2705/201 2709/201
2707/201 2710/201
MATHEMATICS II
AND SURVEYING II
June/July 2019
Time: 3 hours

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

You should have the following for this examination:
Answer booklet;
Non-programmable electronic calculator;
Drawing instruments.
*This paper consists of **EIGHT** questions in **TWO** sections: **A** and **B**.*
*Answer **FIVE** questions choosing at least **TWO** questions from each section.*
All questions carry equal marks.
Maximum marks for each part of a question are indicated.
Candidates should answer the questions in English.

This paper consists of 4 printed pages.

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

Turn over

SECTION A: MATHEMATICS II

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

1. (a) Prove the following hyperbolic identities:

(i) $Cosh^2 x - Sinh^2 x = 1$ (4 marks)

(ii) $Sinh^{-1} x = \ln\{x + \sqrt{1+x^2}\}$ (7 marks)

(b) Find the area under the curve defined parametrically by $x = 6(\theta - Sin\theta)$ and $y = 6(1 - Cos\theta)$ between $\theta = 0$ and $\theta = 2\pi$. (9 marks)

2. (a) Use Taylor's Theorem to expand $f(x) = 2x^{\frac{5}{3}} - 1$ in ascending powers of $x - 1$ up to the term in $(x-1)^3$, hence evaluate $f(1.5)$ correct to four decimal places. (10 marks)

(b) If $Z^3 = 4 - 3j$ find Z in the form $a + jb$. (10 marks)

3. (a) Given that $x^2 y - x^3 y^3 + 2 = 0$, evaluate $\frac{dy}{dx}$ at point $p(1,2)$. (6 marks)

(b) Use the Maclaurin series to expand the function $f(x) = xe^{2x}$ up to the term in x^4, hence evaluate:

$\int_0^1 xf(x)dx$ correct to four decimal places. (14 marks)

4. (a) Solve the differential equation: $\frac{dy}{dx} + 8y = e^x$ given that $y = 4$ when $x = 0$. (6 marks)

(b) Find the coordinates of the centroid of the area bounded by the curve $y = 3x^2$ and $x = 0$ and $x = 4$. (6 marks)

(c) Solve the hyperbolic equation:

$2\,Coshx + Sinx = 2$. (8 marks)

4 - 3j

$\sqrt{Z^5} = \sqrt[3]{4-3j}$

$y = 3x^2$

$6x$

SECTION B: SURVEYING II

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

5. (a) Using illustrations explain each of the following:

(i) **three** types of traverse;
(ii) horizontal angles.

(18 marks)

(b) List the quantities measured during traversing. (2 marks)

6. **Figure 1** represents a playing field ABCD and **table 1** contains the coordinates of the corners. Using the information provided compute:

(a) the bearings and distances of the sides of the playing field hence, the perimeter.

(b) the area of the playing field in hectares.

(20 marks)

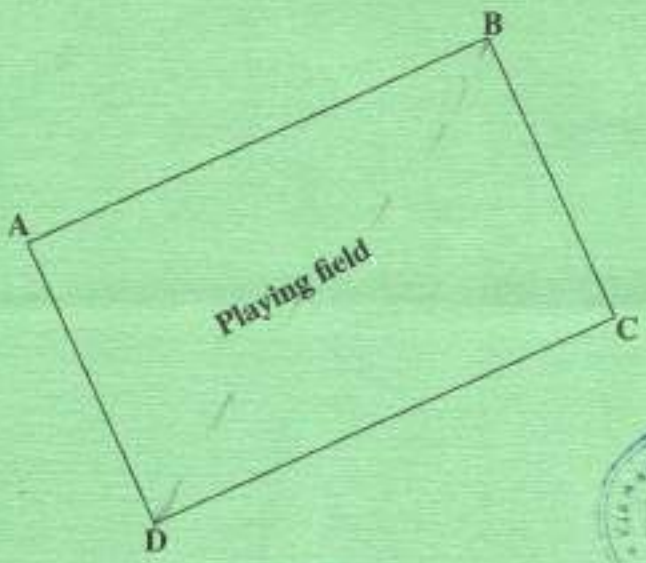

Fig. 1

Table 1

Point	Northing (m)	Easting (m)
A	13909.45	25993.99
B	14644.78	27276.12
C	14211.05	27524.87
D	13475.72	26242.74

7. The following observations were obtained during traversing. The traverse started at F_3 through T_1, T_2, T_3 closing at M_3. Prepare a bearing sheet given the datum bearings in **table 2**.

(20 marks)

@F_3			
F_2	321°	37'	36"
T_1	25°	45'	33"
F_1	232°	10'	32"

@ T_1			
F_3	205°	44'	53"
T_2	112°	07'	39"

@T_2			
T_1	292°	08'	32"
T_3	168°	48'	41"

@T_3			
T_2	348°	48'	49"
M_3	54°	50'	31"

@M_3			
T_3	234°	49'	57"
M_1	292°	33'	43"
H	354°	49'	17"

Table 2: Datum bearings

Line	Bearings		
F3 - F2	321°	38'	19"
F3 - F1	232°	09'	49"
M3 - M1	292°	34'	20"
M3 - H	354°	48'	16"

8. **Table 3** shows values reduced from a traverse observations. Compute the final coordinates of point P1, P2, P3 and P4 given the coordinates of point T is 9372.98 m (N), 3854. 28 m (E). Use Bodwitch method to adjust the coordinates. (20 marks)

Table 3

Line	Distances (m)	Bearings		
T - P_1	155.00	100°	15'	20"
P_1 - P_2	200.00	40°	41'	20"
P_2 - P_3	249.00	10°	15'	20"
P_3 - P_4	190.00	285°	57'	20"
P_4 - T	445.40	198°	56'	30"

THIS IS THE LAST PRINTED PAGE.