**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: 2002**

**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.

(i) A computer is
A. a device used for drawing graphs only
B. a device that is built from hardware and uses software
C. a software for defining problems
D. an electronic machine that will process data and change it into information
E. an electronic machine for manipulation of information

Correct answer: E. an electronic machine for manipulation of information
Reason: A computer's primary purpose is to manipulate and process information. It performs computations, stores data, and retrieves information as required by the user, making this the most accurate description.

(ii) A device that is used to connect a computer to normal telephone systems is
A. Laser printer
B. Modem
C. Satellite
D. RAM
E. VDU

Correct answer: B. Modem
Reason: A modem is designed to convert digital signals from a computer into analog signals suitable for a telephone line and vice versa, enabling data transmission over telephone systems.

(iii) One kilobyte is equivalent to
A. 1000 bytes
B. 1024 bits
C. 1000 bits
D. 1024 bytes
E. 1000 characters

Correct answer: D. 1024 bytes
Reason: In computing, one kilobyte is equal to 1024 bytes because computers use a binary system where one kilobyte equals $2^{10}$ bytes.

(iv) It has been possible to manufacture small but powerful computers today because of
A. stable and good supply of electricity
B. very large scale integration
C. good integrated circuits
D. improved vacuum tubes
E. powerful transistors

Correct answer: B. very large scale integration
Reason: Very Large Scale Integration (VLSI) technology involves embedding millions of transistors on a single chip, allowing for the creation of smaller, more powerful, and efficient computers.

(v) Which of the groups of items given below represents a set of data storage devices?
A. Floppy disk, diskette, keyboard
B. CD, diskette, hard disk
C. Floppy disk, magnetic tape, VDU
D. Hard disk, keyboard, magnetic tape
E. Magnetic tape, mouse, diskette

Correct answer: B. CD, diskette, hard disk
Reason: CD, diskette, and hard disk are all storage devices used for storing digital data, unlike keyboards or mice, which are input devices.

(vi) A program is normally written in high-level language. Which of the following statements is true for a high-level language?
A. It is written in binary
B. It does not need to be translated for execution
C. Instructions in the language represent numbers of machine instruction
D. It is translated by an assembler before execution
E. It is difficult to learn

Correct answer: C. Instructions in the language represent numbers of machine instruction
Reason: High-level languages use syntax that is closer to human language, and these instructions are converted into machine instructions for execution.

(vii) A computer error that arises due to language translation is known as
A. syntax error
B. compilation error
C. logic error
D. personal error
E. Y2K

Correct answer: A. syntax error
Reason: Syntax errors occur when programming code violates the rules or grammar of a programming language, often identified during the translation or compilation phase.

(viii) The equivalent of octal 124 in decimal system is
A. 80
B. 82
C. 86
D. 84
E. 67

Correct answer: B. 82

Reason: To convert octal 124 to decimal, multiply each digit by powers of 8:
$1\times8^2 + 2\times8^1 + 4\times8^0 = 64 + 16 + 2 = 82$.

(ix) Locating and correcting errors in a computer program is called
A. analyzing
B. coding
C. debugging
D. fixing
E. correcting

Correct answer: C. debugging
Reason: Debugging is the process of finding and fixing errors or bugs in a program to ensure its proper functioning.

(x) A flowchart is
A. a method of programming
B. usually a difficult program to understand
C. a graphical representation of logical flow of a program
D. a method of showing a problem in steps of instructions
E. a method of making the problem easy

Correct answer: C. a graphical representation of logical flow of a program
Reason: A flowchart is a diagram that visually represents the sequence and logic of processes in a program, making it easier to design and understand its structure.

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

List A
(i) Error in a program
(ii) Warm booting
(iii) User interface
(iv) The CPU of a microcomputer
(v) Output from the computer which has not been printed
(vi) Enables the user to easily create and edit text
(vii) WAN
(viii) Control unit
(ix) Operating system
(x) Program

List B
A. A type of line printer
B. Booting when the computer was not turned on before

C. Controls only the input devices
D. Turning on the computer from the cold
E. Restarting the computer
F. Bug
G. Controls the general operations of the computer
H. Magnetic disk
I. Computer network which covers a large area
J. Written instructions and commands that make the computer work
K. Part of the central processing unit which controls the flow of data
L. The part of the computer that we interact with when giving the instruction to the computer
M. Word processing application software
N. Soft copy
O. ALU
P. Microprocessor
Q. Non-impact printer
R. The part of the computer that we only use to receive processed results from the computer
S. A set of related records
T. A magnetic disk and a floppy disk

Solutions:

(i) Error in a program - F
(ii) Warm booting - E
(iii) User interface - L
(iv) The CPU of a microcomputer - P
(v) Output from the computer which has not been printed - N
(vi) Enables the user to easily create and edit text - M
(vii) WAN - I
(viii) Control unit - K
(ix) Operating system - G
(x) Program - J

3. Write LET statements to perform the indicated tasks.

(a) Assign the value of expression (A-B)/2 to C2
Solution: LET C2 = (A-B)/2

(b) Assign the string cost to C $
Solution: LET C$ = "cost"

(c) Replace the value of A $ by the string DOS, WINDOWS
Solution: LET A$ = "DOS, WINDOWS"

(d) Increase the value assigned to B by 7
Solution: LET B = B + 7

4. (a) Give the name of the device that makes it possible for the CPU to work
Solution: The device is the motherboard.

(b) Magdalena bought a floppy disk with a computer game on it. Has she bought hardware, software, or both? Why?
Solution: Magdalena has bought both hardware and software. The floppy disk is the hardware, while the computer game stored on the disk is the software.

(c) Define the following terms:
(i) Bytes
Solution: A byte is a unit of digital information that typically consists of 8 bits and is used to represent a character, such as a letter, number, or symbol, in computing.

(ii) Bits
Solution: A bit (binary digit) is the smallest unit of data in a computer and represents a single binary value of either 0 or 1.

5. The words RAM and ROM are often used when computer memory is discussed.

(a) What do the following abbreviations stand for?
(i) RAM
Solution: Random Access Memory

(ii) ROM
Solution: Read-Only Memory

(b) What are main differences between RAM and ROM?
Solution:
RAM:
- Volatile memory; data is lost when the computer is turned off.
- Temporary storage used for active processes and running programs.
ROM:
- Non-volatile memory; data is retained even when the computer is turned off.
- Permanent storage used for essential system instructions, such as the computer's boot process.

(c) Give one use of RAM
Solution: RAM is used to store data and programs that are currently in use by the CPU to ensure quick access and processing.

(d) Give one use of ROM
Solution: ROM is used to store the computer's firmware, such as the Basic Input/Output System (BIOS), which helps start up the computer.

6. (a) Name two tasks done by the operating system
Solution:

- Managing hardware resources, such as CPU, memory, and storage.
- Providing a user interface for interaction with the computer.

(b) Name one operating system used by computers
Solution: Microsoft Windows

(c) Microcomputers can carry out multitasking. Give the meaning of the term multitasking
Solution: Multitasking refers to the ability of a computer to execute multiple tasks or programs simultaneously by sharing computing resources like the CPU and memory.

7. (a) The diagram above shows the flow of data in a computer system. In which part will you expect to find main memory?
Solution: Main memory will be found in the Central Processing Unit (CPU).

(b) Name two input devices
Solution:

- Keyboard
- Mouse

(c) Name two output devices
Solution:

- Monitor
- Printer

(d) Give one use of the main memory
Solution: Main memory is used to temporarily store data and instructions that the CPU needs for processing tasks.

8.
To dry run the flowchart, I will execute the steps of the flowchart sequentially and record the outputs.

1. Start: The program starts.

2. LET X = 0: The variable X is initialized to 0.

3. LET Y = 1: The variable Y is initialized to 1.

4. LET Z = 1: The variable Z is initialized to 1.

5. ADD 1 TO Z: The value of Z is incremented by 1, so Z = 2.

6. Calculate X = Y + Z: The value of X is calculated as X = Y + Z.
   Substituting the values:
   X = 1 + 2
   X = 3

7. Is Z = 3?: The program checks if Z is equal to 3.
   Since Z = 2, the condition is false.

8. Output "VALUE OF Z NOT REACHED": Since Z is not equal to 3, the program outputs:
   VALUE OF Z NOT REACHED.

9. Repeat: The flowchart loops back to ADD 1 TO Z.

10. ADD 1 TO Z: Increment Z again. Now Z = 3.

11. Calculate X = Y + Z: The value of X is recalculated as:
    X = Y + Z
    X = 1 + 3
    X = 4

12. Is Z = 3?: The program checks if Z is equal to 3.
    Since Z = 3, the condition is true.

13. Output "Z IS NOW 3": The program outputs:
    Z IS NOW 3.

14. Output "VALUE OF X IS NOW"; X: The program outputs:
    VALUE OF X IS NOW 4.

15. Stop: The program ends.

Outputs produced:
1. VALUE OF Z NOT REACHED
2. Z IS NOW 3
3. VALUE OF X IS NOW 4

9. In early days of computing, programs were normally written in Assembly Language. Today, programs are normally written in a high-level language.

(a) Give two advantages of a high-level language to a programmer.

- High-level languages are easier to learn and use because they resemble human languages, making programming less complex compared to Assembly Language.
- Programs written in high-level languages are portable across different computer systems since they do not rely on specific hardware, unlike Assembly Language which is hardware-dependent.

(b) An expert programmer is writing a game program. Why might this programmer prefer to use Assembly Language? (Give two reasons.)

- Assembly Language provides greater control over hardware, allowing the programmer to optimize performance, which is crucial in game development.
- It enables the programmer to write highly efficient code for time-critical tasks, such as rendering graphics or processing user inputs quickly.

10. Here is a list of job titles to do with computers:
Computer Engineer, Computer Operator, Data Control Clerk, Data Processing Manager, File Librarian, Keyboard Operator, Programmer, Salesman, Shift Leader, System Analyst.

For each of the tasks below, write down the most likely job title for the person doing it. Use the job title only once.

(a) Correcting errors in a program
Programmer

(b) Sending data to the computer
Keyboard Operator

(c) Testing a new computer system
System Analyst

(d) Demonstrating a computer to a new customer
Salesman

11. Correct the errors found in the following LET statements:

(a) 90 LET C S = SAFARI
The error is the use of C S (spaces are not allowed). The corrected statement is: LET C$ = "SAFARI"

(b) B20 LET C = C + 1
The error is the use of B20 at the beginning. The corrected statement is: LET C = C + 1

(c) 40 LET X + Y = T
The error is assigning to an expression (X + Y). The corrected statement is: LET T = X + Y

(d) 50 LET AB = A + B
The error is assigning AB without declaring it properly. The corrected statement is: LET AB = A + B

12. The following record structure for a data file has been set up by a programmer:

Field name | Field length | Field type | Key field
Name | 25 | Character | NO
Address | 20 | Character | NO
Admission Number | 06 | Numeric | YES
Telephone Number | 13 | Alphanumeric | NO
Date admitted | 08 | Date | NO

(a) How many fields does each record in this file contain?
Each record contains 5 fields: Name, Address, Admission Number, Telephone Number, and Date admitted.

(b) Explain why only "Admission Number" is a key field.
Admission Number is a key field because it uniquely identifies each record in the file. Other fields, such as Name or Address, can have duplicate values, but the Admission Number is unique for every entry.

(c) Define the term record.
A record is a collection of related data fields that are treated as a single unit in a database or file. For example, in this case, a record represents all the information about a single person, including their Name, Address, Admission Number, Telephone Number, and Date admitted.

(d) Find errors in this record:

Admission Number: 00079982
Name: Safiri Salama
Address: Box 73 Morogoro
Telephone Number: 023-262449
Date Admitted: 03-09-1999

Errors:
1. The Admission Number has 8 digits instead of the required 6 digits, as specified in the record structure.
2. The Address field includes "Box 73 Morogoro," which exceeds the allocated 20 characters.
3. The Telephone Number includes a hyphen, which is not consistent with the numeric or alphanumeric field type.

13. (a) State two system commands used in BASIC. How are they used?
- CLS: This command clears the screen, removing any previous output displayed on it.
- RUN: This command is used to execute a program written in BASIC from the beginning.

(b) There are three types of numeric constants used in BASIC. With examples write short notes on each.

- Integer constants: Whole numbers without decimal points (e.g., 25, -100).
- Floating-point constants: Numbers with decimal points (e.g., 3.14, -0.75).
- Exponential constants: Numbers written in scientific notation (e.g., 2.5E3 represents 2500).

14.

(a) Which of the following are illegal variable labels? Why?

(i) F1: Legal, as it starts with a letter and contains no spaces or special characters.
(ii) 9X: Illegal, as it starts with a number instead of a letter.
(iii) BC: Legal, as it starts with a letter and follows naming rules.
(iv) A97: Legal, as it starts with a letter and contains no invalid characters.
(v) B: Legal, as it is a single valid letter.
(vi) 67: Illegal, as it is a number and does not follow the rule of starting with a letter.

(b) Using one example, explain the difference between an assignment statement and a READ statement.
An assignment statement assigns a specific value to a variable (e.g., LET X = 10).
A READ statement is used to retrieve data from a DATA statement (e.g., READ X).

(c) Write LET statements to perform the indicated tasks:

(i) Assign the tenth power of I + R to A.
LET A = (I + R) ^ 10

(ii) Assign the N x C of 1 + R / C and multiply the result by P to K.
LET K = N * C * (1 + R / C) * P

(iii) Assign monthly payment to M. Monthly payment is given by an expression:
LET M = (L * R / 12) / (1 - (1 + R / 12) ^ (-12 * T))

(iv) Store the content of P $ in Q $.
LET Q$ = P $

15.

(a) If A = 1, B = 2, C = 3 write TRUE for a true statement and FALSE otherwise.

(i) A/C * B < = .5
TRUE

(ii) (A < C) AND (A + B = C)
TRUE

(iii) NOT [(A > B) OR (C > A)]
FALSE

(iv) [(A > B) OR (B > C)] AND (-B + C < 0)
FALSE

(b) What are the differences between the GO TO and ONGO TO statements as used in BASIC?

- GO TO: This statement directs the program to jump to a specific line number unconditionally.
- ONGO TO: This statement allows conditional branching to one of several line numbers based on the value of an expression.

(c) What will be printed when the following code is run?

```
10 LET A = 5
20 LET B = 3
30 IF A > 7 AND B > 10 THEN PRINT B
40 LET B = A + B
50 IF A + B < 15 THEN PRINT A ELSE PRINT B
60 PRINT "THAT'S ALL"
70 PRINT A + B
80 END
```

Output:
5
THAT'S ALL
8

16. (a) Define the following terms:

(i) One-dimensional array
A one-dimensional array is a data structure that stores a collection of elements, all of the same data type, in a single row or column. Each element is accessed using a single index.

(ii) Sorting
Sorting is the process of arranging data in a specific order, either ascending or descending, based on a defined criterion, such as numerical or alphabetical order.

(iii) Array
An array is a collection of elements, all of the same data type, stored in a contiguous memory location. Elements are accessed using indices, and arrays can have one or more dimensions.

(b) How many rows, columns, and elements has the array defined by the following DIM statements?

(i) 10 DIM A (8, 3)
- Rows: 8
- Columns: 3
- Elements: 8 x 3 = 24

(ii) 20 DIM X (5, 7), Y (10, 8)
- Array X:
  Rows: 5
  Columns: 7
  Elements: 5 x 7 = 35
- Array Y:
  Rows: 10
  Columns: 8
  Elements: 10 x 8 = 80

Total elements = 35 (X) + 80 (Y) = 115

(c) Show the output of the following program:

```
70 FOR P = 1 TO 4
80   FOR T = 1 TO 4
90     LET M (P, T) = P * T
100   NEXT T
110 NEXT P
150 FOR K = 1 TO 4
160   PRINT M (K, K);
170 NEXT K
180 END
```

Output:

1 4 9 16

Reason: The loop calculates the product of P and T, storing it in the array M(P, T). The second loop prints the diagonal elements where K = P = T (e.g., M(1,1), M(2,2), etc.).

17.

(a) Define batch processing. Explain why READ is used in BASIC as a batch processing statement.

Batch processing is a mode of executing programs where a group of tasks or transactions is processed together without user interaction during the execution.
READ is used in BASIC to retrieve data values stored in DATA statements for batch processing, allowing automated sequential input of data during program execution.

(b) Explain the use of the RESTORE statement as used in BASIC.
The RESTORE statement is used to reset the pointer in DATA statements, allowing data to be read again from the beginning or a specified position.

(c) Given the following BASIC program code, determine the output:

```
100 READ A, B
150 DATA 6, 8, 10, 12
160 RESTORE
170 READ C, D
180 PRINT A; B; C; D;
```

Output:
6 8 6 8

Reason: The first READ statement retrieves 6 and 8 for A and B. After RESTORE, the pointer resets, and the second READ retrieves the same first two values, 6 and 8, for C and D.

18.

(a) How is INT function used in BASIC? Give examples in each case.
The INT function is used to return the integer part of a number by truncating its decimal portion.
Examples:
1. INT(4.7) returns 4.
2. INT(-3.2) returns -4 (rounds towards negative infinity).

(b) Why do the following two BASIC statements produce two different types of results?

```
10 PRINT RND(1)
20 PRINT INT(10*RND(1))
```

1. The first statement generates a random number between 0 and 1.
2. The second statement multiplies the random number by 10, then truncates the decimal part using INT, resulting in an integer between 0 and 9.

(c) Write the following expressions in BASIC (use built-in functions where possible):

(i) $Z = \sin(x^2) + \tan(y) + \log(A)$
LET Z = SIN(X²) + TAN(Y) + LOG(A)

(ii) $X = R - (5P^5 / S^{15})(4Z^2 - 3A) - (5X / 9Z^3)$
LET X = R - (5 * P^5 / S^15) * (4 * Z^2 - 3 * A) - (5 * X / (9 * Z^3))

(iii) $R = \tan(Z^2) + \ln(A^3)$
LET R = TAN(Z^2) + LOG(A^3)