JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF MATHEMATICS AND ACTUARIAL SCIENCE

UNIVERSITY EXAMINATION FOR DEGREE OF BACHELOR OF SCIENCE ACTUARIAL

4TH YEAR SPECIAL RESITS – 2016

MAIN REGULAR

COURSE CODE: SMA 100

COURSE TITLE: BASIC MATHEMATICS

EXAM VENUE: LAB 1 **STREAM: (BSc. Actuarial)**

DATE: 04/05/2016 **EXAM SESSION: 9.00 – 11.00 AM**

TIME: 2.00 HOURS

Instructions:

1. **Answer question 1 (Compulsory) and ANY other 2 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

a) Find the sum of the following arithmetical progression:
$1+3+5+...+101$ (4 marks)

b) Find the exact values of the remaining five trigonometric functions of θ:
$\cos\theta = \frac{-1}{3}, \quad 180^o < \theta < 270^o$ (6 marks)

c) Solve the following equation by factoring:
$\frac{5}{x+4} = 4 + \frac{3}{x-2}$ (6 marks)

d) Find the middle term of the expansion of $(2x+3)^8$, and the value of this when $x = \frac{1}{12}$ (5 marks)

e) Given that $z = 3+4i$ and $w = 12+5i$, write down the modulus and argument of $(zw)^*$ (5 marks)

f) Solve the following inequality, expressing your answer using set notation:
$-3 < \frac{2x-1}{4} < 0$ (5 marks)

QUESTION TWO

a) The sum of three consecutive terms of an arithmetical progression is 36. Their product is 1428. Find the three terms. (10 marks)

b) The fourth, seventh and sixteenth terms of an arithmetical progression are in geometrical progression. If the first six terms of the arithmetical progression have a sum of 12, find the common difference and the common ration. (10 marks)

QUESTION THREE

a) Solve the following equation for the values of θ from 0^0 to 360^0, inclusive:
$\cos(2\theta + 30^0) = 0.8$ (6 marks)

b) Eliminate θ from the equations:
$x = \tan\theta, \; y = \tan 2\theta$ (4 marks)

c) Prove the following identity:
$\frac{1-\sin\theta+\cos\theta}{1-\sin\theta} = \frac{1+\sin\theta+\cos\theta}{\cos\theta}$ (5 marks)

d) Show that the length d of a chord of a circle of radius r is given by the formula
$d = 2r\sin\frac{\theta}{2}$
Where θ is the central angle formed by the radii to the ends of the chord. (5 marks)

QUESTION FOUR

a) Exhibit in each case the set that is described by each of the given statements below, assuming that n is a positive integer:

i. $\left\{ k \left| k = \frac{(-1)^n}{n} \right. \right\}$; (2 marks)

ii. $\left\{ y \left| 3y^2 + 2y + 7 = 0, \quad y, \quad a \quad real \quad number \right. \right\}$. (3 marks)

b) Find the sets A and B if $A - B = \{1,5,7,8\}$, $B - A = \{2,10\}$ and $A \cap B = \{3,6,9\}$. (5 marks)

c) Draw the Venn diagram for the combination of the sets A, B, and C:
$A \cap (B - C)$ (5 marks)

d) Prove the following distribution law of set operations:
$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ (5 marks)

QUESTION FIVE

a) Solve the following system of equations

$$\begin{cases} x + y + z + w = 4 \\ 2x - y + z = 0 \\ 3x + 2y + z - w = 6 \\ x - 2y - 2z + 2w = -1 \end{cases}$$

Using matrices (row operations). If the system has no solution, say that it is inconsistent.
. (10 marks)

b) Solve the system of equations

$$\begin{aligned} 3x - y + 5z &= -2 \\ -4x + y + 7z &= 10 \\ 2z + 4y - z &= 3 \end{aligned}$$

using Cramer's Rule if it is applicable. If Cramer's Rule is not applicable, say so. (10 marks)