JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF MATHEMATICS AND ACTUARIAL SCIENCE

UNIVERSITY EXAMINATION FOR CERTIFICATE IN COMMUNITY HEALTH

1ST YEAR 1ST SEMESTER 2018/2019 ACADEMIC YEAR

MAIN/ KISII CAMPUS

COURSE CODE: SMA 1111

COURSE TITLE: MATHEMATICS I

EXAM VENUE: **STREAM: HEALTH SCIENCE**

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.**

<u>QUESTION ONE</u> (30 marks)

a) Simplify: $\frac{2}{3-\sqrt{5}}$ by rationalizing the denominator (4marks)

b) Given that $A = \{1,2\}$ and $B = \{a, b\}$ Show that the $A \times B \neq B \times A$ (4 marks)

c) Simplify: $\frac{Y^7 \times Y^4}{Y^5}$ (3marks)

d) Solve the equation $x^2 + 4x + 2 = 0$ using the quadratic formula (5marks)

e) Given $A = \{1,2,4,7\}$ and $B = \{2,3,4,5,8\}$. Let R be the following relation from A to B. $R = \{(1,3), (2,4), (2,5)\}$

   i) Determine the arrow diagram of R (2marks)

   ii) Find the inverse relation R^{-1} of R (2marks)

   iii) Determine the domain and the range of R (2marks)

f) In how many ways can a committee consisting of 4 men and 3 women be chosen from8 men and 6 women. (3marks)

g) Use binomial theorem to determine the expansion of $(1 + x)^4$ (5marks)

<u>QUESTION TWO</u> (20 marks)

a) Given two functions $f(x) = x + 1$ and $g(x) = 4x$. Evaluate

   i) fog. (3 marks)

   ii) gof (3marks)

b) Find the inverse of $f(x) = 2x + 3$ (3marks)

c) Find the area of a triangle given that side $AB = 3$, $BC = 2$ and angle $B = 50^o$ (4marks)

d) Convert the following into

i) 230^o into radians (2marks)

ii) $\frac{\pi}{6}$ into degrees (2marks)

e) Solve: $\log x = 2$ (3 marks)

QUESTION THREE **(20 marks)**

a) Define the following terms as used in set theory

i) Empty set (2marks)

ii) Singleton set (2marks)

b) Find the power set of $S = \{1,3\}$ (3marks)

c) Let $U = \{1,2,3, \ldots ,8,9\}$ be the universal set and $A = \{1,2,3,4\}$, $B = \{2,4,6,8\}$ and $C = \{3,4,5,6\}$.

Find

i) A^c (2marks)

ii) $(A \cap C)^c$ (2marks)

iii) $(A \cup B)^c$ (2marks)

iv) $B \backslash C$ (2marks)

d) Draw the Venn diagram and shade the region corresponding to

i) $A \cap B \cap C$ (3marks)

ii) A^c (2marks)

QUESTION FOUR **(20 marks)**

a) The following distribution gives the finishing times in minutes for male runners in a marathon:

Time	20-29	30-39	40-49	50-59	60-69	70-79	80-89
Runners	6	5	7	10	5	4	3

Use the data to compute

i) mode (1mark)

ii) mean (3marks)

ii) median (3marks)

iii) standard deviation from the above data (3marks)

b) Calculate the mean of following ungrouped data:
$20, 18, 15, 15, 14, 12, 11, 9, 7, 6, 4, 1$ (4marks)

c) Solve $sin\theta = \frac{1}{2}$ for $0^O < \theta < 360^O$ (6marks)

<u>QUESTION FIVE</u> (20 marks)

a) Below is an arithmetic progression.

$60 + 57 + \ldots + 18$

(i) How many terms are there in the progression? (3 marks)
(ii) What is the sum of the terms in the progression? (3 marks)

b) A progression has a second term of 48 and a fourth term of 27. Find the first term of the progression in each of the following cases:

(i) the progression is arithmetic (3 marks)
(ii) the progression is geometric with a positive common ratio. (3 marks)

c) The fifth term of a geometric progression is 24 and the ninth term is 384. All the terms are positive.

(i) Find the common ratio. (3 marks)
(ii) Find the first term. (2 marks)
(iii) Find the sum of the first ten terms. (3 marks)