JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

UNIVERSITY EXAMINATION 2012/2013

1ST YEAR 1ST SEMESTER EXAMINATION FOR THE DEGREE OF BED (SCIENCE) AND BSC. (ACTUARIAL SCIENCE)

(REGULAR)

COURSE CODE: SMA *100*

TITLE: BASIC MATHEMATICS

DATE: 2/5/2013 **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) 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 :
$\cos\theta = \frac{-1}{3}, \quad 180^o < \theta < 270^o$ (6marks)

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

d) Find the middle term of the expansion of $\left(2x+3\right)^8$, 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 $\left(zw\right)^*$ (5 marks)

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

QUESTION TWO (20 marks)

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 (20 marks)

a) Solve the following equation
$\cos\left(2\theta + 30^0\right) = 0.8$
for θ where $0^0 \le \theta \le 360^0$ (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 (20 marks)

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

ii. $\left\{ y \middle| 3y^2 + 2y + 7 = 0, \quad y, \quad a \quad real \quad number \right\}$. (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 $A, \quad B,$ 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 (20 marks)

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)