\ index = \dfrac{\sum(p_1 \times q_0)}{\sum(p_0 \times q_o)} \times 100\%$ $Paasche\ price\ index = \dfrac{\sum(p_1 \times q_1)}{\sum(p_0 \times q_1)} \times 100\%$

$Laspeyres$ quantity $index = \dfrac{\sum(p_0 \times q_1)}{\sum(p_0 \times q_o)} \times 100\%$ $Paasche$ quantity $index = \dfrac{\sum(p_1 \times q_1)}{\sum(p_1 \times q_0)} \times 100\%$

Time Series

$\hat{y} = a + bx$ $b = \dfrac{n\sum xy - \sum x \sum y}{n\sum x^2 - (\sum x)^2}$ $a = \dfrac{\sum y - b\sum x}{n}$

Probability

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$ $P(A \cap B) = P(A)P(B)$ $P(B|A) = \dfrac{P(A \cap B)}{P(A)}$