



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF MATHEMATICS AND ACTUARIAL SCIENCE

**UNIVERSITY EXAMINATION FOR DEGREE OF BACHELOR OF SCIENCE IN
COMMUNITY HEALTH**

1ST YEAR 1ST SEMESTER 2016/2017 ACADEMIC YEAR

MAIN CAMPUS

COURSE CODE: SMA 3111

COURSE TITLE: MATHEMATICS I

EXAM VENUE: STREAM: E-LEARNING

DATE:

EXAM SESSION:

TIME: 2.00 HOURS

Instructions:

- 1. Answer question one (compulsory) and any other two questions.**
- 2. Candidates are advised not to write on the question paper.**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room.**

QUESTION ONE (30 MARKS)

- Given that $X = \{1,2,3\}$ and $Y = \{a, b\}$. Show that $X \times Y \neq Y \times X$. (4marks)
- Find the power set of $N = \{a, b, c, d\}$ (4marks)
- Convert
 - 120° to radians. Express your answer as a multiple of π . (2marks)
 - $\frac{\pi}{3}$ radians to degrees (2marks)
- Solve the equation $2 \log_3(x + 4) - \log_3 9 = 2$ (4marks)
- Find the real solution, if any of the equation using quadratic formula
 $9 + \frac{3}{x} - \frac{2}{x^2} = 0$ (4marks)
- Find the coefficient of x^6 in $(x + 3)^{12}$ (3marks)
- Let f and g be the functions from the set of integers to the set of integers defined by $f(x) = 2x + 3$ and $g(x) = 3x + 2$. Find
 - $(f \circ g)$ (2marks)
 - $(g \circ f)$ (2marks)
- Karen invested \$1000 in an account that paid 3.5% interest compounded quarterly. Find the total amount of money that Karen had at the end of 5 years. (3marks)

QUESTION TWO (20 MARKS)

- a) The fifth term of a geometric progression is 12 and the ninth term 384. All the terms are positive.
- i) Find the common ratio (3marks)
 - ii) Find the first term (2marks)
 - iii) Find the sum of the first 20 terms (3marks)
- b) A man wishes to save money by setting aside 1 shilling the first day, 2 shillings the second day, 4 shillings the third day, and so on:
- i) If he continues to double the amount set aside each day, how much must he set aside on the fifteenth day? (3 marks)
 - ii) Assuming he does not run out of money, what is the total amount saved at the end of the 30 days? (3 marks)
- c) If it rains on a given day, the probability that it rains the next day is $\frac{1}{3}$. If it does not rain on a given day, the probability that it rains the next day is $\frac{1}{6}$. The probability that it will rain tomorrow is $\frac{1}{5}$. Using a tree diagram find the probability that it will rain the day after tomorrow. (6marks)

QUESTION THREE (20 MARKS)

- a) Solve $3(1 - \cos\theta) = 2\sin^2\theta$ for $0^\circ \leq \theta \leq 360^\circ$ (6marks)
- b) Verify the identity
- $$\frac{1 + \cot\theta}{1 + \tan\theta} = \cot\theta$$
- (6marks)
- c) A triangle XYZ has sides $x = 9\text{cm}$, $y = 7.5\text{cm}$ and $z = 6.5\text{cm}$. Determine its 3 angles and its area. (8marks)

QUESTION FOUR (20 MARKS)

- a) The data below represents the masses of some containers sampled from a warehouse.

Mass	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74
Frequency	1	2	4	5	10	8	5	2	1

Use the data to calculate

- i) the mean (2marks)
 - ii) the median (3marks)
 - iii) the variance (3marks)
 - iv) the standard deviation (2marks)
- b) Out of 7 consonants and 4 vowels, how many words of 3 consonants and 2 vowels that can be formed. (4marks)
- c) If $x-2$ and $x+2$ are factors of $6x^3 + ax^2 + bx + 16$, determine the values of

a and b

(6marks)

QUESTION FIVE (20 MARKS)

- a) Describe the following sets using list method and give the set cardinality.
 $A = \{x: x^2 + 2x + 1 = 0, x, a \text{ real number}\}$ (3marks)
- b) If $U = \{1,2, \dots, 7\}, S = \{1,2,3,4,5,7\}, T = \{1,2,6,7\}, V = \{4\}$, and $W = \{1,2,4,5,7\}$.
Find
- i) $[(S \cup W) \cup T^c]^c$ (4marks)
- ii) $(S \setminus (T \cap V) \cap W)$ (4marks)
- c) Draw the Venn diagram and shade the regions corresponding to the combinations to the set $X^c \cup (Y^c \cap Z^c)$ (3marks)
- d) Prove the following law of set operation
 $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$. (6marks)