



**NAMIBIA UNIVERSITY  
OF SCIENCE AND TECHNOLOGY  
FACULTY OF HEALTH AND APPLIED SCIENCES  
DEPARTMENT OF MATHEMATICS AND STATISTICS**

<b>QUALIFICATION:</b> BACHELOR OF ECONOMICS	
<b>QUALIFICATION CODE:</b> 07BECO	<b>LEVEL:</b> 5
<b>COURSE CODE:</b> MFE512S	<b>COURSE NAME:</b> MATHEMATICS FOR ECONOMISTS 1B
<b>SESSION:</b> JANUARY 2019	<b>PAPER:</b> THEORY
<b>DURATION:</b> 3 HOURS	<b>MARKS:</b> 100

<b>SECOND OPPORTUNITY EXAMINATION QUESTION PAPER</b>	
<b>EXAMINERS</b>	MR. T. KAENANDUNGE, MS. S MWEWA, MS. Y. SHAANIKA
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<b>INSTRUCTIONS</b>
<ol style="list-style-type: none"><li>1. Answer ALL the questions in the booklet provided.</li><li>2. Show clearly all the steps used in the calculations.</li><li>3. All written work must be done in blue or black ink and sketches must be done in pencil.</li></ol>

**PERMISSIBLE MATERIALS**

1. Non-programmable calculator without a cover.

**ATTACHMENT**

Graph paper

**THIS QUESTION PAPER CONSISTS OF 4 PAGES** (Including this front page)

**QUESTION 1**

**[61]**

1.1 Determine the value of  $x$  and  $y$  for which the following matrices are equal:

$$A = \begin{pmatrix} 2x & 2 \\ 1 & 3 \end{pmatrix} \text{ and } B = \begin{pmatrix} x^2 - 3 & 2 \\ 1 & y - 1 \end{pmatrix} \quad [5]$$

1.2 Determine the value(s) of  $x$  so that  $|B| = 0$  if  $B = \begin{pmatrix} x & 2 & 0 \\ 2 & x & 1 \\ 0 & 1 & 2 \end{pmatrix}$ . [5]

1.3 One of the properties of matrix inverse is  $A^{-k} = (A^{-1})^k$  where A is an invertible matrix and  $k$  is a natural number. Use this property to find  $A^{-2}$  if  $A = \begin{pmatrix} 2 & 1 \\ -3 & -1 \end{pmatrix}$  [5]

1.4 A fruit grower raises two crops, mangoes and cabbages. Each of these crops are shipped to three different outlets. The number of units of crops  $i$  that are shipped to the outlet  $j$  is represented by the matrix  $A = \begin{pmatrix} 125 & 100 & 75 \\ 100 & 175 & 125 \end{pmatrix}$ . [5]

The profit per unit is represented by the matrix  $B = (\text{N\$}3.50 \quad \text{N\$}6.00)$ . Find the product  $AB$  and  $BA$  and state what each entry of each product represent.

1.5 Evaluate the following

1.5.1  $\begin{bmatrix} 2 & -1 \\ 3 & 5 \end{bmatrix} \begin{bmatrix} 4 & 3 \\ 2 & 1 \end{bmatrix}^2$  [6]

1.5.2 If  $A = \begin{bmatrix} 3 & 4 & 2 \\ 1 & 2 & 4 \end{bmatrix}$ ,  $B = \begin{bmatrix} 4 & 1 \\ 0 & 1 \\ -2 & 3 \end{bmatrix}$  and  $C = \begin{bmatrix} -1 & 3 \\ \frac{1}{2} & 1 \\ -2 & 3 \end{bmatrix}$

determine the value of  $2A \times (-B + C)$ . [6]

1.6 A car dealer sells four model types: A, B, C, D. In a given week, this dealer sold 10 cars of model A, 5 of model B, 8 of model C and 3 of model D. The selling prices of each automobile are respectively N\$12,500, N\$11,800, N\$15,900 and N\$25,300. Represent the data using matrices and use matrix Algebra to find the total revenue. [8]

**MFE512S- MATHEMATICS FOR ECONOMISTS 1B: 2<sup>ND</sup> OPPORTUNITY QUESTION PAPER-JANUARY, 2019**

- 1.7 The following table shows the cost of one square metre of residential real estate, in dollars per square foot, at the start of 2011, and the changes in 2012 and 2013 (from 2011) in N\$.

	Outapi	Oshakati	Ongwediva
2011	600	620	400
Change in 2012	120	60	-50
Change in 2013	40	120	-50

Use matrix algebra to find the cost of residential real estate in each city in a) 2012 and b) 2013.

[8]

- 1.8 Determine the value(s) of  $x$  for which the matrix  $A = \begin{bmatrix} x & 1 & -1 \\ 2 & x & 3 \\ 4 & 1 & 5 \end{bmatrix}$  is not invertible (has no inverse).

[5]

- 1.9 Solve the following system of simultaneous equations using matrix inversion.

$$\frac{2x - 5y}{3} = 3 \quad \text{and} \quad \frac{7x}{3} = 5 + \frac{y}{3}$$

[8]

**QUESTION 2.**

[15]

Sky Property cc, a real-estate developer is planning a new apartment complex consisting of 1 bedroom units and 2-and 3-bedroom townhouses. A total of 192 units are planned and the number of family units (2-and 3-bedroom units) will be equal to the number of 1 bedroom units. If the number of 1-bedroom units to be built is three times the number of 3-bedroom units to be built, find the number of each type unit that will be built in the complex, using Cramer's rule.

[15]

**QUESTION 3.**

**[24]**

3.1 A fruit grower has 150 hector of land available to raise two crops, Mahangu and Maize. It takes one day to trim a hector of mahangu and two days to trim a hector of maize, and there are 240 days per year available for trimming. It takes 0.3 day to pick a hector of mahangu and 0.1 day to pick a hector of maize, and there are 30 days per year available for picking. Use the graphical method to find the number of hectors of each fruit that should be planted to maximize profit, assuming that the profit is N\$140 per hector of mahangu and N\$235 hector of maize. [10]

3.2 A steel company has two mills. Mill 1 costs \$70,000 per day to operate, and it can produce 400 tons of high-grade steel, 500 tons of medium-grade steel, and 450 tons of low-grade steel each day. Mill 2 costs \$60,000 per day to operate, and it can produce 350 tons of high-grade steel, 600 tons of medium-grade steel, and 400 tons of low-grade steel each day. The company has orders totalling 100,000 tons of high-grade steel, 150,000 tons of medium-grade steel, and 124,500 tons of low-grade steel. How many days should the company run each mill to minimize its costs and still fill the orders? Use the method of duals. [14]

\*\*\*\*\*END OF EXAMINATION\*\*\*\*\*

**GOODLUCK!!!!!!!!!!**