TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSISCS

UPGRADING MATHEMATICS

AMA 1001: ALGEBRA

END OF SEMESTER EXAMINATION
SERIES: DECEMEBER 2014
TIME ALLOWED: 2 HOURS

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<u>**Instructions to Candidates:**</u>
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) (i) $\dfrac{1}{3} - \left(\dfrac{2}{5} + \dfrac{1}{4}\right) \div \left(\dfrac{3}{8} \times \dfrac{1}{3}\right)$ **(3 marks)**

(ii) $\left(\dfrac{2}{3} \times 1\dfrac{1}{4}\right) \div \left(\dfrac{2}{3} + \dfrac{1}{4}\right) + 1\dfrac{3}{5}$ **(3 marks)**

b) (I) Express as decimal number correct to 3 significant figures:

(i) $\dfrac{9}{16}$

(ii) $5\dfrac{7}{8}$ **(2 marks)**

c) Find the value of:

(i) $5pq^2r^3$ when $p = \dfrac{2}{5}, q = -2$ and r = -1 **(2 marks)**

(ii) $\left(x^2y^3z\right)\left(x^3yz^2\right)$ when $x = \dfrac{1}{2}, \ y = 2$ and z = 3 **(2 marks)**

d) A German silver alloy consist of 60% copper, 25% zinc and 15% nickel. Determine the masses of the copper, zinc and nickel in a 3.74kg block of the alloy. **(3 marks)**

e) Evaluate using the laws of indices:

(i) $\dfrac{\left(2^4\right)^2 \times 3^{-2} \times 4^4}{2^3 \times 16^2}$ **(3 marks)**

(ii) $\dfrac{\left(3^2\right)^{\frac{3}{2}} \times \left(8^{\frac{1}{3}}\right)^2}{3^2 \times \left(4^3\right)^{\frac{1}{2}}\left(9\right)^{-\frac{1}{2}}}$ **(3 marks)**

f) Evaluate expressing your answer in standard form:

(i) $\dfrac{\left(2.4 \times 10^3\right)\left(3 \times 10^{-2}\right)}{\left(4.8 \times 10^4\right)}$ **(2 marks)**

(ii) $\dfrac{6 \times 10^{-3}}{3 \times 10^{-5}}$ **(2 marks)**

g) Convert 11011_2 to a decimal number. **(3 marks)**

Question Two

a) Solve the equation:

$$\frac{x}{4} - \frac{x+6}{5} = \frac{x+3}{2}$$

   (i)   **(2 marks)**

$$\frac{x+3}{4} = \frac{x-3}{5} + 2$$

   (ii)   **(2 marks)**

b) Solve the following simultaneous equations:

   (i)   By substitution method

$$5c = 1 - 3d$$

$$2d + c + 4 = 0$$

                                               (3 marks)

   (ii)   By elimination

$$7x - 2y = 26$$

$$6x + 5y = 29$$

                                               (3 marks)

c) Solve the following quadratic equation:

$$15x^2 + 2x - 8 = 0$$

   (i)   By factorization   **(3 marks)**

$$2x^2 + 9x + 8 = 0$$

   (ii)   By completing square   **(3 marks)**

d) Solve the following equations:

$$5(f - 2) - 3(2f + 5) + 15 = 0$$

   (i)   **(2 marks)**

$$10 + 3(r - 7) = 16 - (r + 2)$$

   (ii)   **(2 marks)**

Question Three

a) Solve the following indices equations for x each correct to 4 significant figures:

$$2^{x-1} = 3^{2x-1}$$

   (i)   **(3 marks)**

$$x^{-0.25} = 0.792$$

   (ii)   **(2 marks)**

$$4^{2x-1} = 5^{x+2}$$

   (iii)   **(3 marks)**

b) Solve the following equations:

$$\log_3 {}^{1}\!/_{81} = x$$

   (i)   **(3 marks)**

$$\log_2 x = -3$$

   (ii)   **(3 marks)**

c) Convert the decimal number into binary number.

      53.90625_{10} **(3 marks)**

d) Convert into a decimal number   **(3 marks)**

           10111.011_{2}

Question Four

a) The 1st, 12th and last term of an arithmetic progression are 4, 31.5 and 376.5 respectively. Determine:
- (i) The number of terms in the series
- (ii) The sum of all the term and;
- (iii) The 80th term   **(6 marks)**

b) Find the sum to infinity of the series:

      2½, 1¼, 5/8   **(2 marks)**

c) Evaluate the following:

   (i) 7_{C_4}

   (ii) 10_{C_4}

   (iii) 4_{P_2}

   (iv) 7_{P_4}

d) Expand $(2a + 3b)^5$ using Pascal's triangle.   **(4 marks)**

Question Five

a) Plot the following graphs on the same axes between the range:

      $x = -4$ to $x = +4$

                            and determine the gradient and y-axis intercept of each:
- **(i)** y = x
- **(ii)** y = x + 5
- **(iii)** y = x + 2
- **(iv)** y = x -3   **(12 marks)**

b) Solve the simultaneous equations graphically:

$$3x + 4y = 5$$
$$2x - 5y + 12 = 0$$

                                                          (8 marks)