



UGANDA BUSINESS AND TECHNICAL EXAMINATIONS BOARD

PAPER CODE	PROGRAMME	DATE
TDIT 112	NATIONAL DIPLOMA IN INFORMATION AND COMMUNICATION TECHNOLOGY YEAR I SEMESTER I	TUESDAY, 3 RD DECEMBER 2019
SERIES	PAPER NAME	TIME ALLOWED
NOV/DEC 2019	COMPUTATIONAL MATHEMATICS	3 HOURS

YOU SHOULD HAVE THE FOLLOWING FOR THIS EXAMINATION

Answer Booklet
Non-Programmable Electronic Calculator
Graph Paper
Mathematical Tables
Drawing Instruments

INSTRUCTIONS TO CANDIDATES

1. This paper consists of **eight** questions.
2. Answer only **five** questions.
3. All questions carry equal marks.
4. All answers to each question should begin on a fresh page.
5. **Do not** write anywhere on this question paper.
6. All rough work should be done in the official answer booklet provided.
7. Read other instructions on the answer booklet.

Question One

- (a) **Fig. 1** shows a circuit diagram, write down the Boolean function and simplify it to its equivalent circuit.

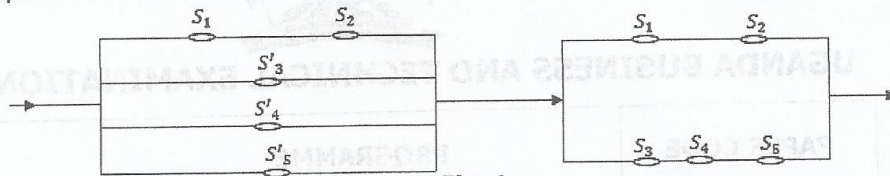


Fig. 1

Hence draw the simpler equivalent circuit.

(10 marks)

- (b) Test the validity of the Boolean statement below;
 "If he gets a degree, he will get a good job. If he gets a good job, he will buy a car. He does not buy a car, therefore he has not got a degree."
 (10 marks)

Question Two

- (a) The Cartesian product of two sets A and B is written as $A \times B$ and is the set of all possible ordered pairs (x, y) where $x \in A$ and $y \in B$. Sets A and B are given as follows;
 $A = \{1, 2\}$, $B = \{2, 3, 4\}$ Find the Cartesian product of A and B . (03 marks)
- (b) Four members of the Cartesian product of two sets P and Q are $(2, 1)$, $(2, 3)$, $(4, 1)$ and $(4, 5)$. If there are a total of six such ordered pairs in the Cartesian product $P \times Q$. Find the;
 (i) two missing members of $P \times Q$. (03 marks)
 (ii) elements P and Q . (01 mark)
 (iii) Ordered pairs (x, y) such that $x \in P$, $y \in Q$ and x is less than y . (03 marks)
- (c) The function $f(x) = \frac{a}{x} + b$ is such that $f(-1) = 1\frac{1}{2}$. $f(2) = 9$
 (i) Find the value of a and b (04 marks)
 (ii) Evaluate $f(4)$ and $f^{-1}(4)$ (04 marks)
 (iii) State the value of x for which f is not defined. (02 marks)

Question Three

- (a) Solve the equations
 (i) $9 \times 3^{4x} = 27^{x-1}$ (04 marks)
 (ii) $(3^x)^2 - 12 \times 3^x + 27 = 0$ (04 marks)
- (b) Simplify the equation
 (i) $\left\{ \left(\frac{x^4}{9} \right)^{1/2} + \left(\frac{x^6}{8} \right)^{1/3} \right\}^{1/2}$ (03 marks)

(ii) Show by simplifying that: $\frac{x-1}{x^2-1} = x^{1/2}$ (04 marks)

(c) Given that: $y = 97 + 56\sqrt{3}$. Find the square root of y . (05 marks)

Question Four

(a) (i) Define a singular matrix as used in matrices. (01 mark)

(ii) Given that $A = \begin{pmatrix} 3 & 2 & 4 \\ 1 & 5 & 3 \\ -1 & 8 & 2 \end{pmatrix}$ Show that matrix A is a singular matrix. (02 marks)

(b) Solve the following set of linear equation by matrix inversion.

$$x_1 + 3x_2 + 2x_3 = 3$$

$$2x_1 - x_2 - 3x_3 = -8$$

$$5x_1 + 2x_2 + x_3 = 9$$

(c) Solve the equation

$$\begin{bmatrix} x & 2 & 3 \\ 2 & x+3 & 6 \\ 3 & 4 & x+6 \end{bmatrix} = 0$$
 (05 marks)

Question Five

(a) (i) Explain the meaning of the term **conditional probability** of event A given event B. (02 marks)

(ii) State the conditions for A and B to be independent. (01 mark)

(b) **Table 1** shows the records from an assembling factory for smart phones with four assembling lines; A_1 , A_2 , A_3 and A_4 . The table shows the percentage of faulty phones produced per line, and the percentage of the total output produced per line.

Table 1

Line	A_1	A_2	A_3	A_4
Faulty phones (%)	1	3	2.5	2
% of total output	35	20	24	21

Determine the probability that

(i) A phone chosen at random from a whole output is faulty. (03 marks)

(ii) A phone is faulty and comes from A_1 (02 marks)

(iii) A phone is faulty and comes from A_2 (02 marks)

(iv) A phone is faulty and comes from A_3 (02 marks)

(v) A phone is faulty and comes from A_4 (02 marks)

(c) Two events A and B are independent given that $P(A \cap B') = \frac{1}{4}$, and $P\left(\frac{A'}{B}\right) = \frac{1}{6}$.

Find;

(i) $P(A)$

(01 mark)

(ii) $P(B)$

(01 mark)

(iii) $P(A \cap B)$

(02 marks)

(iv) $P(A \cap B')$

(02 marks)

You may use a Venn diagram in your answer.

Question Six

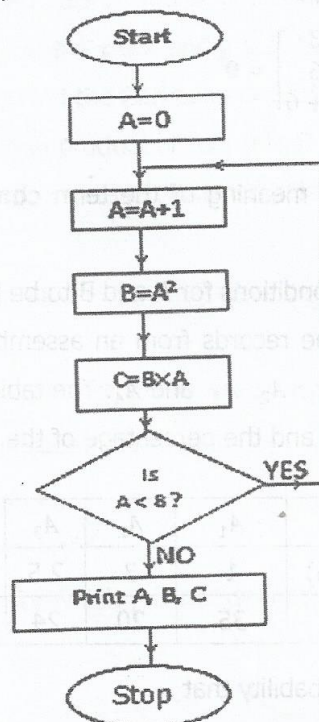
(a) Define the term **algorithms** as used in flow charts.

(01 mark)

(b) Draw a flow chart that reads and prints the mean of the first twenty counting numbers.

(10 marks)

(c) Given the flow chart below;



Use the flow chart above to perform a dry run and use it to state the relationship between;

(i) A and B

(ii) A and C

(09 marks)

Question Seven

(a) Given that $A = \begin{pmatrix} 2 & -1 & -2 \\ -1 & 1 & 0 \\ -2 & 1 & 3 \end{pmatrix}$ $B = \begin{pmatrix} 3 & 1 & 2 \\ 3 & 2 & 2 \\ 1 & 0 & 1 \end{pmatrix}$

Evaluate AB hence solve the simultaneous equations by matrix inversion method.

$$3x + y + 2z = 11$$

$$3x + 2y + 2z = 10$$

$$x + z = 5$$

(09 marks)

(b) Given a matrix $A = \begin{pmatrix} 1 & -1 & 0 \\ 2 & 1 & -2 \\ 1 & 3 & 1 \end{pmatrix}$

Use the minor cofactors (Gaussian Jordan) method to find the inverse of A .

(11 marks)

Question Eight

- (a) A computer dealer imports 40% and 60% of spare parts from countries A and B respectively. The percentage of parts produced defective in the countries are 0.3 and 0.5 respectively.

A spare part is drawn at random from a sample of parts imported from A and B. Find the probability that;

(i) It is defective and it is from country B. (05 marks)

(ii) It is defective. (03 marks)

- (b) Four competitors throw a die in turn. Determine the probability that;

(i) they all score more than 4. (04 marks)

(ii) two get less than 3. (04 marks)

(iii) the total score is 23. (04 marks)

END