JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

UNIVERSITY EXAMINATION 2012/2013

1ST YEAR 1ST SEMESTER EXAMINATION FOR BACHELORS DEGREE (REGULAR)

COURSE CODE: SMA 3111

TITLE: MATHEMATICS I

DATE: 29 /4/2013   **TIME: 9.00-11.00AM**

DURATION: 2 HOURS

INSTRUCTIONS

1. This paper contains SIX (6) questions
2. Answer question 1 (Compulsory) and ANY other 2 Questions
3. Write all answers in the booklet provided

QUESTION ONE (30 marks)

a. The following information refers to the functions f and g:

$$f : x \rightarrow 3x - 2$$

$$g : x \rightarrow \frac{5}{x-2}, x \neq k$$

Find (i) the value of k, (1 marks)

      (ii) $fg(x)$ (4 marks)

b. Exhibit the set that is described by the given statement below (where n is a positive integer):

$$\{x \mid x = n^2 + 10 < 40\}. \text{(4 marks)}$$

Hence find its cardinality. (1 marks)

c. If $\tan \theta = \frac{3}{4}$ and $\sin \theta < 0$, find the exact value of each of the remaining trigonometric functions of θ. (7 marks)

d. Solve the equation: $\log_5(x^2 + x + 4) = 2$. (5 marks)

e. Find the ratio of the term in x^3 to the term in x^4 in the expansion of $(2x+3)^7$ (5 marks)

f. How many four-digit numbers can be formed using the digits $0,1,2,3,4,5,6,7,8,$ and 9 if the first digit cannot be 0? (3 marks)

QUESTION TWO (20 marks)

a. Let $A = \{0,2,4,6,8,10\}$, $B = \{0,1,2,3,4,5,6\}$, and $C = \{4,5,6,7,8,9,10\}$.

Find: (i) $A \cap B \cap C$; (2 marks)

      (ii) $(A \cap B) \cup C$ (3 marks)

b. Prove that $(A \cap B)^c = A^c \cup B^c$ (6 marks)

c. Draw the Venn diagram for the combination of the sets $A,$ $B,$ and C:

$$(A \cap B^c) \cup (A \cap C^C) \text{(9 marks)}$$

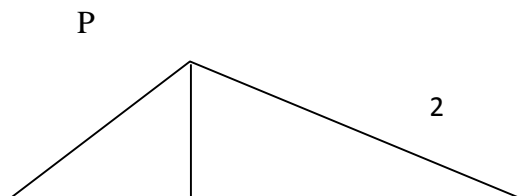**QUESTION THREE (20 marks)**

a. Solve $\tan^2 \theta = \frac{3}{2} \sec \theta$ on the interval $0 \leq \theta \leq 2f$. (4 marks)

b. Establish the identity

$$\frac{1 - 2\cos^2 \theta}{\sin \theta \cos \theta} = \tan \theta - \cot \theta. \text{(4 marks)}$$

c. The figure below shows a roof truss PQR with rafter $PQ = 3m$, $\angle PQR = 40^0$, and $\angle PRQ = 32^0$ Calculate the length of (i) the roof rise PP', (ii) the rafter PR, and (iii) the roof span QR. Hence determine the cross-sectional area of the roof of truss. (12 marks)

P

2

3m

Q ⌐　　　　□　　　　　⌐　R

P′

QUESTION FOUR (20 marks)

a. The first, twelfth and last term of an arithmetic progression are 4, $31\frac{1}{2}$, and $376\frac{1}{2}$ respectively.

Determine:
   i.　the number of terms in the series, (4 marks)
   ii.　the sum of all term, and (4marks)
   iii.　the 80th term. (4 marks)

b. If $Kshs.250,000$ is invested at compound interest of 6% per annum, determine:
   i.　the value after 15 years, (4 marks)
   ii.　the time, correct to the nearest year, it takes to reach $Kshs.750,000$. (4 marks)

QUESTION FIVE (20 marks)

From the following observations prepare a frequency distribution starting with $5 - 10$ (5 marks)

12	36	40	30	28	20	19	10	10	16
19	27	15	26	20	19	7	45	33	21
26	37	6	20	11	17	37	30	20	5

Hence:
a. compute mean and standard deviation from the above data, (10 marks)
b. draw the ogive curve from the above data. (5 marks)