TEVETA
Technical Education, Vocational and Entrepreneurship Training Authority

DIPLOMA IN SCIENCE LABORATORY

LEVEL 6 - YEAR I EXAMINATIONS

FINAL INTEGRATED SUMMATIVE EXAMINATIONS

SITTING: JULY /AUGUST 2025

MATHEMATICS I

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

PASS MARK: 50

INSTRUCTIONS TO CANDIDATES

1. **Write your examination number and National Registration Card Number on the answer booklet provided. Ensure you append your signature in the space provided in the answer booklet.**
2. **Write the answer script serial number on the examination register and on the entry slip.**
3. **There are seven (7) questions in this paper. Answer Five (5) questions.**
4. **Diagrams may be used where necessary to clarify your answer.**
5. **Cell phones and programmable calculators are not allowed in the examination room.**

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

QUESTION 1

(a) Express $3.\overline{14}$ in the form $\frac{a}{b}$ [4 marks]

(b) Simplify $\frac{(x^8x^5)}{(x^{-2}y^{-4})}^{-2}$ [3 marks]

(c) Derive the quadratic formula [7 marks]

(d) Solve $3^{2x} - 7(3)^x + 10 = 0$ giving your answer correct to 3significant figures. [6 marks]

TOTAL: [20 Marks]

QUESTION 2

Solve the system of equations

$$x + 2y - z = 2$$
$$8x + 3y - 7z = 4$$
$$4y - 12z = -8$$

[20 marks]

TOTAL: [20 Marks]

QUESTION 3

(a) Solve $(2 + 5i)(3 + i)$ [5 marks]

(b) Divide $3x^3 + x^2 + 3x + 5$ by $x + 1$ using synthetic division [5 marks]

(c) The expression $b + ax - 4x^2 + 8x^3$, gives a remainder of -19 when divided by $x + 1$ and has remainder 9 when divided by $2x - 1$. Find the values of a *and* b. [10 marks]

TOTAL: [20 Marks]

QUESTION 4

(a) Resolve into partial fractions

$\frac{x^2+7x+3}{x^2(x+3)}$ [10 marks]

(b) Starting with $x = a^y$, prove that

$\log_a x = \frac{\log_b x}{\log_b a}$ [3 marks]

(c) Express $\log_2 12$ as a logarithm in base 10, so that $\log_2 12 = k \times \log_{10} 12$ and find the value of k. [2 marks]

(d) Solve $\log_4 x + \log_4(x - 12) = 3$ [5 marks]

TOTAL: [20 Marks]

QUESTION 5

(a) A sample of 60 components is taken from a production line and their diameters, d mm recorded. The resulting data are summarized in the following frequency table.

Diameter(mm)	Frequency
25≤d<30	1
30≤d< 35	3
35≤d< 40	7
40≤d< 45	15
45≤d< 50	17
50≤d< 55	10
55≤d< 60	5
60≤d< 65	2

Calculate.

(a) The mean [5 marks]

(b) The mode [4 marks]

(c) The median [4 marks]

(d) Standard deviation [2 marks]

(e) Variance [5 marks]

TOTAL: [20 Marks]

QUESTION 6

(a) Express $\frac{2+\sqrt{3}}{1-\sqrt{3}}$ in the form $p + q\sqrt{3}$ and write down the value of p and q [4 marks]

(b) The line p_1 has equation $2x + 8y + 14 = 0$

(i) Find the gradient of p_1 [2 marks]

(ii) The line p_2 is perpendicular to p_1 and passes through the point $(3, 6)$. Find the equation of the line p_2 in the form $ax + by + c = 0$ [4 marks]

The lines p_1 and p_2 intersect at point A.

(iii) Find the coordinate of point A. [5 marks]

(iv) Calculate the length OA. [5 marks]

TOTAL: [20 Marks]

QUESTION 7

(a) Show the equation $5\cos^2 x = 3(1 + sinx)$ can be written as

$5\sin^2 x + 3\,sin\,x - 2 = 0$ [3 marks]

(b) Hence solve for $0^0 \leq \theta \leq 360^0$, the equation

$5\cos^2 x = 3(1 + sinx)$, giving your answers to 1 decimal place where appropriate

[7 marks]

(c) Express $\cos\vartheta + \sqrt{3}sin\vartheta$ in the form $Rcos\,(\vartheta - \alpha)$. Hence find the exact value of R and α where $R > 0$ and $0° < \alpha < 90°$ [10 marks]

TOTAL: [20 Marks]