

073206T4BLD

BUILDING TECHNOLOGY LEVEL 6

CON/OS/BUT/BC/CU/01/6

Apply Engineering Mathematics

November/December 2025



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

WRITTEN ASSESSMENT

TIME: 3 HOURS

INSTRUCTIONS TO CANDIDATE

1. This paper consists of **TWO** sections: **A** and **B**.
2. Answer **ALL** questions in section A.
3. Answer question **THIRTEEN** (13) and any other **TWO** (2) questions in section B.
4. Marks for each question are indicated in the brackets.
5. Candidates are provided with a separate answer booklet
6. Do not write on the question paper.

This paper consists of FOUR (4) printed pages
Candidate should check the question paper to ascertain that all pages are printed as
indicated and that no questions are missing.

SECTION A (40 MARKS)

1. Simplify using laws of indices: (4 Marks)

$$\frac{(3x^{-2}y^3)^2}{9x^{-1}y}$$
2. Solve for x : (2 Marks)

$$\text{Log}_{10}(x) = 2$$
3. Solve using substitution method the simultaneous equations: (4 Marks)

$$2x + y = 7, 3x - 2y = 4$$
4. Expand $(1 + x)^4$ up to the x^2 term using binomial theorem. (3 Marks)
5. A line has equation $2x + 3y - 12 = 0$. Find the slope and the intercepts on the coordinate axes. (3 Marks)
6. Differentiate: (5 Marks)

$$y = (3x^2 + 2x)$$
7. Evaluate the integral: (4 Marks)

$$\int (3x^2 - 2x + 1) dx$$
8. Find the modulus and argument of the complex number: (4 Marks)

$$z = -3 + 4i$$
9. A vector is given as $A^{\vec{}} = 2\hat{i} + 3\hat{j}$. Find its magnitude. (4 Marks)
10. A rectangular prism has dimensions $3 \text{ m} \times 2 \text{ m} \times 1.5 \text{ m}$. Find its volume and surface area. (4 Marks)
11. A triangle has side $a = 7\text{cm}$, $b = 9\text{cm}$ and angle $C = 120^\circ$. Use the cosine rule to find side c . (3 Marks)

SECTION B (60 MARKS)

12.

- a. A bag contains 5 red, 3 blue, and 2 green balls. If two balls are drawn at random:
- Find the probability that both are red. (3 Marks)
 - Find the probability that one is red and the other is blue. (4 Marks)
 - Find the probability that none is green. (3 Marks)
- b. Given the matrix: $A = \begin{pmatrix} 2 & 1 & 0 \\ -1 & 3 & 2 \\ 0 & 1 & 4 \end{pmatrix}$
- Find the determinant of A. (4 Marks)
 - Hence, find A^{-1} (6 Marks)

13.

- a. A concrete block is made of three materials: cement, sand and ballast in the ratio 3:6:12. If a sample block has a mass of 5.6 kgs, find the mass of each material in grams. (4 Marks)
- b. The table below shows the income tax rates:

Monthly taxable pay (Ksh)	Rate of tax % in each shilling
1-9680	10
9681 – 18800	15
18801 – 27920	20
27921 – 37040	25
Over 37040	30

- Ben's monthly salary is Ksh 42,000. Given that the monthly personal relief is Ksh 1056, calculate Ben's monthly tax. (8 Marks)
- Find the accumulated amount if Ksh 20,000 is deposited for $3\frac{1}{3}$ years at 10% per annum compound interest. (8 Marks)

14.

- a. Find the Fourier series of the 2π -periodic function $f \in K_{2\pi}$, which is given in the interval $[-\pi, \pi]$ by; (10 Marks)

$$f(t) = \begin{cases} 0 & \text{for } -\pi < t \leq 0, \\ 1 & \text{for } 0 < t \leq \pi, \end{cases} \text{ and find the sum of the series at } t=0.$$

- b. Using Maclaurin's expansion, expand e^x up to the term in x^4 . Hence, approximate

the value of $e^{0.2}$.

(10 Marks)

15.

- a. The table below shows the distribution of marks of 40 trainees in a test. Calculate the mean and standard deviation: (20 Marks)

Marks	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
frequency	2	2	3	9	12	5	2	3	1	1

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