



**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND  
TECHNOLOGY**

**UNIVERSITY EXAMINATION 2013**

**FIRSTYEAR FIRST SEMESTER EXAMINATION 2013**

**KISUMU LEARNING CENTRE**

**COURSE CODE: SMA 2111**

**COURSE TITLE: MATHEMATICS I**

**DATE: 16/4/2013**

**TIME:9.00-10.30AM**

**DURATION: 1.5 HOURS**

**INSTRUCTIONS**

- 1. This paper contains FIVE questions.**
- 2. Answer question 1(compulsory ) and ANY other TWO questions**
- 3. Write all your answers in the booklet provided**

**Question one (30 mks)**

- a. Find the fifth terms of each of the following sequence of numbers;

7.2, 7.8, 8.4... (3 marks)

- b. A die is rolled and a coin is tossed, find the probability that the die shows an odd number and the coin shows a head. (3 marks)
- c. Evaluate the following complex numbers  $(2 + 3i)(4 + 5i)$  (2 marks)
- d. The manager of a team has a squad of 16 players. He needs to choose 11 to play in a match. How many possible teams can be chosen? (3 marks)
- e. Given that  $\cos \beta = \frac{3}{5}$ , find without the use of a calculator  $\sin \beta$  (3 marks)
- f. Convert 225 degrees into radians (3 marks)
- g. Solve the trigonometric equation  $2 \cos x + 2 = 3$  for  $0^\circ \leq x \leq 360^\circ$ . (3 marks)
- h. Find the roots of the quadratic equation  $2x^2 + 7x + 3 = 0$ . (4 marks)
- i. If the mean of the data set 7, 3, 4, 2, 2, 3, 1, and x is 3, find the mode and median of the data. (3 marks)
- j. Calculate the amount paid by a customer who borrows Ksh 450,000 for a period of  $2\frac{1}{2}$  from a financial institution that charges compound interest at the rate of 30% per annum. (3 marks)

**Question two: 20 marks**

- a. i. Using an example, briefly describe a complex number. (2 marks)
- ii. Illustrate a general form of a complex number on a complex plane. (2 marks)
- iii. Evaluate the following complex numbers;
- $(3 + 2i) + (4 - 6i)$  (2 marks)
- b. State and prove De Moivre's Theorem for complex numbers. (7 marks)
- c. New employees joining a certain firm receive an annual salary of 8500 pounds. Every year they stay with the company, they have a salary increase of 800 pounds up to a maximum of 13300 pounds per annum. How much will the employee have earned up to and including the year he is on maximum salary? (4 marks)
- d. Find the number of possible different ways that the four letters ABCD can be arranged. (3 marks)

**Question three (20 marks)**

- a. The blood groups of 200 people is distributed as follows: 50 have type **A** blood, 65 have **B** blood type, 70 have **O** blood type and 15 have type **AB** blood. If a person from this group is selected at random, what is the probability that this person has O blood type? (4 marks)
- b. i. Find the fifth term of the sequence

$$\frac{1}{4}, \frac{1}{12}, \frac{1}{36}, \frac{1}{108}, \dots$$

(3 marks)

ii. Find the sum of the first six terms of the sequence 5, 10, 20 ...

(3 marks)

c. Fill in the table below;

|       |    |     |     |     |      |      |      |
|-------|----|-----|-----|-----|------|------|------|
| x     | 0° | 30° | 60° | 90° | 120° | 150° | 180° |
| Sin x |    |     |     |     |      |      |      |

(2 marks)

ii. Sketch the graph of the trigonometric function  $y = \sin x$  for  $0^\circ \leq x \leq 360^\circ$

(3 marks)

iii. Use your graph to solve the equation  $\sin x = 0$ .

(2 marks)

d. i. Simplify the expression  $\log 3 + \log 4 - \log 2$ .

(2 marks)

ii. Hence solve the equation  $\log x = \log 3 + \log 4 - \log 2$ .

(1 marks)

#### Question four (20 marks)

a. i. Show that for a general quadratic equation in the form  $ax^2 + bx + c = 0$ , where a, b and c are constants,

$$\text{Then } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad (5 \text{ marks})$$

Hence use the formula to solve the equation  $-2x^2 + 5x - 3 = 0$

(3 marks)

b. i. What do the following values mean in probability?

(3 marks)

| Value | Meaning |
|-------|---------|
| 0     |         |
| 0.5   |         |
| 1     |         |

ii. Two dice are rolled; find the probability that the sum is

a) equal to 1

b) equal to 4

c) less than 13

(6 marks)

a. Convert  $\frac{3\pi}{2}$  radians into degrees.

(3 marks)

#### Question five (20 marks)

- a. The following is a frequency distribution of marks for Mathematics I course at Jaramogi Oginga Odinga University of Science and technology.

|           |       |       |       |       |       |       |
|-----------|-------|-------|-------|-------|-------|-------|
| Marks     | 40-49 | 50-59 | 60-69 | 70-79 | 80-89 | 90-99 |
| Frequency | 4     | 4     | 10    | 12    | 16    | 4     |

Treating this data as sample, calculate the following;

- i. Mean (2 marks)
- ii. Median (3 marks)
- iii. Mode (2marks)
- iv. Standard deviation (3 marks)
- b. i. State the conjugate of  $3-\sqrt{5}$  (1 mark)
- ii. Hence rationalize the denominator in the expression  $\frac{1}{3-\sqrt{5}}$  (3 marks)
- c. Use completing the square method to solve  $x^2 + 2x - 8 = 0$  (3 marks)
- d. Simplify the following expression:  $\frac{3x^3y^2 \times 4xy}{2x^2y}$  (3 marks)