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Name	Seac	353 (10)	Index No.	1
2705/201	2707/201		Candidate's Signi	ature
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MATHEM	ATICS II AND SURVEYING II		Date	
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#### 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

Time: 3 hours

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
		20	Phone in a
A		20	
		20	
		20	
В		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.

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### 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<sup>30</sup>. (8 marks)
  - (b) Use the Taylor's theorem to expand  $Sin(\frac{\pi}{4} + h)$  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)  $y = \log_e \{Sinx^2\}$ ,
  - (ii)  $y = \frac{e^{2x+1}}{x^2-1}$



(4 marks)

(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)



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)
- 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'	130	00'
BC	39	30'	222"	30'
CD	22	15'	200°	30'
DE	242	45'	62"	45
EA	330	15'	147°	45'

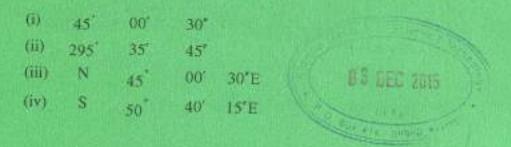
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- (a) Using illustrations distinguish between the following terms:
  - (i) interior and exterior angles;
  - (ii) forward and back bearings;
  - (iii) whole circle bearing and quadratal bearing.

(9 marks)

(4 marks) ¢

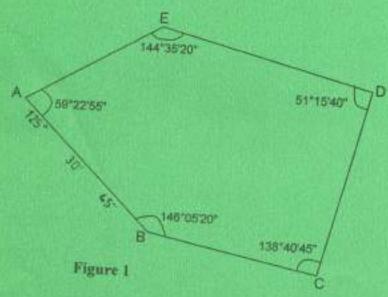
(b) Convert the following forward bearings to back bearings:



- (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)



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2707/201 2710/201 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<sub>1</sub> 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
CTI	270	15"	36"	2732.11

