Name _____ Index No. _____/_____

2705/201 2707/201
2709/201 2710/201
MATHEMATICS II AND SURVEYING II
Oct./Nov. 2015
Time: 3 hours

Candidate's Signature _____

Date _____

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN BUILDING CONSTRUCTION
DIPLOMA IN CIVIL ENGINEERING
DIPLOMA IN ARCHITECTURE
MODULE II

MATHEMATICS II AND SURVEYING II

3 hours

INSTRUCTIONS TO CANDIDATES

Write your name and index number in the spaces provided above.
Sign and write the date of the examination in the spaces provided above.
You should have drawing instruments and a Scientific calculator for this examination.
*This paper consists of **EIGHT** questions in **TWO** sections; **A** and **B**.*
*Answer **FIVE** questions choosing at least **TWO** questions from each section in the spaces provided in this question paper.*
All questions carry equal marks.
Maximum marks for each part of a question are as shown.
*Do **NOT** remove any pages from this question paper.*
Candidates should answer the questions in English.

For Examiner's Use Only

Section	Question	Maximum Score	Candidate's Score
A		20	
		20	
		20	
B		20	
		20	
		20	
	Total Score	100	

This question paper consists of 20 printed pages.

Candidates must check the question paper to ascertain that all the pages are printed and that no questions are missing.

SECTION A: PHYSICAL SCIENCE

*Answer at least **TWO** questions from this section.*

1. (a) Given that $Z_1 = 4 - i$ and $Z_2 = 2 + 5i$, find: $\frac{Z_1}{Z_2}$ giving your answer in the form $re^{j\theta}$. (8 marks)

   (b) (i) Use the Taylor's theorem to expand $Sin\left(\frac{\pi}{4} + h\right)$ in ascending powers of h as far as the term h^4.

   (ii) Use your results in b (i) to find the value of Sin 46° to four decimal places. (12 marks)

2. (a) Find $\frac{dx}{dy}$ given that:

   (i) $y = \log_e\{Sinx^2\}$. (4 marks)

   (ii) $y = \frac{e^{2x+1}}{x^2 - 1}$ (5 marks)

   (b) Find the general solution of the differential equation:

   $$\frac{d^2y}{dx^2} - 2\frac{dy}{dx} - 3y = 7x$$ (11 marks)

3. (a) Given the function $f(x,y) = \tan^{-1}\left(\frac{y}{x}\right)$

   Show that:

   $$\frac{\partial^2 y}{\partial x^2} + \frac{\partial^2 f}{\partial y^2} = 0$$ (7 marks)

   (b) Solve the hyperbolic equation:

   $2Cosh\, x + Sinh\, x = 2$ (8 marks)

   (c) Find the integral

   $$\int \frac{dx}{2x^2 + 3x - 5}$$ (5 marks)

4. (a) A body performs simple harmonic motion represented by the equation:

$$\frac{d^2x}{dt^2} = -n^2x$$

Where n is a constant and the periodic time $T = \frac{2\pi}{n}$. Determine the displacement x at any time t. (12 marks)

(b) Show that $Sinh^{-1}x = \ln\{x + \sqrt{x^2+1}\}$. (8 marks)

SECTION B: SURVEYING II

*Answer at least **TWO** questions from this section.*

5. (a) Outline the functions of the following components of a theodolite:

(i) tribrach;
(ii) footscrews;
(iii) optical plummet.

(3 marks)

(b) Outline the procedure of setting up a theodolite. (6 marks)

(c) Describe the procedure of locating tangent points when the intersection point is inaccessible. (11 marks)

6. **Table 1** shows observed bearing of the lines of a traverse ABCDEA with a compass in a place where local attraction was suspected. Compute the corrected bearings of the lines. (20 marks)

Table 1

Line	Fore bearing		Back bearing	
AB	191°	45'	13°	00'
BC	39°	30'	222°	30'
CD	22°	15'	200°	30'
DE	242°	45'	62°	45'
EA	330°	15'	147°	45'

7. (a) Using illustrations distinguish between the following terms:

(i) interior and exterior angles;

(ii) forward and back bearings;

(iii) whole circle bearing and quadratal bearing.

(9 marks)

(b) Convert the following forward bearings to back bearings:

(i)	45°	00′	30″	
(ii)	295°	35′	45″	
(iii)	N	45°	00′	30″E
(iv)	S	50°	40′	15″E

(4 marks)

(c) Convert the following whole circle bearings to quadrantal bearings:

(i)	35°	40′	15″
(ii)	305°	15′	45″
(iii)	165°	20′	25″

(3 marks)

(d) **Figure 1** is a closed polygon. If the bearing of the line AB is 125° 30′ 45″, compute the bearings of the lines BC, CD, *DE* and EA given that the interior angles had been adjusted.

(4 marks)

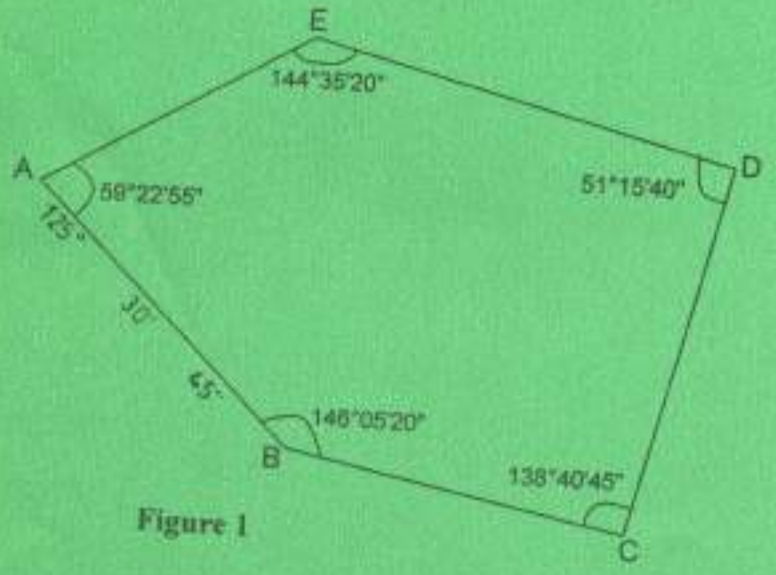

Figure 1

8. (a) Using illustrations distinguish between a loop and a closed oriented traverse. (4 marks)

(b) **Table 2** shows bearings and distances for a loop traverse. Given the coordinates of point T_1 are (1000.00N, 1000.00E) compute the final coordinates of A, B, and C. Adjust the coordinates using Bowditch method. (16 marks)

Table 2

Line	Bearing			Distance (m)
TA	25°	33′	51″	1035.92
AB	72°	55′	15″	1415.50
BC	145°	43′	30″	1645.55
CT_1	270°	15′	36″	2732.11