TEVETA
Technical Education, Vocational and Entrepreneurship Training Authority

DIPLOMA IN SCIENCE LABORATORY

LEVEL 6 - YEAR II EXAMINATIONS

FINAL INTEGRATED SUMMATIVE EXAMINATIONS

SITTING: NOVEMBER / DECEMBER 2025

SUBJECT: MATHEMATICS II

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

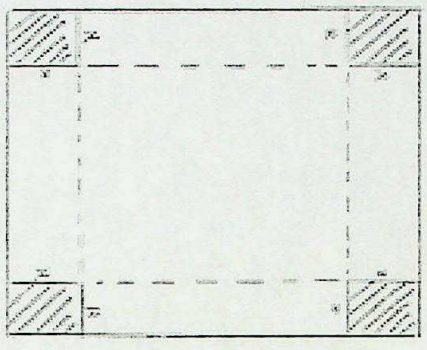
INSTRUCTIONS TO CANDIDATES **PASS MARK: 50**

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. Cell phone 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 rectangular piece of card measures 24cm by 9cm. Equal squares of length x cm are cut from each corner of the card. What is left is then folded to form an **open** box of length $l\ cm$ and $w\ cm$



(a) Write expressions, in terms of x for

(i) The length, l [2 marks]

(ii) The width, w [2 marks]

(b) Show that the volume Vcm^3 of the box is given by $V = 4x^3 - 66x^2 + 216x$ [4 marks]

(c) Find $\frac{dV}{dx}$. [2 marks]

(d) I) Find the value of x which gives the maximum volume of the box. [5 marks]

(iii) Calculate the maximum volume of the box. [5 marks]

TOTAL: [20 Marks

QUESTION 2

Given the equation of a conic section as $x^2+9y^2+16x-54y+136=0$

(a) Express the equation in standard form and name this conic section. [7 marks]

Find

(b) The centre,

(c) The vertices, [3 marks]

(d) The foci [3 marks]

(e) The eccentricity. [3 marks]

(f) Sketch the graph [4 marks]

TOTAL: [20 Marks]

QUESTION 3

(a) Integrate the following with respect to x

(i) $\int 2xe^{2x}\ dx$ [5 marks]

(ii) $\int 5 + \frac{2}{3+x} dx$ [4 marks]

(iii) $\int \cos^2 x \sin x\ dx$ [5 marks]

(b) Evaluate the definite integral $\int_1^4 (3x^2 + 4x + 1)dx$ [6 marks]

TOTAL: [20 Marks]

QUESTION 4

(a) Given that cubic polynomial $f(x) = ax^3 + bx^2 + 3x + 8$ leaves a remainder of -6 when divided by $x-2$ and remainder of -34 when divided by $x+2$. Calculate the values of the constants a and b. [10 marks]

(b) (i) Expand $(1 + p)^4$ in ascending powers of p [3 marks]

(ii) Hence find the expansion of $(1 + x - x^2)^4$ as far as x^3 [7 marks]

TOTAL: [20 Marks]

QUESTION 5

The probability that a patient will be cured of corona virus when injected with the new vaccine is 0.8. Find the probability that out of 8 patients will be cured on being injected with the vaccine

(a) Exactly 3 [5 marks]

(b) At least 1 [5 marks]

(c) Almost 2 [5 marks]

(d) Less than 3 [5 marks]

TOTAL: [20 Marks]

QUESTION 6

(a) Evaluate the following

(i) $\lim_{x \to 1} \frac{x^2-1}{x-1}$ [5 marks]

(ii) $\lim_{x \to 1} x^2 + 2x + 3$ [5 marks]

(b) The sum of 7 terms of an AP is 35 and the common difference is 1.2. Determine the first term [5 marks]

(c) Determine the sum to infinity of the series 4, 2, 1, ... [5 marks]

TOTAL: [20 Marks]

QUESTION 7

(a) Differentiate with respect to x

(i) $y = \ln(x^2 - 3x + 1)$ [4 marks]

(ii) $y = xsinx$ [4 marks]

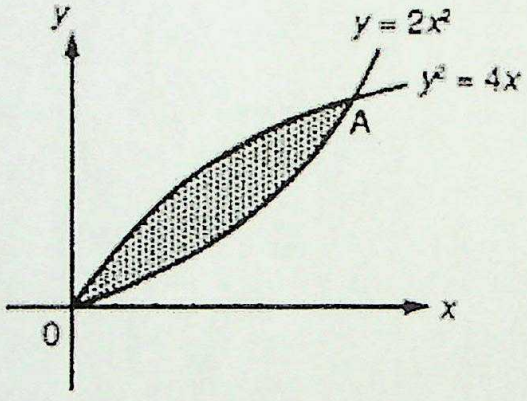
(b) Find the general solution for the equation

$2y\frac{dy}{dx} = x^2 + 1$ [5 marks]

(c) In the figure below, the curves $y^2 = 4x$ and $y = 2x^2$ intersect at O and A.

(i) Find the coordinates of A

(ii) The region bound by the two curves is rotated about the x-axis, find the volume of revolution.



[7 marks]

TOTAL: [20 Marks]