

**073106T4LAS LAND SURVEY AND MAPPING LEVEL 6**  
**LSM/OS/LS/CC/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. Marks for each question are indicated in the brackets.
2. The paper consists of **TWO** sections: **A** and **B**.
3. Attempt **ALL** the questions in section A and any **THREE** questions in section B.
4. Candidates are provided with a separate answer booklet
5. **DO NOT** write on this question paper.

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

**SECTION A: (40 MARKS)**

*Answer ALL the questions in this section.*

1. The Marks of 5 students are: 10,12,15,20,23. Find mean, variance, standard deviation. (5 Marks)
2. Simplify:  $(2 + 3i)(4 - i)$  (4 Marks)
3. Find the equation of the line through (1,2) and (3,6). (4 Marks)
4. A fair die is rolled once. Find the probability of getting:
  - a. A multiple of 3 (2 Marks)
  - b. A prime number (2 Marks)
5. Evaluate  $\int_0^2 x^2 dx$  (3 Marks)
6. A cylinder of radius 7 cm and height 10 cm is melted to form spheres of radius 7 cm.  
How many spheres are formed. (3 Marks)
7. Given matrices  $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ ,  $B = \begin{pmatrix} 2 & 0 \\ 1 & 2 \end{pmatrix}$ , compute AB (3 Marks)
8. Use binomial expansion to approximate  $(1.02)^5$  (4 Marks)
9. Given  $\vec{u} = \langle 1, 2, 3 \rangle$  and  $\vec{v} = \langle 2, -1, 4 \rangle$ , find  $\vec{u} \cdot \vec{v}$ . (3 Marks)
10. Differentiate  $\ln(x^2 + 1)$  (3 Marks)
11. Solve for  $x$ : (4 Marks)  
 $\log_{10}(x + 4) - \log_{10}(x - 1) = 1$

**SECTION B:(60 MARKS) Answer any  
THREE Questions in This Section.**

12.

a. Given the matrices

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 4 \\ 5 & 6 & 0 \end{bmatrix} \text{ and } B = \begin{bmatrix} 2 & 0 & 1 \\ 1 & 3 & 2 \\ 4 & -1 & 2 \end{bmatrix} \text{ and the simultaneous system}$$

$$x + y + z = 6$$

$$2x - y + 3z = 14$$

$$x + 2y - z = 2$$

- (i) Find  $A + B$  (3 Marks)
- (ii) Find the product  $AB$  (5 Marks)
- (iii) Write system in matrix form  $CX = D$  (2 Marks)
- (iv) Find the determinant of  $C$  (5 Marks)
- (v) Use the inverse method to solve for  $x, y, z$  (5 Marks)

13.

a. A solid consists of a hollow cylindrical pipe open at both ends. The external diameter is 20 cm, the internal diameter is 14 cm, and the length of the pipe is 35 cm. The material is uniformly thick.

- (i) Calculate the external curved surface area of the pipe. (3 Marks)
- (ii) Calculate the internal curved surface area of the pipe. (3 Marks)
- (iii) Find the volume of the material used to make the pipe. (4 Marks)

b. A bag contains 5 red, 4 blue and 3 green balls. Two balls are drawn one after the other without replacement.

- (i) Find the probability that both are red. (3 Marks)
- (ii) Find the probability that one is red and the other is blue. (3 Marks)
- (iii) Find the probability that at least one is green. (4 Marks)

14. Given the function  $y = 5x^3 - 4x^2 + 6x - 7$ 

- a. Differentiate the function with respect to  $x$ . (3 Marks)
- b. Find the slope of the curve at  $x = 2$ . (2 Marks)
- c. The function represents the displacement  $s$  in metres after  $t$  seconds the velocity and acceleration expressions. (2 Marks)
- d. Find the equation of the tangent to the curve at  $x = 1$ . (5 Marks)

- e. The radius of a sphere increases at the rate of 0.02 cm/s. Find the rate of change of its volume when the radius is 10 cm. (4 Marks)

- f. For the function  $f(x, y) = x^2 + y^2 - 4x - 6y$ , find stationary point(s). (4 Marks)

15.

- a. Use Newton -Raphson method to approximate a root of:  $f(x) = x^3 - 2x - 5 = 0$  starting with  $x_0 = 2$  correct to 3 decimal places. (5 Marks) b.

Given:  $A(1, 2, 3), B(4, 1, 5)$  Find  $\vec{AB}$ . (3 Marks)

- c. Given: Force  $F = 60$  N at angle  $45^\circ$  above horizontal. Resolve into horizontal and vertical components. (4 Marks)

- d. State Simpson's rule for  $n$  even and step  $h$ . (2 Marks)

- e. Apply Simpson's rule with  $n = 4$  to compute the integral. (6 Marks)

$$\int_0^2 (x^2 + 1) dx$$

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