TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSISCS

CERTIFICATE IN UPGRADING MATHEMATICS (UMTH)

AMA 1004: COMMERCIAL ARITHMETICS & STATISTICS

END OF SEMESTER EXAMINATION
SERIES: APRIL 2015
TIME ALLOWED: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
- *Answer Booklet*
- *Mathematical Table*

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) Use the exchange rates below to answer this question:

	Buying	**Selling**
1 US Dollar	63.00	63.20
1 UK Pound	125.30	125.95

A tourist arriving in Kenya from Britain had 9600 pounds. He converted the pounds to Kenya Shillings at a commission of 5%. While in Kenya, he spent ¾ of his money. He changed back the balance to US Dollars at no commission. Calculate to the nearest US Dollars the amount he received.
(4 marks)

b) Solve the inequalities given below and illustrate your answer on a number line **(4 marks)**

$$\frac{3}{2}x + 1 \leq 11 < 6x - 1$$

c) Find the Quartile deviation of the data below:

235, 418, 626, 405. 335, 717, 504, 609, 414, 431, 918 **(3 marks)**

d) The following tables shows marks for 40 students. Use it to draw the frequency polygon.
(4 marks)

Marks	30 – 39	40 – 49	50 – 49	60 – 69	70 – 79
No. of Students	2	9	14	7	8

e) Solve the following using Cramer's rule:

$$5x_1 - 2x_2 + 3x_3 = 16$$
$$2x_1 + 3x_2 - 5x_3 = 2$$
$$4x_1 - 5x_2 + 6x_3 = 7$$

(5 marks)

f) After how many years would kshs 15,000 amount to kshs 24015.50 at a rate of 16% p.a. compounded quarterly. **(4 marks)**

g) During inter-university competitions, rugby and handball teams from Tum took part. The probability that the rugby would win their first match was 1/8 while that the handball team could lose was 4/7. Find the probability that:
(i) Both teams won their first matches **(1 mark)**
(ii) At least one team won the first match **(3 marks)**

h) Distinguish between the terms mutually exclusive and independent events as used in probability.
(2 marks)

Question Two

a) A sum of money is invested in a bank which pays a compound interest at r% p.a. At the end of the first year, the sum amount to kshs 17,600 and at the end of the second year it becomes kshs 19,360.
(i) Find the value of r **(3 marks)**
(ii) Find the initial sum of money **(2 marks)**

b) Denis bought a new laptop on hire purchase. The cash value of the laptop was kshs 48,000. He paid a deposit of 10,000 followed by 24 monthly installments of kshs 2000 each. Calculate the monthly rate at which the interest was charged. **(5 marks)**

c) The table below shows income tax rates:

Monthly taxable pay K£	Rate of tax kshs per £
1 – 435	2
436 – 970	3
971 – 1505	4
1506 – 2040	5
Excess over 2040	6

Malei is a civil servant earning a basic salary of kshs 40,000. He is housed by the employer but pays a nominal rent of kshs 3,500. he is also given medical, transport and hardship allowances of kshs 2,800, kshs 3,000, and kshs 2,000 respectively. If he is entitled to personal relief of kshs 800 p.m.
   (i) Calculate his PAYE **(8 marks)**
   (ii) If he pays NHIF kshs 520 and kshs 400 to HELB. Find his net income **(2 marks)**

Question Three

a) A compound has 7 white cups and 5 brown cups all identical in size and shapes. There is a blackout in the town and Mrs Bett has to select 3 cups one after another without replacing the previous ones.
   (i) Draw a tree diagram for this information **(2 marks)**
   (ii) Find probability she picks 2 white and a brown cup **(2 marks)**
   (iii) The probability she picks 2 brown and a white cup **(2 marks)**
   (iv) She picks 3 cups of same colour **(2 marks)**

b) Solve the following using Cramer's rule **(5 marks)**
$$x + 2y + 3z = -5$$
$$3x + y - 3z = 4$$
$$-3x + 4y + 7z = -7$$

c) Considering the following as a singular matrix, find the value of x. **(2 marks)**
$$\begin{pmatrix} 5x & 45 \\ +4 & x \end{pmatrix}$$

d) Use the inverse matrix method to solve:
$$3x + 2y = 13$$
$$2x - 3y = 0$$

(3 marks)

Question Four

a) The table below shows the No. of coffee beams on each tree in a farm:

No. of Beans	Cumulative Frequency	Frequency

30 – 39	12	
40 – 49	29	
50 – 59	52	
60 – 69	64	
70 – 79	71	
80 – 89	76	
90 – 99	80	

     (i) Determine the respective frequencies. **(2 marks)**
     (ii) State the modal class **(1 mark)**
     (iii)   Draw an ogive to represent this data **(3 marks)**
     (iv) Use the ogive to find the median **(1 mark)**
     (v) Use the ogive to find the quartile deviation **(3 marks)**

b) The table below shows the distribution of wages in a week for a number of employees at an EPZ.

Wage	800 – 899	900 – 999	1000 – 1099	1100 – 1199	1200 – 1399	1400 – 1599
No. of workers	3	10	23	9	3	2

     (i) Using an assumed mean of 1049.5 find the mean **(6 marks)**
     (ii) Find the standard deviation **(3 marks)**
     (iii)   The week that followed, every employee earned kshs. 100 extra as wage increment.
     Determine the new wage mean for the group **(1 mark)**

Question Five

a) Solve the following inequality and list all integral values that satisfy it. **(4 marks)**

b) Write down the inequalities that satisfy the unshaded region. **(3 marks)**

     x

c) A parking lot is to be constructed for x matatus and y buses. Matatus are allowed $10m^2$ of space and buses $20m^2$ and there is only $500m^2$ of space available. Not more than 40 vehicles are allowed at a time. There are always both types of vehicles parked and at the most 15 buses are allowed at a time.

    (i) Write down all the inequalities that satisfy this information   **(5 marks)**

    (ii) Draw all the inequalities in the grid provided   **(5 marks)**

    (iii)   If parking charges for matatus is 50 and for a bus is 200 per day. How many vehicles of each type should be parked to obtain the maximum income   **(3 marks)**