

071305T4EOP

ELECTRICAL OPERATOR (POWER OPTION) LEVEL 5

ENG/CU/PO/CC/02/5/A

APPLY ENGINEERING MATHEMATICS

July/August 2024

Time: 3 Hours



**TVET CURRICULUM DEVELOPMENT, ASSESSMENT AND CERTIFICATION
COUNCIL (TVET CDACC)**

WRITTEN ASSESSMENT

INSTRUCTIONS TO CANDIDATES

1. This paper has three sections: **A and B**
2. You are provided with a separate answer booklet.
3. Marks for each question are as indicated.
4. Do not write on the question paper.
5. Answer the questions in **English**.

This paper consists of FOUR (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.**

SECTION A (40 Marks)

Answer **all** questions in this section.

1. Evaluate $\int_2^4 (\frac{1}{2}x^4 + 1)dx$. (4 Marks)
2. Evaluate **Sin** ($43^\circ.39'$) and give your answer in 4 decimal places. (4 Marks)
3. Solve for x in the equation $2^{(x+1)} = \log 3^{(2x-5)}$. (4 Marks)
4. Simplify the expression $\frac{x^2+3x-2}{x-2}$ using the remainder theorem. (4 Marks)
5. Without using calculator, evaluate $\frac{3\tan 60^\circ - 2\cos 30^\circ}{\tan 30^\circ}$. (4 Marks)
6. Find the equation of the vector passing through the points (3,2,4) and (7,4,8) (4 Marks)
7. A 160 GB iPod is advertised as costing sh.190 excluding VAT. If VAT is added at 17.5%, determine the total cost of the iPod. (4 Marks)
8. Convert the expression $\frac{2x+3}{(x-2)^2}$ to equivalent partial fractions. (4 Marks)
9. Use the completing square method to solve the quadratic equation $2x^2 + 9x + 8 = 0$. (4 Marks)
10. Solve the equation $\log(x^2 - 3) - \log x = \log 2$. (4 Marks)

SECTION B (60 Marks)

Answer any **THREE** questions from this section.

11. a) Express $3\sin\theta + 5\cos\theta$ in the form $R\sin(\theta + \alpha)$, and hence solve the equation $3\sin\theta + 5\cos\theta = 4$ for values of θ between 0° and 360° . (10 Marks)
- b) (i) If $z = \sin xy$ show that $\frac{1}{y} \frac{\partial z}{\partial x} = \frac{1}{x} \frac{\partial z}{\partial y}$ (5 Marks)
- (ii) Find $\frac{\partial z}{\partial x}$, if $z = 5x^4 + 2x^3y^2 - 3y$ (5 Marks)
12. (a) Express $\frac{\sqrt{1+2x}}{\sqrt[3]{1-3x}}$ as a power series as far as the term in x^2 . State the range of values of x for which the series is convergent (12 Marks)
- (b) The major axis of an ellipse is 15.0 cm and the minor axis is 9.0 cm. Find;
- i. The area (5 Marks)
- ii. Approximate perimeter. (3 Marks)
13. a) The frequency distribution for the values of resistance in ohms of 48 resistors is shown in table 1. Calculate the standard deviation from the mean of the resistors, correct to 3 significant figures (10 Marks)

Table 1

20.5-20.9	3
21.0-21.4	10
21.5-21.9	11
22.0-22.4	13
22.5-22.9	9
23.5-23.4	2

- b) Use the matrix method to solve simultaneous equation

$$3x + 5y - 7 = 0$$

$$4x - 3y - 19 = 0$$

(10 Marks)

14.

- a) A closed cylindrical container of volume 200 cm^3 is to be made from a metal sheet. Determine the radius and height of the container that will give minimum surface area. (9 Marks)
- b) A vector field is given by $\mathbf{F} = x^2 y \mathbf{i} - (z^3 - 3x) \mathbf{j} + 4y^2 \mathbf{k}$, find at point $(1, -2, 1)$
- Div. $\mathbf{F}$
 - Curl $\mathbf{F}$

(11 Marks)

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