TECHNICAL UNIVERSITY OF MOMBASA

UKUNDA CAMPUS

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

CERTIFICATE IN COMPUTER MAINTENANCE (CICM 13S)

AMA 1152: MATHEMATICS I

END OF SEMESTER EXAMINATION
SERIES: DECEMBER 2013
TIME ALLOWED: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
- *Mathematical tables*
- *Scientific Calculator*

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) Define the following terms as used in mathematics:
(i) A sequence
(ii) An equation **(2 marks)**

b) The 6th term of an Arithmetic Progression (AP) is -23 and the 10th term is -35. Find the first term, the common difference and the sum of the first 15 terms of the series **(5 marks)**

c) A racing car counts five laps of a circuit in a race, each lap covered at the following average speed (in mph).

123.4, 132.8, 125.7, 126.9, 134.9

Find the average speed of the car for the whole race. **(3 marks)**

d) Find the mean for the following data using an appropriate assumed mean.

Class	5 – 20	21 – 36	37 – 52	53 – 60	69 – 84	85 - 100
Frequency	6	12	17	11	3	1

(5 marks)

e) Solve the following set of equations using Gaussian elimination method.

$$x_1 - 4x_2 - 2x_3 = 21$$
$$2x_1 + x_2 + 2x_3 = 3$$
$$3x_1 + 2x_2 - x_3 = -2$$

(6 marks)

f) Show that the sum of n terms of an arithmetic series is given by:

$$S_n = \frac{n}{2}\left(2a + (n-1)d\right)$$

(5 marks)

g) Show that $\log_b N = \frac{\log_a N}{\log_a b}$ and hence find $\log_7 83.64$ **(4 marks)**

Question Two

a) A box has 6 blue beads and 4 red beads 3 beads are drawn at random without replacement. What is the probability that:
(i) They are all blue **(2 marks)**
(ii) They are exactly 2 blue beads **(2 marks)**
(iii) There is at least 1 blue bead **(2 marks)**

b) Given the following set of equations, find the unknowns:

$$5(x+2y)-4(3x+4z)-2(x+3y-5z)=16$$
$$2(3x-y)+3(y-2z)+4(2x-3y+z)=-16$$
$$4(y-2z)+2(2x-4y-3)-3(x+4y-2z)=-62$$

(8 marks)

c) Solve the following equation by completing the square:

$$2x^2+10x-7=0$$

(4 marks)

d) State whether or not the following can be expressed as a product of linear factors:

(i) $2x^2-9x+18=0$ **(1 mark)**

(ii) $4x^2+11x+28=0$ **(1 mark)**

Question Three

a) Differentiate between symmetric and skew symmetric matrices giving 1 example of each. **(4 marks)**

b) Given the following matrix, A, find its inverse.

$$A=\begin{pmatrix} 2 & 7 & 4 \\ 3 & 1 & 6 \\ 5 & 0 & 8 \end{pmatrix}$$

(6 marks)

c) Insert three arithmetic means between 12 and 26 **(4 marks)**

d) If $u_n=n^2+3n+1$, determine an expression for $\sum_{i=1}^{n}(n^2+3n+1)$ **(6 marks)**

Question Four

a) Derive the quadratic formula and hence solve the following equation:

$$2x^2-3x-4=0$$

(6 marks)

b) Simplify the following equation:

$$E=\left(5x^2y^{-3/2}z^{1/4}\right)^2\times\left(4x^4y^2z\right)^{1/2}$$

(4 marks)

c) Solve the equation $7(14.3^{x+5})\times 6.4^{2x}=294$ **(4 marks)**

d) Show that the sum of n terms of a geometric series is given by:

$$S_n = \frac{a\left(1 - r^n\right)}{1 - r}$$

(4 marks)

e) Determine the following antilogarithms to the base stated.

(i) Antilog 2.4572 (base 6) **(1 mark)**

(ii) Antilog 3.2684 (base 10) **(1 mark)**

Question Five

a) The lengths (in mm) of 40 spindles were increased with the following results:

20.90	20.57	20.86	20.74	20.82	20.63	20.53	20.89	20.75	20.65
20.71	21.03	20.72	20.41	20.94	20.75	20.79	20.65	21.08	20.89
20.50	20.88	20.97	20.78	20.61	20.92	21.07	21.16	20.80	20.77
20.82	20.72	20.60	20.90	20.86	20.68	20.75	20.88	20.56	20.94

Display the data above using a class size of 0.10 **(8 marks)**

b) Let X_1, X_2……..X_n be a sample of a given population show that the sum of squares of the deviations of a set of data from any number say B is least when B - $\overline{X} = 0$ where $\overline{X}$ is the arithmetic mean

(3 marks)

c) Solve for x in the following equation:

$$\frac{3}{x-2} + \frac{5}{x-3} - \frac{8}{x+3} = 0$$

(4 marks)

d) Given the following matrices:

$$A = \begin{pmatrix} 4 & 2 & 3 \\ 4 & 2 & 4 \end{pmatrix} \qquad B = \begin{pmatrix} 1 & 0 \\ 1 & 0 \\ 3 & 4 \end{pmatrix} \qquad C = \begin{pmatrix} 1 & 0 & 1 \\ 3 & 1 & 0 \end{pmatrix}$$

Find:

(i) $A + 2B$ **(2 marks)**

(ii) A_2 **(2 marks)**

(iii) Predict the order of matrix A.B.C **(1 mark)**