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: 2003**

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)–(x), choose the correct answer from among the given alternatives and write its letter beside the item number.

(i) The device that can eliminate the manual step of keying in the data is called a
A. key-to-disk machine
B. optical scanner
C. keypunch machine
D. electronic register
E. mouse

Answer: B. optical scanner
Reason: An optical scanner digitizes text or images, eliminating the need for manual data entry.

(ii) An impact printer gets its name by
A. having the same print quality as an electric typewriter
B. transferring a pattern of dots on paper
C. transferring a whole or partial character by striking the ribbon
D. using heat to transfer an image onto the paper
E. creating continuous character images using light

Answer: C. transferring a whole or partial character by striking the ribbon
Reason: Impact printers physically strike a ribbon to transfer ink onto paper, creating characters.

(iii) The following is not the function of the control unit:
A. To coordinate transfer of data to and from primary storage
B. To change the sequence in which instructions are executed when directed to do so
C. To recognize data and to execute instructions
D. To perform arithmetic operations
E. To direct and to control input and output devices

Answer: D. To perform arithmetic operations
Reason: Performing arithmetic operations is the function of the Arithmetic Logic Unit (ALU), not the control unit.

(iv) An optical recognizer can read
A. magnetically encoded numbers
B. any combination of numbers and letters
C. bar codes in supermarkets
D. electronically encoded patterns
E. specially coded characters or patterns

Answer: C. bar codes in supermarkets

Reason: Optical recognizers, such as bar code scanners, are commonly used in supermarkets to read bar codes.

(v) The following is a direct access storage device:
A. A tape
B. A card
C. A disk
D. A printer
E. A joystick

Answer: C. A disk
Reason: Disks allow direct access to data without sequential searching, unlike tapes.

(vi) A programming language that uses normal sentences in English is called a
A. machine language
B. first generation language
C. procedure-oriented language
D. natural language
E. high-level language

Answer: E. high-level language
Reason: High-level languages, like Python or Java, use syntax similar to normal English sentences, making them easier to learn and use.

(vii) Fundamental steps in developing computer programs and application software include all of the following except
A. maintenance
B. language selection
C. analysis and design
D. supervisor approval
E. implementation

Answer: D. supervisor approval
Reason: Supervisor approval is not part of the fundamental steps; it is a managerial or administrative process.

(viii) The REM statement is used to
A. document a program
B. reserve room in the computer's memory for subscripted variables
C. remember values that are assigned to LET statements
D. permit the use of matrix operations
E. skip one line before executing the next command

Answer: A. document a program

Reason: REM (remark) is used to add comments to a program for documentation purposes.

(ix) When used in a PRINT statement, the colon (:) will
A. cause an error message
B. result in printing expressions, numbers, and messages closer together
C. result in printing expressions, numbers, characters, and messages in the next field
D. cause the computer to skip one line before printing
E. result in printing null characters on the screen

Answer: C. result in printing expressions, numbers, characters, and messages in the next field
Reason: The colon in a PRINT statement separates expressions, printing them sequentially in the next field.

(x) Data can be entered directly into the computer system from a terminal when using the
A. TERM statement
B. ENTER statement
C. READ statement
D. LET statement
E. INPUT statement

Answer: E. INPUT statement
Reason: The INPUT statement is used to accept data directly from the user during program execution.

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) TAB
(ii) LET
(iii) Scripted variables
(iv) Modem
(v) Logical
(vi) Structured design
(vii) Problem definition
(viii) Coding
(ix) Coder
(x) Technical design

List B

A. Allows companies to electronically, store, rearrange and print key paragraphs
B. Example of first generation computer
C. Possible carrier with computer manufacturer

D. The use of a device to encode a transform data into digital codes
E. Used in BASIC program to represent lists or table numbers
F. Another name for a computer programmer
G. An error that will not result in an error message
H. A type of number that is only evenly divisible by itself
I. A hardware device that is used in data communication
J. A file organization method that involves storing logical records in a given sequence, usually based on key control field in the record
K. Will cause the values of the variable to be stored in computer memory
L. The activity of producing software in a formal project environment
M. Used to produce attractive output in a computer program
N. A program that combines separate modules into a one executable program
O. The overall purpose is to find the best possible way to develop software
P. Procedures and rules used to develop data communications software
Q. The step of application development where input requirements are determined
R. Rules that are used with a particular programming language
S. The process of writing the necessary instructions in a computer programming language
T. A type of implementation procedure

Solutions

(i) TAB - E
(ii) LET - K
(iii) Scripted variables - R
(iv) Modem - I
(v) Logical - G
(vi) Structured design - N
(vii) Problem definition - Q
(viii) Coding - S
(ix) Coder - F
(x) Technical design - T

3. What does each of the following flowchart symbols represent?

(a) Oval (ellipse)
Represents the start or end of a process in a flowchart.

(b) Parallelogram
Represents input or output operations, such as receiving data from the user or displaying results.

(c) Rectangle
Represents a process or instruction to be carried out during the execution of the program.

(d) Diamond
Represents a decision point in the flowchart where a condition is evaluated to determine the next step.

4. (a) What is the difference between an algorithm and a pseudocode?
An algorithm is a step-by-step process or a well-defined set of instructions to solve a specific problem. A pseudocode is a simplified, informal way of writing algorithms using plain language and programming-like constructs to describe the logic without syntax rules.

(b) When numbers are used in a BASIC program, commas should not be included (e.g., 1000 should not be written as 1,000). Why?
In programming, commas are treated as delimiters or separators. Using commas in numbers could result in syntax errors because the program interprets them incorrectly as separate elements instead of a single numeric value.

(c) Distinguish between an assembler and an interpreter as used in programming languages.
An assembler translates assembly language programs into machine code. It processes low-level instructions specific to hardware. An interpreter translates high-level programming code line by line into machine language during execution, allowing immediate feedback but slower execution compared to compiled programs.

(d) Explain two circumstances under which you would format a floppy diskette.
- To erase all previous data on the disk and prepare it for reuse.
- To create a new file system structure that the operating system can recognize, ensuring compatibility with the computer.

5. (a) What is a Binary Coded Decimal (BCD)?
Binary Coded Decimal is a method of representing decimal numbers where each digit of the decimal number is converted into its equivalent 4-bit binary form.

(b) Represent the decimal number 2003 as a BCD code.
2003 in BCD: 0010 0000 0000 0011

(c) What is a hexadecimal number system?
The hexadecimal number system is a base-16 numbering system that uses the digits 0-9 and letters A-F to represent values. It is commonly used in computing because it is compact and easily converted to binary.

(d) Convert the hexadecimal number EC to a decimal (base ten) number.
E = 14 (in decimal) and C = 12 (in decimal).
EC in decimal = $(14 \times 16) + 12 = 224 + 12 = 236$.

6. (a) Why can't we use zero (0) as a step value in the FOR and NEXT loops?
Using zero as a step value causes an infinite loop because the loop counter will not change, and the loop will neither progress nor terminate.

(b) Correct errors in the following nested FOR/NEXT loop:

```
FOR I = 1 TO 5
  FOR J = Q TO R
  .
  .
  NEXT I
NEXT J
```

Correct version:

```
FOR I = 1 TO 5
  FOR J = Q TO R
  .
  .
  NEXT J
NEXT I
```

(c) What rules should be remembered when using nested FOR/NEXT loops?
1. Ensure each loop has a distinct loop variable.
2. Always close the inner loop with NEXT before closing the outer loop.

7. What are the qualities of a good algorithm?

- Finiteness: The algorithm must terminate after a finite number of steps.
- Input: The algorithm should accept zero or more inputs.
- Output: The algorithm must produce at least one output.
- Definiteness: Each step must be clearly and precisely defined.
- Effectiveness: The steps must be simple enough to be executed in a finite amount of time.

8. Write a BASIC statement that will join A$ and B$ and produce C$. If A$ = "JOSEPH" and B$ = "MILENZO," what will C$ be equal to after this statement is executed?

```
LET C$ = A$ + B$
C$ = "JOSEPHMILENZO"
```

9. What is the general format of the LET statement? Give one example.
The LET statement assigns a value to a variable.
Format: LET variable = expression
Example: LET X = 5

10. (a) List down three program structures.
- Sequential structure
- Selection structure
- Iteration structure

(b) What is data?
Data refers to raw, unprocessed facts and figures that can be used for computation or decision-making, such as numbers, text, or symbols.

11. Write down the output of the following program:

```
COUNT = 0
LIMIT = 3
ANAMES = "ABDALLAH HAMIS"
DO UNTIL COUNT = LIMIT
  COUNT = COUNT + 1
  PRINT ANAMES
  PRINT COUNT
LOOP
PRINT "THE END"
END
```

Output:
ABDALLAH HAMIS
1
ABDALLAH HAMIS
2
ABDALLAH HAMIS
3
THE END

12.

(a) What are the functions of the main memory?
1. Stores data and instructions that the CPU needs while executing tasks.
2. Provides fast and temporary storage for active processes and intermediate results.
3. Facilitates communication between the CPU and other components by temporarily holding data during processing.

(b) Line numbers in a BASIC program serve two purposes. What are they?
1. Indicating the sequence of execution for program statements.
2. Allowing the use of control statements like GOTO and ON-GOTO to navigate specific parts of the code.

13. (a) Write down the order in which arithmetic operators are evaluated. How are the operators at the same level operated?
1. Parentheses ( )
2. Exponentiation (^)
3. Multiplication (*) and Division (/)
4. Addition (+) and Subtraction (-)

Operators at the same level are evaluated from left to right, except exponentiation, which is evaluated from right to left.

(b) Evaluate the expression: (4 * A / (22 / 7)) ^ 2 where A = 154.

Step 1: Substitute A = 154.
Expression: (4 * 154 / (22 / 7)) ^ 2

Step 2: Simplify inside the parentheses:
(4 * 154 / (22 / 7)) = (4 * 154 * 7) / 22 = 4312 / 22 = 196

Step 3: Exponentiate:
196 ^ 2 = 38416

Answer: 38416

(c) List down three types of information processing systems.
1. Batch processing system
2. Real-time processing system
3. Online processing system

14.

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

```
10 FOR i = 1 TO (3 * 4) STEP -4
20   FOR j = 1 TO 2 STEP -1
30     PRINT i, j
40   NEXT j
50 NEXT i
```

The loop condition for `FOR i = 1 TO (3 * 4) STEP -4` is invalid since the start value (1) is less than the target value (12) when using a negative step value (-4). This loop will not execute, so no output will be produced.

(b)

(i) What is a variable?
A variable is a named memory location used to store data that can change during the execution of a program.

(ii) Differentiate a numeric variable from a string variable.
A numeric variable stores numerical values (e.g., integers or floating-point numbers), whereas a string variable stores sequences of characters (e.g., text or alphanumeric data).

15. (a) What steps are followed in setting up a counter for loop control?
- Initialize the counter to a starting value.
- Define the ending value or condition for the loop.
- Specify the increment or decrement step for the counter.

(b) What input statements are available in BASIC? Explain the use of each statement.
- INPUT: Used to accept data from the user during program execution. Example: INPUT A allows the user to input a value for variable A.
- READ: Retrieves data from a DATA statement. Example: READ X retrieves the next value from the DATA list.

(c) What is the need of using RESTORE statement?
The RESTORE statement is needed to reset the pointer of the DATA statement so that the program can re-read values from the beginning or a specified position.

16.

(a) What is the advantage of using arrays?
- Arrays allow storage of multiple values of the same data type under a single variable name, making it easier to manage related data.
- They enable efficient access to elements using indices.
- Arrays simplify operations like sorting, searching, and iterative processing on collections of data.

(b) Write a BASIC program which prints the largest number in an array of 10 numbers.

```
DIM A(10)
LET MAX = 0
FOR I = 1 TO 10
  INPUT A(I)
  IF A(I) > MAX THEN LET MAX = A(I)
NEXT I
PRINT "The largest number is "; MAX
END
```

17. (a) Development of a program can be broken down into six phases. State them.
1. Problem definition
2. Algorithm development
3. Coding
4. Debugging
5. Testing and validation
6. Implementation and maintenance

(b) Differentiate library functions from user-defined functions.
Library functions: Predefined functions provided by a programming language or library (e.g., SIN, LOG). They are built-in and require no user definition.
User-defined functions: Functions created by the programmer to perform specific tasks that are not available as built-in functions.

18. (a) Explain three types of errors which a programmer may encounter when preparing a BASIC program.
- Syntax errors: Occur when the program violates the rules of the programming language (e.g., incorrect use of keywords).
- Logical errors: Occur when the program runs but produces incorrect results due to a flaw in logic.
- Runtime errors: Occur during program execution, such as division by zero or accessing unavailable resources.

(b)

(i) What is an email?
An email is a digital communication method that allows sending and receiving messages electronically over the internet.

(ii) List two advantages and two disadvantages of the email.
Advantages:
- Fast and efficient communication across long distances.
- Allows attachments such as documents and images.

Disadvantages:
- Susceptible to spam and phishing attacks.
- Requires internet access, making it inaccessible in areas without connectivity.