TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSISCS

DIPLOMA IN MEDICAL LABORATORY SCIENCES (DMLS 14S)
DIPLOMA IN COMMUNITY HEALTH MANAGEMENT (DCHM 14S)

AMA 2101: MATHS FOR SCIENCE

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 **THREE** printed pages

Question One (Compulsory)

a) Define the following terms as used in Mathematics:
    (i) An equation
    (ii) Napierian logarithms   **(2 marks)**

b) Given that $\log_a N = n$ and $\log_a N = m$ Show that $\log_a N = \dfrac{\log_a N}{\log_a b}$ **(5 marks)**

c) Differentiate the given equation below: **(4 marks)**

$$y = \frac{\ln x}{e^{2x}}$$

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

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

$$x^2 + 22x + 28 = 0$$
    (ii)   **(1 mark)**

$$x^2 + 5x - 24 = 0$$
    (iii)   **(1 mark)**

$$x^2 - 4x - 21 = 0$$
    (iv)   **(1 mark)**

$$10x - 7 = -2x^2$$
e) Solve the following by completing the square   **(5 marks)**

f) Integrate the following equation below:

$$\int \left(\frac{3x2}{x3 - 4} \right) dx$$

                                                                  (5 marks)

$$\log_2 x + \log_3 x + \log_4 x = 7.079 \log_{10} x$$
g) Show that the statement below holds: **(3 marks)**

$$ep^2 + \int p + g = 0$$
h) Transpose the equation below to make P the subject   **(2 marks)**

Question Two

a) Solve for the unknowns in the following set of equations below:

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

(8 marks)

b) Simplify the equation below:
$$F = \sqrt[3]{a^6b^3} \div \sqrt{\frac{1}{9}a^4b^6} \times \left(4\sqrt{a^6b^2}\right)^{-\frac{1}{2}}$$

(3 marks)

c) Solve for the unknown below:
$$5.4^{x+3} \times 8.2^{2x-1} = 4.8^{3x}$$

(5 marks)

d) Write down the gradient and the co-ordinates of the y-intercept of the following lines:
$$-5x=-y+4$$
(i) **(2 mark)**
$$6x=2y+3$$
(ii)
(2 marks)

Question Three

$$3x=1-2y$$
a) Find the equation of a line perpendicular to another line whose equation is   and passes through point (-3, 1) **(4 marks)**

b) Derive the quadratic formula and hence solve for x in the equation below **(6 marks)**
$$2x^2 - 3x - 4 = 0$$

c) The length of a cylindrical pipe is 2m. Its external radius is 2.1cm and the external radius is 1.4cm. Find the volume of the material that was used to make it. **(4 marks)**

$$\int x^3 e^{2x} dx$$

d) Integrate the following: **(6 marks)**

Question Four

$$x = a(\cos\theta + \theta\sin), \quad y = a(\sin\theta - \theta\cos\theta)$$
a) Given that   Find:
$$\frac{dy}{dx}$$
(i) **(6 mark)**
$$\frac{dy^2}{dx^2}$$
(ii) **(4 marks)**

b) Determine the following anti-logarithms to the base stated:
   (i) Antilog 3.2684 (base 10)

(ii) Antilog $\overline{4}.3157$ (base 10)

(iii)　Antilog 2.8623 (base 10)

(iv) Antilog $\overline{4}.3157$ (base 10)　　　　　　　　　　　　　　　　**(4 marks)**

c)　Solve the following:

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

(3 marks)

d)　Solve the pair of equation below using substitution

$$2y = 14 - 5x$$
$$3x - 24 = 4y$$

(3 marks)

Question Five

a)　Given that $y = uv$, where u and v are functions of x. Show that $\frac{dy}{dx} = U\frac{dv}{dx} + V\frac{vdu}{dx}$　　**(6 marks)**

And hence find $\frac{dy}{dx}$ of the equation below if $y = x^4 \cos x$　　**(2 marks)**

b)　A frustum is cut from a cone of height 35cm. The radii of the circular sections are 7cm and 14cm respectively. Find the volume of the frustum　　**(5 marks)**

c)　Find the x and y intercepts of the line with equation y − 6 = 5x　　**(4 marks)**

d)　State any THREE areas in life where mathematics can be applied　　**(3 marks)**