



**TECHNICAL UNIVERSITY OF MOMBASA**  
**Faculty of Applied & Health**  
**Sciences**

DEPARTMENT OF MATHEMATICS & PHYSICS

**UPGRADING MATHEMATICS**

AMA 1006: COMMERCIAL ARITHMETIC & STATISTICS

**END OF SEMESTER EXAMINATION**

**SERIES: AUGUST 2014**

**TIME ALLOWED: 2 HOURS**

**Instructions to Candidates:**

You should have the following for this examination

- *Answer Booklet*

This paper consist of **FIVE** questions

Answer question **ONE (COMPULSORY)** and any other **TWO** questions

Maximum marks for each part of a question are as shown  
 This paper consists of **FOUR** printed pages

**Question One (Compulsory)**

- a) Find the rate per annum at which a certain amount of money doubles after being invested for 5 years compounded annually. **(4 marks)**

$$P = \begin{pmatrix} a & 2a \\ a-1 & a+1 \end{pmatrix}$$

- b) Given that  $P$  is a singular matrix. Find the possible value of  $a$ . **(3 marks)**

- c) The table below shows the number of defective bolts in a factory. Find the standard deviation **(5 marks)**

<b>No of defective bolts (x)</b>	0	1	2	3	4	5
<b>Frequency</b>	20	8	6	4	1	1

- d) Solve the following pair of inequalities and represent it on a number line  $2x + 8 \geq 10$  and  $3x + 8 \leq 14$  **(4 marks)**
- e) Two dice are tossed together. By showing the probability space find the probability that the sum of the two upper faces will be 7. **(3 marks)**

- f) During a certain period, the exchange rates were as follows:  
 1 sterling pound = ksh 102  
 1 sterling pound = 1.7 US dollar  
 1 US dollar = ksh 60.6

- g) A school intended to buy textbooks worth kshs 500,000 from U.K. It changed the money into sterling pounds later the school discovered that the books were cheaper in USA. It therefore changed the pounds to dollars. Unfortunately a financial crisis arose and the money had to be changed back to Kenya shillings. How much money did the school end with. **(4 marks)**

- h) Solve the following using Cramer's Rule

$$\begin{aligned} x + y &= 2 \\ 3y - z &= -4 \\ x + z &= 3 \end{aligned}$$

**(4 mark)**

<b>Marks</b>	1 – 10	11 – 20	21 – 30	31– 40	41-50	51 – 60	61–70	71–80	81–90	91 - 100
<b>No. of Students</b>	1	3	4	7	12	9	2	1	0	1

**Question Two**

The following shows marks obtained by 40 students in a class:

- a) Using an assumed mean of 45.6, calculate:  
 (i) The actual mean **(5 marks)**  
 (ii) Standard deviation **(5 marks)**  
 (iii) When ranked from first to last what mark was scored by the 30<sup>th</sup> student? **(3 marks)**

- (iv) Calculate the median mark (3 marks)
- b) Name TWO measures of dispersion (2 marks)
- c) State TWO advantages of using a bar graph to present data. (2 marks)

### Question Three

- a) The cash price of a bed is 6500. If bought on hire purchase a down payment of 2300 is paid followed by 12 monthly installments of 490 each. Calculate the rate of interest charged. (5 marks)
- b) The initial cost of a ranch is 5,000, 000. At the end of each year, the value of the land increases by 2%. Find its value at the end of 3 years. (3 marks)
- c) Find the accumulated amount if shs 20,000 is deposited for  $3\frac{1}{3}$  years at 10% p.a compound interest. (4 marks)
- d) The tax table below was used in 2003.

Income Taxable	Tax Rate
1 – 9680	10
9681 – 18800	15
18801 – 27920	20
27921 – 37040	25
37041 and above	30

In the year 2003, Ole Senguya's monthly earnings were:

Basic salary 20,600  
 House allowance 12,000  
 Medical allowance 2880  
 Transport allowance 340

If Ole Senguya is entitled to a personal relief of ksh 1056p.m. Calculate:

- (i) His monthly taxable income (2 marks)
- (ii) His PAYE (6 marks)

### Question Four

- a) The probability that a computer in a factory is defective is  $\frac{3}{10}$  if 3 computers are chosen at random and using a tree diagram, find the probability that:
- (i) All are defective (2 marks)
- (ii) Only one is defective (3 marks)
- (iii) At least one is defective (3 marks)
- (iv) At most one is defective (3 marks)

$$A = \begin{pmatrix} 1 & 2 & 3 \\ 0 & 1 & 2 \end{pmatrix} \quad \text{and} \quad A = \begin{pmatrix} 3 & 4 & 3 \\ 0 & 2 & 9 \\ 4 & 1 & 1 \end{pmatrix}$$

b) If  $A = \begin{pmatrix} 1 & 2 & 3 \\ 0 & 1 & 2 \end{pmatrix}$  and  $A = \begin{pmatrix} 3 & 4 & 3 \\ 0 & 2 & 9 \\ 4 & 1 & 1 \end{pmatrix}$  find AB (2 marks)

$$A = \begin{pmatrix} 2x-1 & 1 \\ x^2 & 1 \end{pmatrix}$$

c) Find the value of x for which  $A = \begin{pmatrix} 2x-1 & 1 \\ x^2 & 1 \end{pmatrix}$  is a singular matrix (3 marks)

d) Solve for x and y using matrix method (4 marks)

$$3x + 2y = 12$$

$$4x - y = 5$$

### Question Five

a) Draw by shading the unwanted regions, a graph representing the following inequalities.

$$2x + y \leq 8$$

$$x \geq 1$$

$$y \geq 2$$

(3 marks)

b) Find integral values that satisfy the following inequalities:

$$2x - 3 > -15 \quad 7 > 2x - 3$$

and

(4 marks)

c) Write 3 inequalities to represent the unshaded region.

(3 marks)

x

- d) A parking lot is to be constructed for  $X$  matatus and 7 buses. Matatus are allowed  $10\text{m}^2$  of spaces and bus  $20\text{m}^2$  and there is only  $500\text{m}^2$  space available not more than 40 vehicles are allowed at a time. There are always both types of vehicles parked and at most 15 buses allowed at a time.
- (i) Write down all the inequalities based on these facts **(4 marks)**
  - (ii) Graph the inequalities in the graph provided **(4 marks)**
  - (iii) The parking charge for a matatu is ksh 50 and that for a bus is ksh 200. Find the number of vehicles of each type that should be parked so as to maximize the income. Calculate this maximum income. **(2 marks)**