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: 2007**

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)–(vi), 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 is used to automatically convert printed or written text into digital data, eliminating 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 create characters by physically striking the ribbon against the paper.

(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: Arithmetic operations are performed by 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 barcode scanners, are designed 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, such as hard disks and SSDs, allow direct access to data, unlike tapes which use sequential access.

(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 are designed to be human-readable, often resembling normal English sentences.

(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 typically a fundamental step in the software development lifecycle.

(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: The REM (remark) statement in BASIC is used to add comments or documentation to the code, which are ignored during execution.

(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: B. Result in printing expressions, numbers, and messages closer together
Reason: In BASIC, a colon (:) separates multiple PRINT statements, allowing the output to appear closer together.

(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 allows a user to enter data directly into the program during 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 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 communication 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 - O

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

(i) Oval (a): Represents the start or end of a process.
(ii) Parallelogram (b): Represents input or output operations.
(iii) Rectangle (c): Represents a process or operation to be performed.
(iv) Diamond (d): Represents a decision point in the flowchart.

4. (a) What is the difference between an algorithm and a pseudocode?
An algorithm is a formal, step-by-step procedure to solve a problem, typically written in a structured format. Pseudocode, on the other hand, is an informal and human-readable representation of an algorithm, using simple language and programming constructs to describe its logic.

(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 BASIC programming, commas are used as delimiters to separate values or variables. Including commas in numbers would cause syntax errors as the program would treat them as separate entities.

5. (a) Distinguish between an assembler and an interpreter as used in programming languages.
An assembler converts assembly language code into machine code, which the computer can directly execute. An interpreter translates high-level programming language code into machine code line by line during runtime, allowing immediate execution.

(b) Explain two circumstances under which you would format a floppy diskette.

- To prepare the disk for use by creating a new file system.
- To erase all existing data on the disk and remove potential corrupt files or viruses.

6. (a) What is a Binary Coded Decimal (BCD)?
Binary Coded Decimal (BCD) is a method of representing decimal numbers in which each digit of the number is represented by its binary equivalent.

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

(c) What is a hexadecimal number system?
The hexadecimal number system is a base-16 numbering system that uses digits 0-9 and letters A-F to represent values.

(d) Convert the hexadecimal number EC to a decimal (base 10) number.
Hexadecimal: EC
Decimal: $(E \times 16^1) + (C \times 16^0) = (14 \times 16) + (12 \times 1) = 224 + 12 = 236$

7. (a) Why can't we use zero (0) as a step value in the FOR and NEXT loops?
Zero cannot be used as a step value because it would create an infinite loop. The step value determines how much the loop variable changes with each iteration, and a step of zero means no change, preventing the loop from ending.

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

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

  NEXT I
```

NEXT J

Corrected Version:

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

Reason: The `NEXT` statements were incorrectly placed. The inner loop (`FOR J`) must have its corresponding `NEXT J` before the outer loop (`FOR I`) ends.

(c) What rules should be remembered when using nested FOR/NEXT loops?
1. Each `FOR` statement must have a corresponding `NEXT` statement.
2. The innermost loop must complete before the outer loops continue.
3. Loop variables must not interfere with each other.

8. What are the qualities of a good algorithm?
- Clarity: The steps should be simple and easy to understand.
- Efficiency: The algorithm should use the least amount of time and resources possible.
- Finiteness: The algorithm must always terminate after a finite number of steps.
- Correctness: The algorithm must produce the expected output for all valid inputs.

9. (a) 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?
`C$ = A$ + B$`
Result: `C$ = "JOSEPHMILENZO"`

(b) What is the general format of the LET statement? Give one example.
The general format is: `LET variable = expression`.
Example: `LET X = A + B`.

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

(b) What is data?
Data refers to raw facts or figures that can be processed by a computer to produce meaningful information.

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
```

Step-by-step Execution:
1. Initial values: COUNT = 0, LIMIT = 3.
2. First iteration:
   COUNT = 1, PRINT "ABDALLAH HAMIS", PRINT 1.
3. Second iteration:
   COUNT = 2, PRINT "ABDALLAH HAMIS", PRINT 2.
4. Third iteration:
   COUNT = 3, PRINT "ABDALLAH HAMIS", PRINT 3.

After the loop ends, PRINT "THE END".

Output:

```
ABDALLAH HAMIS
1
ABDALLAH HAMIS
2
ABDALLAH HAMIS
3
THE END
```

12.

(a) What are the functions of the main memory?

- Stores data and instructions that the CPU processes.
- Holds intermediate results during program execution.
- Retains data temporarily while waiting to be processed or transferred.

(b) Line numbers in a BASIC program serve two purposes. What are they?

- They specify the sequence in which statements are executed.
- They help in debugging by allowing specific lines to be identified and edited.

13. (a) Write down the order in which arithmetic operators are evaluated. How are the operators at the same level operated?

The order is:

- Parentheses
- Exponents
- Multiplication and Division (left to right)
- Addition and Subtraction (left to right)

At the same level, operators are evaluated from left to right.

(b) Evaluate the expression $4 + A \left(\sqrt{25/4} \right)^3$ where A = 154.

Step-by-step calculation:

- $\sqrt{25/4} = 5/2 = 2.5$
- $(2.5)^3 = 15.625$
- $154 \times 15.625 = 2406.25$
- $4 + 2406.25 = 2410.25$

Final result: 2410.25

(c) List down the 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 contains an error because the step values are negative, but the range does not allow the loop to execute.

Corrected Output: None (loop does not execute).

(b) What is a variable?
A variable is a named storage location in memory that can hold data values, which can change during program execution.

(c) Differentiate a numeric variable from a string variable.
A numeric variable holds numeric values (e.g., integers or decimals), while a string variable holds sequences of characters or text.

15. (a) What steps are followed in setting up a counter for loop control?
- Initialize the counter variable.
- Define the start and end values of the counter.
- Specify the increment or decrement step.

(b) What input statements are available in BASIC? Explain the use of each statement.
- INPUT: Allows the user to input data during program execution.
- READ: Retrieves data from a DATA statement.

(c) What is the need of using RESTORE statements?
The RESTORE statement resets the pointer of a DATA statement, allowing the program to read data from the beginning again.

16. (a) What is the advantage of using arrays?
- Arrays store multiple values of the same type under one variable name, improving code organization.
- They allow easy access to values using indices.

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

```
DIM NUM(10)
FOR i = 1 TO 10
  READ NUM(i)
NEXT i
LET MAX = NUM(1)
FOR i = 2 TO 10
  IF NUM(i) > MAX THEN LET MAX = NUM(i)
NEXT i
PRINT "The largest number is"; MAX
DATA 12, 34, 56, 78, 90, 23, 45, 67, 89, 11
END
```

Output: The largest number is 90

17. (a) Development of a program can be broken down into six phases. State them.

- Problem definition
- Feasibility study
- System design
- Coding
- Testing
- Implementation and maintenance

(b) Differentiate library functions from user-defined functions.

Library functions are pre-written and provided by the programming environment, while user-defined functions are created by the programmer for specific tasks.

18. (a) Explain three types of errors which a programmer may encounter when preparing a BASIC program.

- Syntax errors: Occur when code violates the rules of the programming language.
- Logical errors: Occur when the program runs but produces incorrect results due to flaws in logic.
- Runtime errors: Occur during program execution, often due to invalid input or memory issues.

(b)

(i) What is an email?

Email is an electronic method of exchanging messages and files over the internet.

(ii) List two advantages and two disadvantages of email.

Advantages:

- Fast communication.
- Cost-effective.

Disadvantages:

- Requires internet access.
- Risk of spam or phishing attacks.