



## FACULTY OF SCIENCE

### DEPARTMENT OF PURE AND APPLIED MATHEMATICS

**MODULE:** BASIC MATHEMATICS AND APPLICATIONS IN ECONOMICS AND BUSINESS B – MAEB0B1 and MAEB322

**CAMPUS:** APK

**ASSESSMENT:** EXAM

**DATE:** 5 DECEMBER 2016

**ASSESSORS:** MR W VAN REENEN  
DR UR KOUMBA

**INTERNAL MODERATOR:** MR RJ MAARTENS

**DURATION:** 2 HOURS

**55**

**INITIALS AND SURNAME:** \_\_\_\_\_

**STUDENT NUMBER:** \_\_\_\_\_

**CONTACT NUMBER:** \_\_\_\_\_

**NUMBER OF PAGES: 10 (INCLUDING COVER PAGE)**

**INSTRUCTIONS:**

- ANSWER ALL THE QUESTIONS IN PEN.
- NO PENCIL OR TIPEX ALLOWED.
- ALL GRAPHS MUST BE DRAWN IN PEN.
- SHOW ALL THE NECESSARY CALCULATIONS CLEARLY.
- SCIENTIFIC CALCULATORS ARE ALLOWED.
- FINANCIAL CALCULATORS ARE NOT ALLOWED.
- IF NECESSARY ROUND OFF TO TWO DECIMAL PLACES.
- THE QUESTIONS CAN BE ANSWERED IN ANY ORDER.

**Question 1****[5]**

A debt R 2,000.00 due in two years and R 2,500.00 due in four years is to be repaid by R 1,500.00 in one year and a final payment of R  $x$  in 3 years.

- 1.1 Represent this problem on a clearly labelled time-line. Circle the year where you will be evaluating the problem. [1]

- 1.2 If the investment rate is 12%, compounded quarterly, determine the value of the unknown payment. [4]

**Question 2****[3]**

Thandeka is 25 and graduated from UJ. She has started her own company which trades in glass beads used for traditional embroidery. She wants to start a retirement fund and estimates that she will require R 10,000,000.00 when she retires at the age of 65. An investment firm offers her an interest rate of 10%, compounded monthly, in their *Excite Retirement Annuity Fund*. What amount must Thandeka deposit at the end of every month, in order to realise her retirement expectations?



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**Question 3****[6]**

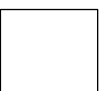
Xholani and his wife, Thandi, purchased their first home for R700,000.00. The transfer duty and bond registration amounts to R50,000.00. Xholani and Thandi took out a home loan for R750,000.00 at a good interest rate of 9.5% per year, compounded monthly, for a 20 year period.

Determine:

3.1 The monthly payment. [2]

3.2 The interest contained in the 20<sup>th</sup> payment. [2]

3.3 The finance charge. [2]



**Question 4****[10]**

A clothing manufacturer makes a very popular style of shirt for both men and women. The first type, for men, requires 2 buttons and 5 square meters of fabric. The second type of shirt, for women, requires 3 buttons and 4 square meters of fabric. Based on the market analysis a minimum of 10 shirts for men and 20 shirts for women must be manufactured per day. The factory has an available inventory of 100 buttons and 200 square meters of material per day. The manufacturer makes a profit of R100.00 on every women's shirt sold and R 150.00 on every men's shirt.

If the constraints are:

$$\begin{cases} 2x + 3y \leq 100 \\ 5x + 4y \leq 200 \\ x \geq 10 \\ y \geq 20 \end{cases}$$

And the objective function is given by:  $P = 150x + 100y$

- 4.1 Sketch the feasible region described by the constraints. Clearly label your axes and Feasible Region. [6]

- 4.2 Determine all the corner points of the Feasible Region. [3]



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4.3 Determine the maximum possible profit. [1]

**Question 5** [8]

Differentiate, but **do not simplify** your answer:

5.1  $y = \ln \sqrt{x^2 - 1}$  [1.5]

5.2  $y = 2^{x^2}$  [1.5]



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5.3  $y = (5x^5 + 25x)(6x^6 + 36x)$  [2]

5.4  $y = \frac{2x^2 + 4x}{3x^3 + 9x + 2}$  [3]



**Question 6****[10]**

The following data consists of the test scores out of 60 for a group of MFD001 students:

3	5	5	10	10	11	13	15	17	18
20	20	26	27	30	30	31	34	36	37
40	41	44	45	46					

6.1 Complete the following class-based frequency table.

**[3]**

<b>Class</b>	<b>Count</b>	<b>Frequency</b>	<b>Relative Frequency</b>
<b>0-10</b>			
<b>11-20</b>			
<b>21-30</b>			
<b>31-40</b>			
<b>41-50</b>			
<b>51-60</b>			
<b>TOTAL</b>			

6.2 Complete the following table:

**[3]**

Mean	
Mode	
Median	

6.3 Construct a histogram using the frequency table from Question 6.1.

**[4]**

**Question 7****[5]**

You have one die and one coin. You first roll the die and then throw the coin.

- Die: 1, 2, 3, 4, 5, 6
- Coin: H = Heads, T = Tails

7.1 Determine the sample space.

**[2]**

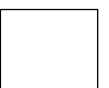
7.2 Construct a tree diagram which represents the situation. Clearly indicate all probabilities.

**[3]****Question 8****[8]**

Given the following sample space  $S$  with events  $A$  and  $B$ :

$$S = \{1, 2, 3, 4, 5, 6\} \quad A = \{1, 2, 3, 5, 6\} \quad B = \{3, 4, 5\}$$

8.1 Construct the Venn-Diagram which represents this situation.

**[3]**



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8.2 Determine:

a)  $P(A)$  [1]

b)  $P(B)$  [1]

c)  $P(A \cap B)$  [1]

8.3 Prove that A and B are independent events. [2]

<b>End of Assessment – Total 55 Marks</b>
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**Use this space if you want to redo a question. Clearly indicate at the question that the answer is on Page 10.**

