TEVETA
Technical Education, Vocational and Entrepreneurship Training Authority

DIPLOMA IN ELECTRICAL ENGINEERING

LEVEL 6 YEAR II EXAMINATIONS

FINAL INTEGRATED SUMMATIVE EXAMINATIONS

SITTING: APRIL/MAY 2025.

SUBJECT: ENGINEERING MATHEMATICS II

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

PASS MARK: 50

INSTRUCTIONS TO CANDIDATE

1. Write your examination number and national registration card numbers on the answer booklet provided. Ensure to append your signature in the space provided on the answer booklet
2. Write your answer SCRIPT SERIAL NUMBER on the examination register provided and the entry slip.
3. There are EIGHT (8) questions in this paper.
4. Question one is Compulsory. Answer any other FOUR (4) questions.
5. Each question carries 20 marks.
6. 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) Using the first principle, determine the derivative of $y = 3x^2 + 2x$ **[5marks]**

b) Determine the third and fourth term in the expansion of $\left(3 - \frac{1}{x}\right)^6$ in ascending powers of x. **[5marks]**

c) In a geometric progression the third term is 16 and the fifth term is 4, calculate

i. The first term and common ratio **[4marks]**

ii. The tenth term **[3marks]**

iii. The sum to infinity **[3marks]**

[Total:20marks]

QUESTION 2

The frequency distribution for the values of resistance in ohms of 20 resistors is as shown

Values of Resistance	frequency
10-15	5
16-21	2
22-27	5
28-33	4
34-39	1
40-45	3

Calculate

a) Mean **[4marks]**

b) Median **[5marks]**

c) Variance **[7marks]**

d) Standard deviation **[3marks]**

[Total:20marks]

QUESTION 3

a) The distance x meters moved by a car in a time t seconds is given by $x = 3t^3 - 2t^2 + 4t - 1$. Determine the velocity and acceleration when $t = 1.5s$ **[6marks]**

b) Given that $2y^2 - 5x^4 - 2 - 7y^3 = 0, d$etermine $\frac{dy}{dx}$ **[6marks]**

c) Determine the derivative of $f(x) = \frac{(x^3+6)^2}{(2x+1)^3}$ using logarithmic differentiation **[8marks]**

[Total:20marks]

QUESTION 4

a) A team of four is chosen at random from five girls and six boys

i. In how many ways can a team be chosen if there are no restrictions **[4marks]**

ii. In how many ways can a team be chosen if there are more boys than girls **[5marks]**

iii. Determine the probability that the team contains only one boy. **[5marks]**

b) At a particular college 60% of the students are on Government bursary sponsorship. Out of 5 candidates, calculate the probability that at least three candidates are on government sponsorship. **[6marks]**

[Total:20marks]

QUESTION 5

a) A bread manufacturing company gradually closes down the production of bread when the sweet potatoes season begin. If the number of bags of sweet potatoes processed in the first week is 35, increasing by 10 bags every week.

i. Identify the type of progression **[2marks]**

ii. Determine the number of bags processed in the 13th week **[3marks]**

b) Given the equation of the circle $x^2 + y^2 - 8x + 6y - 11 = 0$,determine

i. the radius **[4marks]**

ii. The co-ordinates of the center of the circle **[4marks]**

iii. Sketch the graph **[7marks]**

[Total:20marks]

QUESTION 6

a) The straight-line l has a gradient of $-\frac{5}{12}$ and passes through the points $A(10,1)$ and $B(k,11)$, where k is a constant

i. Determine the equation of l in the form $ax + by + c = 0$, where a, b and c are constants. **[4marks]**

ii. Determine the value of k **[4marks]**

iii. Hence show that AB is 26 units **[4marks]**

b) Determine the independent term of x in the expansion of $\left(2x^2 - \frac{1}{2}\right)^{12}$ **[8marks]**

[Total:20marks]

QUESTION 7

a) Integrate the following

i. $\int \frac{3x^3}{2} - 5x + \frac{1}{x^2} dx$ **[5marks]**

ii. $\int \frac{x}{4x^2-1} dx$ **[5marks]**

b) Determine the area bounded by the curve $y = x + 2$ and $y = x^2 + x - 2$

[5marks]

c) Determine the 7th term in the arithmetic sequence where the first term is $3x$ and the common difference is $-x$ **[5marks]**

[Total:20marks]

QUESTION 8

Given the equation of the hyperbola $9x^2 - y^2 + 36x - 6y + 18 = 0$.

i. Express the equation in the form $\frac{(x+h)^2}{a^2} - \frac{(y+k)^2}{b^2} = 1$ **[6marks]**

Hence determine;

ii. The centre **[1mark]**

iii. Vertices **[3marks]**

iv. Foci **[5marks]**

v. Sketch the graph **[5marks]**

[Total:20marks]