TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF MATHEMATICS AND PHYSICS

UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN COMMUNITY HEALTH / BSMR

AMA 4104/AMA 4104: MATHEMATICS FOR SCIENCES

PAPER 1

END OF SEMESTER EXAMINATION

SERIES: FIRST SEMESTER YEAR ONE

TIME: 2 HOURS

DATE: APRIL 2016

Instructions to Candidates
You should have the following for this examination
-Answer Booklet, examination pass and student ID
This paper consists of FIVE Questions. Attempt   **QUESTION ONE** and any other TWO.
Do not write on the question paper.

QUESTION ONE (30 MARKS)

a) (i)   Simplify $\dfrac{\left(\frac{4}{3}\right)^2 \times \left(\frac{3}{5}\right)^{-2}}{\left(\frac{2}{5}\right)^{-3}}$ (4marks)

   (ii)   Evaluate

$$\frac{\log 25 - \log 125 + \frac{1}{2}\log 625}{3\log 5}$$ (4 marks)

b) (i) Divide $4a^3 - 6a^2b + 5b^3$ by $2a - b$ (4 marks)

(ii) Find the remainder when $x^5 - 4x^3 + 2x + 3$ is divided by x - 2. (3marks)

c) Express $\dfrac{1}{1 - \cos 45}$ in surd form and rationalize the denominator (4 marks)

d) Determine the nth term whose value is 22 in the series 2½, 4, 5½, 7. (4 marks)

e) The probability of a component failing in one year due to excessive temperature is 1/20 , due to excessive vibration is 1/25 and due to excessive humidity is 1/50; Determine the probabilities that during a one-year period a component;
(i) fails due to excessive temperature and vibration
(ii) fails due to excessive vibration and excessive humidity and
(iii) will not fail because of excessive temperature and excessive humidity
(7marks)

QUESTION TWO (20 MARKS)

a) In an ecology field study the following frequency distribution was obtained on the height in centimeters of a certain plant species.

Height (cm)	50-59	60-69	70-79	80-89	90-99	100-109	110-119
No. of Plants	7	81	192	312	218	82	18

Calculate the
(i) Mean height (5 marks)

(ii) Median height (5 marks)

b) Solve the following equations by the method indicated
(i) $6x^2 + x - 2 = 0$ (factor method) (3 marks)

(ii) $2x^2 - 1 = 3x$ (completing the square) (4 marks)

c) How many committees can be formed from a group of 5 governors and 7 senators if each committee consists of 3 governors and 4 senators? (3 marks)

QUESTION THREE (20 MARKS)

a) The roots of the equation $2x^2 - 7 + 4 = 0$ are r, s . Find an equation with integral coefficients whose roots are r/s and s/r (7 marks)

b) Find by completing the square, the greatest value of the function $f(x) = 1 - 6x - x^2$ (5 marks)

c) (i) Multiply and simplify $\cos x(\tan x - \sec x)$ (2marks)

   (ii) Draw the graph of y= cos x for $-2f < x < 2f$ and use the graph to solve for x if
        cos x = -0.5   (6 marks

QUESTION FOUR (20 MARKS)

a) Evaluate the value of $\log_2 7$ (5 marks)

b) In a geometric progression, the sum of the second and third term is 9, and the seventh
    term is eight times the fourth. Find:
    (i) The first term   (2 marks)
    (ii) common ratio   (5 marks)
    (iii) Fifth term   (2marks)

c) Derive the quadratic formulae.   (6marks)

QUESTION FIVE (20 MARKS)

a) Expand $\dfrac{1}{(4-x)^2}$ in ascending powers of x as far as the term in x^3 (7 marks)

b) In a triangle PQR, PQ =35 cm, QR = 45 cm and PR = 65 cm. Calculate :
    (i)   The size of angle PQR   (4marks)
    (ii)   The area of triangle PQR   (3 marks)

c) Solve the equation $3e^{2x} - 7e^x + 2 = 0$ (6 marks)