THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

036/1 INFORMATION AND COMPUTER STUDIES 1

(For Both School and Private Candidates)

Time: 3 Hours **ANSWERS** **Year: 2006**

Instructions

1. This paper consists of sections A, B and C with a total of twelve questions

2. Answer all the questions in section A and B and one question in section C.

1. For each of the items (i)–(v), choose the correct answer from among the given alternatives and write its letter beside the item number.

(i) The first large-scale computer ever developed is
A. IMB 701 and EDVAS
B. EDVAC
C. LAPTOP
D. Mark II
E. UNIVAC

Answer: E. UNIVAC
Reason: The UNIVAC (Universal Automatic Computer) was one of the first large-scale computers designed for general use.

(ii) Development of standardized programming language featured prominently during
A. First generation computers
B. Second generation computers
C. Third generation computers
D. Fourth generation computers
E. Fifth generation computers

Answer: C. Third generation computers
Reason: Standardized programming languages, such as COBOL and FORTRAN, were introduced and widely used during the third generation of computers.

(iii) The IF statement is used when
A. A series of steps are to be executed several times
B. A series of steps are to be executed a given number of times
C. A series of steps are to be executed under a certain condition
D. One or more statements are selected for execution when a certain condition is met
E. One or more statements are to be executed until a certain condition is met

Answer: D. One or more statements are selected for execution when a certain condition is met
Reason: An IF statement evaluates a condition and executes specific code if the condition is true.

(iv) A program is written in high-level language. Which of the following statements is true?
A. Each instruction in the program represents a number of machine instructions
B. It is written in binary
C. It does not need to be translated before execution
D. It is translated by an assembler before execution
E. The language is called "high-level" because it is difficult to learn

Answer: A. Each instruction in the program represents a number of machine instructions

Reason: High-level languages use statements that correspond to multiple machine-level instructions.

(v) Which subroutine will be executed as a result of the following statement?
Assume that COUNT = 5 and ANGLE = 5.

```
IF COUNT = 5
THEN
  IF ANGLE = 2
  THEN
    GOSUB 11
  ELSE
    GOSUB 13
```

A. The subroutine at line 11
B. The subroutine at line 13
C. Neither subroutine will be executed, an error message will be displayed
D. Neither subroutine will be executed, but no error message will be displayed
E. Both subroutines will be executed

Answer: B. The subroutine at line 13
Reason: The first condition `COUNT = 5` is true, but the second condition `ANGLE = 2` is false. Therefore, the `ELSE` statement executes the subroutine at line 13.

1.

(vi) An arithmetic and logic unit (ALU) performs
A. Arithmetic computations and data transfer
B. Logical operations and data transfer
C. Control operations and arithmetic computations
D. Logic and control functions
E. Logic operations and arithmetic computations

Answer: E. Logic operations and arithmetic computations
Reason: The ALU is a part of the CPU that handles arithmetic operations (like addition and subtraction) and logical operations (like comparisons).

(vii) What is an icon?
A. A file, option, or help menu
B. A special key on the Microsoft keyboard
C. An image representing a program or some other object
D. Instructions contained on notepad
E. A component of a computer that interprets instructions

Answer: C. An image representing a program or some other object
Reason: Icons are graphical representations of files, applications, or tools on a computer.

(viii) How is hardware different from software?
A. Hardware is composed of physical devices
B. Software must always be read from disk before it is used
C. Hardware cannot perform logic operations, software can
D. Software uses less electricity
E. Hardware is more reliable than software

Answer: A. Hardware is composed of physical devices
Reason: Hardware refers to the tangible components of a computer, whereas software is intangible and consists of programs and data.

(ix) A programmer
A. Is an expert using Microsoft Office
B. Designs sequences of instructions for computer execution
C. Is an expert at managing all aspects of a computer center
D. Operates mainframe computers
E. Is a computer sales person

Answer: B. Designs sequences of instructions for computer execution
Reason: A programmer creates software by writing code that provides instructions to a computer.

(x) What is Excel used for?
A. Graphics editing
B. Database manipulation
C. Word processing
D. Desk-top publishing
E. Spreadsheet calculations

Answer: E. Spreadsheet calculations
Reason: Microsoft Excel is a spreadsheet program commonly used for calculations, data analysis, and financial modeling.

2. Match the items in List A with the responses in List B by writing the letter of the corresponding response beside the item number.

List A
(i) RAM
(ii) Procedure language
(iii) A set of program instructions

(iv) Allows programs to run in a computer without human intervention
(v) Rules that define structure of statements in a program
(vi) Recording information on a magnetic tape
(vii) A utility program which supplies synonyms and antonyms
(viii) At least two processes sharing CPU and memory in one computer system
(ix) Program written for destructive purposes
(x) LAN

List B
A. Computer network which is confined in a small area
B. Third generation programming languages
C. Stores all data and instructions required for current work
D. Code
E. Record
F. Sequential recording
G. Bootstrap
H. Application software
I. Thesaurus
J. Syntax
K. Grammatical rules
L. Multiprocessing
M. Modem
N. Fourth generation languages
O. Multiprogramming
P. Line recording
Q. Virus
R. Spreadsheets
S. Computer network that covers a large area
T. OS

Answers.
(i) C
(ii) B
(iii) D
(iv) G
(v) J
(vi) F
(vii) I
(viii) L
(ix) Q
(x) A

3.

(a) Define the following terms:

(i) Analog computer: An analog computer is a computing device that processes data represented by continuous physical quantities, such as voltage, current, or mechanical motion. It is used in applications like measuring temperature, speed, and pressure, where data can vary continuously. Analog computers are less precise compared to digital computers but are effective for real-time data processing.

(ii) Digital computer: A digital computer is a type of computer that processes information in discrete binary form, represented as 0s and 1s. It uses logical operations to perform calculations and execute programs. Digital computers are used in a wide range of applications, such as business, education, and scientific research, due to their accuracy and ability to process large amounts of data efficiently.

(b) What do the following abbreviations stand for?

(i) ROM stands for Read-Only Memory. It is a type of non-volatile memory that stores essential data and instructions for the computer's startup process and system operation. The data in ROM cannot be modified during normal operation.

(ii) RAM stands for Random Access Memory. It is a type of volatile memory that temporarily stores data and instructions currently in use by the CPU. RAM allows quick access to information, enabling efficient program execution.

4. (a) Draw a DO – WHILE flow chart.

A DO-WHILE flowchart typically includes the following elements:
- A process or action block that executes a task.
- A decision block that checks a condition.
- A loop that repeats the process as long as the condition remains true.

(b) Define an array.

An array is a collection of elements of the same data type stored in contiguous memory locations. Arrays are used to store multiple values under a single variable name, which can be accessed using an index. For example, an array named NUMBERS could store ten integers: NUMBERS(1), NUMBERS(2), ..., NUMBERS(10).

5.

Write LET statements to perform the indicated tasks:
(a) Reduce the value assigned to L by 5

(b) Assign the string constant “WINDOW” to Y
(c) Finding the sum of three numbers
(d) Find the product of A and B

(a) LET L = L - 5
This reduces the current value of L by 5 and stores the result back in L.

(b) LET Y = "WINDOW"
This assigns the string "WINDOW" to the variable Y.

(c) LET SUM = A + B + C
This calculates the sum of three numbers stored in variables A, B, and C and assigns the result to SUM.

(d) LET PRODUCT = A * B
This calculates the product of two numbers, A and B, and assigns the result to PRODUCT.

6.

Write down four features of an assembly language.

1. Low-level language: Assembly language is closer to machine code, making it a low-level programming language.
2. Mnemonic codes: It uses mnemonic codes like MOV, ADD, and SUB for operations, which are easier to remember than binary machine code.
3. Hardware specificity: Assembly language is designed for specific computer architectures and processors.
4. Efficiency: Programs written in assembly language can be highly efficient and optimized for performance, especially for hardware-level tasks.

7.

(a) Define a program and programming.

A program is a set of instructions written in a specific programming language that a computer executes to perform a particular task. Programs can be simple, like a calculator, or complex, like operating systems.

Programming is the process of designing, writing, testing, and maintaining code to create software programs. It involves using logical thinking, problem-solving skills, and knowledge of programming languages to instruct the computer on what to do.

(b) What is a string variable?

A string variable is a type of variable used to store a sequence of characters, such as letters, numbers, and symbols. For example, a string variable named NAME could hold the value "John Doe". Strings are commonly used to handle text in programming.

8.

Mention four computer hardware components and give one example for each.

1. Input devices: These allow users to interact with the computer by providing data or commands. Example: Keyboard.
2. Output devices: These display the results of computer processes. Example: Monitor.
3. Processing unit: This executes instructions and performs computations. Example: Central Processing Unit (CPU).
4. Storage devices: These store data and programs for future use. Example: Hard drive.

9.

What are the differences between:
(a) Bugs and debugging
(b) Virus and a worm

(a) Bugs and debugging:
- Bugs are errors or flaws in a program that prevent it from functioning correctly.
- Debugging is the process of identifying, analyzing, and fixing bugs in a program to ensure proper functionality.

(b) Virus and a worm:
- A virus is a malicious program that attaches itself to other files or programs and spreads when the host is executed.
- A worm is a standalone malicious program that replicates itself to spread across networks without requiring a host file.

10.

(a) Distinguish special-purpose software from general-purpose software.

Special-purpose software is designed to perform specific tasks, such as payroll systems or inventory management. These programs are tailored for particular use cases and are not versatile.

General-purpose software, on the other hand, can be used for a variety of tasks. Examples include Microsoft Word (used for document editing) and Excel (used for spreadsheets).

(b) Give one advantage and one disadvantage of general-purpose software.

Advantage: Flexibility – It can be used for a wide range of tasks across different domains.
Disadvantage: Inefficiency – It may lack features tailored to specific tasks, leading to inefficiencies in specialized applications.

11.

List two differences between local area network and wide area network.

1. Coverage area: A local area network (LAN) covers a small geographical area, such as an office or a home, while a wide area network (WAN) spans a large geographical area, such as cities or countries.
2. Speed: LANs are typically faster due to proximity and dedicated connections, while WANs are slower due to the longer distances and potential congestion.

12.

(a) What is system software?

System software is a type of software designed to manage computer hardware and provide a platform for running application software. Examples include operating systems (like Windows or Linux) and utility programs.

(b) Mention three functions of system software.

1. Manages hardware resources, such as memory, processors, and storage.
2. Provides user interfaces, such as graphical or command-line interfaces, for interaction with the computer.
3. Facilitates the execution of application programs by providing essential services and environments.

13.

(a) Dry run the following nested FOR/NEXT loop and write down the output:

```
10 FOR i = (3*4) TO 1 STEP -4
20   FOR j = 3 TO 1 STEP -1
30     PRINT i, j
40   NEXT j
50 NEXT i
60 END
```

Output:
The outer loop runs for values of `i = 12, 8, 4`, decreasing by 4 each time.
The inner loop runs for values of `j = 3, 2, 1`, decreasing by 1 each time.
The nested loop produces the following output:

12, 3
12, 2
12, 1
8, 3
8, 2
8, 1
4, 3
4, 2
4, 1

(b) Define a pseudocode.

Pseudocode is a simplified, informal way of describing the steps of a program's logic using plain language and basic programming constructs. It is not written in any specific programming language and is used for planning algorithms before actual coding.

(c) Differentiate a numeric variable from a string variable.

A numeric variable stores numerical data that can be used in mathematical calculations, such as integers or floating-point numbers.
A string variable stores a sequence of characters, which may include letters, numbers, and symbols, and is used for text-based data.

14.

(a) Write short notes on the following:

(i) DATA statement
The DATA statement is used in BASIC programming to define a list of constant values that can be accessed sequentially using the READ statement. These values are stored within the program and are typically used to supply input during program execution. Example: `DATA 1, 2, 3, 4`.

(ii) READ statement
The READ statement retrieves values from a DATA statement in sequential order. Each time a READ statement is executed, it reads the next value in the DATA list. Example: `READ A` assigns the next available value from DATA to variable A.

(iii) RESTORE statement
The RESTORE statement resets the pointer of the DATA list back to the beginning, allowing the program to reread the DATA values from the start. This is useful when the same data needs to be used multiple times within a program.

(b) Given the following BASIC program:

```
10 READ A, B
20 RESTORE
30 READ C
40 RESTORE
50 READ D, E, F, G
60 DATA 1, 2, 3, 4, 5, 6
```

What values will be assigned to A, B, C, D, E, F, and G?

Explanation:
- Line 10: Reads A = 1 and B = 2 from the DATA statement.
- Line 20: RESTORE resets the DATA pointer to the start.
- Line 30: Reads C = 1 (first value again after RESTORE).
- Line 40: RESTORE resets the DATA pointer to the start.
- Line 50: Reads D = 1, E = 2, F = 3, and G = 4 (first four values after RESTORE).

Values:
A = 1, B = 2, C = 1, D = 1, E = 2, F = 3, G = 4

15.

(a) Define the following terms:

(i) Programming language
A programming language is a formal set of instructions that can be used to communicate with a computer to develop software programs. Examples include Python, BASIC, and Java.

(ii) Flowchart
A flowchart is a graphical representation of a process or algorithm, showing the flow of control through symbols such as ovals, rectangles, and diamonds connected by arrows.

(iii) Time-sharing
Time-sharing is a computing technique in which multiple users share system resources (e.g., CPU time) simultaneously, providing the illusion of concurrent execution. It is commonly used in multi-user systems.

15.

(b) In a retail store, a clerk is paid a commission on each sale. If the sale is T.shs.150,000 or more, the commission is 4%; otherwise, the commission is 2%. In a flowchart, describe the logic required to compute the commission, from the point of sale to the commission calculation.

The flowchart logic would involve the following steps:

1. Start: Begin the process.
2. Input Sale Amount: Prompt the user to input the sale amount.
3. Decision: Check if the sale amount is greater than or equal to T.shs.150,000.
   - If yes, calculate the commission as 4% of the sale amount.
   - If no, calculate the commission as 2% of the sale amount.
4. Output Commission: Display the calculated commission.
5. End: Terminate the process.

(c) Write a LET statement that will assign gross profit to 75% of sales minus 125,000.

LET GrossProfit = (Sales * 0.75) - 125000

(d) Correct errors in the following LET statements:

(i) `100 LET X*Y=Z` should be corrected to `100 LET Z=X*Y`.
(ii) `200 LET P=$500G` should be corrected to `200 LET P=500`.

16. (a) Write a LET statement that will assign the date 21-12-1996 to the string DS.
LET DS = "21-12-1996"

(b) Write a PRINT statement that will instruct the computer to print values of the variables A, B, C, D, E, F, and G on one line.

PRINT A, B, C, D, E, F, G

(c) Given the following lines:
20 A = 100
30 B = 200
40 C = 300

What is the exact output that will be printed by the computer for the following line?
90 PRINT A^5, A^½
If the arrow pointing upwards represents exponentiation (as it is often used in BASIC programming), the calculations remain the same:

Given the lines:

20 A = 100
30 B = 200

40 C = 300

And the line:

90 PRINT A ^ 5, A ^ (1/2)

Explanation:

- `A ^ 5` means 100 raised to the power of 5:
  `100^5 = 100 * 100 * 100 * 100 * 100 = 10,000,000,000`.

- `A ^ (1/2)` means the square root of 100:
  `100^(1/2) = √100 = 10`.

Exact Output:
10,000,000,000, 10

17. (a) Write the general form of a FOR/NEXT loop.

The general form of a FOR/NEXT loop is:

FOR variable = start TO end [STEP increment]
  [Statements to execute within the loop]
NEXT [variable]

Explanation:
- `variable` is the loop control variable.
- `start` is the initial value of the variable.
- `end` is the final value the variable will take.
- `STEP increment` is optional and determines the amount by which the variable changes each iteration (default is 1).
- `NEXT` indicates the end of the loop and moves to the next iteration.

(b) Given the following BASIC program:

10 REM SUMMING PROGRAM
20 LET S = 0
30 FOR Y = 1 TO 5
40 INPUT Y
50 LET S = S + Y
60 NEXT Y
70 PRINT "Sum is" S
80 END

(i) How many types of errors are there in the program?
There are two types of errors:

- Logical Error: The variable `Y` is reused in the loop and input statement, which can cause incorrect calculations.
- Input Error: The program assumes valid input, but no error handling is implemented for invalid or non-numeric inputs.

(ii) What will happen to the program if numbers entered are less than 5?
If numbers entered are less than 5, the loop will sum those values, and the program will print the correct total of the entered numbers.

(iii) What will happen to the program if numbers entered are equal to or greater than 5?
The program will still function correctly and sum the values since there is no restriction on the range of numbers that can be entered.

(iv) Write the correct version of the program that works for all values.

```
10 REM SUMMING PROGRAM
20 LET S = 0
30 FOR X = 1 TO 5
40 INPUT N
50 LET S = S + N
60 NEXT X
70 PRINT "Sum is "; S
80 END
```

Explanation:
- The loop control variable `X` is introduced to avoid reusing `Y`.
- `N` is used as the input variable to avoid conflicting with the loop variable.

18. (a) What steps are followed in setting up a counter for loop control?

The steps are:
1. Initialization: Set the counter variable to its starting value.
2. Condition Testing: Define the end condition for the loop (e.g., counter ≤ 10).
3. Increment/Decrement: Specify the step value by which the counter variable changes during each iteration.
4. Execution. Repeat the statements within the loop until the end condition is met.

(b) Why can't zero be used as a step value in the FOR/NEXT loop?
A step value of zero would create an infinite loop because the counter variable would not change, and the condition to exit the loop would never be met.

(c) What input statements are available in BASIC? Explain.

The input statements in BASIC are:
1. INPUT: Allows the user to input a value during program execution. For example, `INPUT X` prompts the user to enter a value for `X`.
2. READ: Reads data from predefined `DATA` statements in the program.
3. LINE INPUT: Allows the user to input a complete line of text, including spaces.

Explanation:
- `INPUT` is interactive and waits for user input.
- `READ` retrieves data automatically during execution without user intervention.
- `LINE INPUT` is suitable for capturing textual data.