

061306T4CSC

COMPUTER SCIENCE LEVEL 6

ICT/OS/CS/CR/03/6/A

UNDERSTAND MATHEMATICS FOR COMPUTER SCIENCE

July/ August 2024



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

WRITTEN ASSESSMENT

TIME: 3 HOURS

INSTRUCTIONS TO CANDIDATE

1. The paper consists of **two** sections: **A** and **B**
2. Answer **ALL** questions in Section **A** and any **Three** from section **B**
3. Marks for each question are indicated in the brackets
4. A separate answer booklet will be provided
5. Do not write on the 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 questions in this section*

1. Write the standard form of a linear equation with two variables. (2 Marks)
2. Define a complement as applied in Boolean algebra. (2 Marks)
3. Highlight THREE operations that form the base of Boolean algebra. (3 Marks)
4. Define universal gates . (2 Marks)
5. Explain the term derivative of a function. (2 Marks)
6. Given the following set $U = \{11,12,13,14,15,16,17,18\}$, $B = \{11,13,14,15\}$ and $A = \{11,12,13\}$;
Determine each of the following operations: (4 Marks)
 - $A \cap B$;
 - $A^c \cap B$;
7. Draw each of the following logic gates. (4 Marks)
 - a. NAND
 - b. NOR
8. Draw a truth table for a three-input OR gate using JKL as inputs and Z as output. (4 Marks)
9. Proof that $(P.Q)' = (P)' + (Q)'$, using truth tables. (4 Marks)
10. Outline THREE characteristics of a set. (3 Marks)
11. X is a set of alphabets and Y is a set of numbers. Determine the intersection of X and Y. (2 Marks)
12. Find the value of $P + Q$ where $P = \begin{pmatrix} 4 & -2 & 2 \\ 1 & 0 & 37 \end{pmatrix}$ and $Q = \begin{pmatrix} -4 & -2 & 2 \\ -8 & 3 & 6 \end{pmatrix}$ (4 Marks)
13. Suppose $\check{Z} = \begin{pmatrix} x1 \\ y1 \end{pmatrix}$ and $\check{S} = \begin{pmatrix} x2 \\ y2 \end{pmatrix}$, given that $x1 = 2, y1 = -7$ and $x2 = -12, y2 = 15$,
write an expression to show the subtraction of the two vectors and calculate the result of the subtraction. (4 Marks)

SECTION B: (60 MARKS)

Answer any *THREE* questions in this section.

14.

- a. Solve $5x - 6 = 3x - 8$ (4 Marks)
- b. Solve this system of equations graphically. (6 Marks)
 - $4x - 6y = 12$
 - $2x + 2y = 6$
- c. Describe the following terms as applied in probability and statistics. (10 Marks)
 - i. Population
 - ii. Data
 - iii. Variables
 - iv. Sample space
 - v. Event

15.

- a. Differentiate between descriptive and inferential statistics. (4 Marks)
- b. Highlight the differences between variance and standard deviation. (4 Marks)
- c. The following is a list of monthly earnings of 10 employees. 1000, 1200, 1300, 1100, 1090, 1010, 1500, 1900, 1700, 2000. Calculate the mean. (4 Marks)
- d. Using truth tables, describe the OR, NOR, NAND and XOR gates. (8 Marks)

16.

- a. Derive the Boolean expression and construct a truth table for the switching circuit shown in figure 1 below. (6 Marks)

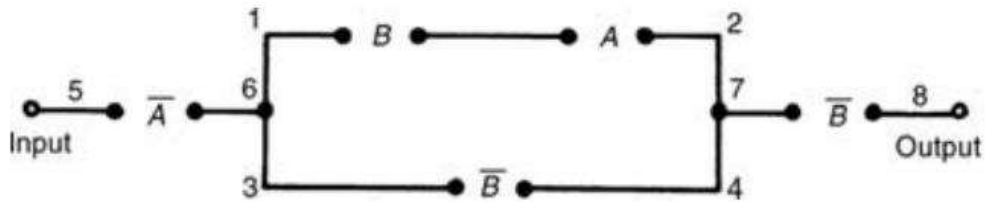


figure 1

- b. The following data shows the distribution of marks scored by 100 candidates at Imax college. Calculate the Harmonic mean. (10 Marks)

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
No. of students	1	3	10	12	20	30	10	8	4	2

- c. Find the value of x in the matrix below if its determinant has a value of -12 . (4 Marks)

$$\begin{bmatrix} -4 & 2 \\ -8 & x \end{bmatrix}$$

17.

- a. Given the following data calculate geometric mean: (5 Marks)
- b. 130, 135, 140, 145, 146, 148, 149, 150, 157
- c. Given that set $U = \{2, 4, 6, 7, 8, 9, 10\}$ and $A = \{7, 8, 9, 10\}$ and $B = \{8, 9, 10\}$. Find
- The complement of A. (2 Marks)
 - Complement of B. (2 Marks)
 - Complement of A union B. (2 Marks)
- d. A tyre manufacturing company kept a record of the distance covered before a tyre needed to be replaced. The table shows the results of 1000 cases.

Distance (in km)	Less than 4000	4000 to 9000	9001 to 14000	More than 14000
Frequency	20	210	325	445

If a tyre is bought from this company, what is the probability that: (9 Marks)

- It has to be substituted before 4000 km is covered.
- It will last more than 9000 km.
- It has to be replaced after 4000 km and 14000 km is covered by it.

THIS IS THE LAST PRINTED PAGE