TEVETA

Technical Education, Vocational And Entrepreneurship Training Authority

DIPLOMA IN SCIENCE LABORATORY

LEVEL 6 YEAR III EXAMINATIONS

FINAL INTEGRATED SUMMATIVE EXAMINATIONS

SITTING: NOVEMBER DECEMBER 2025

SUBJECT: PHYSICS III

TIME: THREE (3) HOURS **TOTAL MARKS: 100**

PASS MARK: 50

INSTRUCTIONS TO CANDIDATE

1. Write your Examination Number and National Registration Card (NRC) Number on the answer booklet provided. Ensure you append your signature in the space provided on the answer booklet.
2. Write the ANSWER SCRIPT SERIAL NUMBER on the examination register and on the entry slip.
3. This paper has seven (7) questions. Answer five (5) questions.
4. Diagrams may be used where necessary to clarify your answer.
5. Cellphones and programmable calculators are not allowed in the examination room

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

QUESTION 1

Using well labelled diagrams, describe the construction of three (3) types of multi-vibrators. **[20 marks]**

QUESTION 2

Using combinations of

a) NAND gates only

b) NOR gates only

Implement the following logic gates

i) NOT gate . **[2 marks]**

ii) OR gate **[4 marks]**

iii) AND gate **[4 marks]**

iv) X-OR gate **[5 marks]**

v) X-NOR gate **[5 marks]**

[TOTAL: 20 marks]

QUESTION 3

Given the following boolean expression

$$Q=\overline{(\overline{X}Y+X\overline{Y})Z+\overline{\overline{(\overline{X}Y+X\overline{Y})}\,\overline{Z}}+\overline{\overline{X}Z}}$$

Determine the following:

a) Complete a truth table without simplifying the expression **[12 marks]**

b) Simplify the boolean expression using k-map. **[8 marks]**

[TOTAL: 20 marks]

QUESTION 4

a) Evaluate the following Hexadecimal number leaving your answer in Octal to **three (3)** decimal places:

$(DAF.EB)^2(C57.E4)$. **[8 marks]**

b) Define the following terms in relation to digital electronic:

i) Bit . **[1 mark]**

ii) Nibble. **[1 mark]**

iii) Byte. **[1 mark]**

iv) Word. **[1 mark]**

v) Logic gate. **[2 marks]**

vi) Logic level. **[2 marks]**

vii) Truth table. **[2 marks]**

viii) Karnaugh map. **[2 marks]**

[TOTAL: 20 marks]

QUESTION 5

a) Using truth tables, describe the operations of the following two (2) input logic gates
   i) OR gate. **[3 marks]**
   ii) NAND gate. **[3 marks]**
   iii) X-NOR gate. **[3 marks]**

b) Simplify the Boolean expressions
   i) $\overline{A + B(A + C) + AC}$. **[3 marks]**
   ii) $\overline{(A + B)(\overline{A} + C) + A\overline{BC}}$. **[4 marks]**
   iii) $\overline{\overline{A}B + (\overline{A} + C) + A + \overline{BC}}$. **[4 marks]**

[TOTAL: 20 marks]

QUESTION 6

Consider the truth table given below:

INPUTS			OUTPUT
C	B	A	F
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

a) Write down POS and SOP expressions for the output F. **[4 marks]**
b) Prove that your expression in part a) are equal using boolean algebra.a **[10 marks]**
c) Identify the logic gate represented by the simplified expressions and draw its symbol **[6 marks]**

[TOTAL: 20 marks]

QUESTION 7

a) Using a well labelled diagrams, tabulate six (6) differences between an analogue signal and a digital signal. **[6 marks]**

b) Convert the following leaving the answer to four decimal places

i) 75.98_{10} to binary. **[4 marks]**

ii) 48.987_{10} to base 5. **[5 marks]**

iii) $BAE.25_{16}$ to octal. **[5 marks]**

[TOTAL: 20 marks]