



**TECHNICAL UNIVERSITY OF MOMBASA**  

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**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.**

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**QUESTION ONE (30 MARKS)**

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

(ii) Evaluate

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

- 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  $\frac{1}{1 - \cos 45}$  in surd form and rationalize the denominator (4 marks)
- d) Determine the  $n$ th term whose value is 22 in the series  $2\frac{1}{2}, 4, 5\frac{1}{2}, 7$ . (4 marks)
- e) The probability of a component failing in one year due to excessive temperature is  $\frac{1}{20}$ , due to excessive vibration is  $\frac{1}{25}$  and due to excessive humidity is  $\frac{1}{50}$ ; 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  $\alpha, \beta$ . Find an equation with integral coefficients whose roots are  $\alpha/\beta$  and  $\beta/\alpha$  (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  $-2\pi < x < 2\pi$  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  $\frac{1}{(4-x)^2}$  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)