THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

ADVANCED CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

136/1 **COMPUTER SCIENCE 1**

(For Both School and Private Candidates)

Time: 3 Hours **ANSWERS** **Year: 2017**

Instructions:

1. this paper consists of section A and B with total of ten questions
2. Answer all questions in Section A and two questions in section B
3. Use a blue or black pen.

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1. (a) Define the term macros and give three advantages of using macros in spreadsheets.

Macros are predefined sequences of actions or instructions in a spreadsheet that automate repetitive tasks. They are written using scripting languages such as VBA (Visual Basic for Applications).

Advantages:
i. Time-saving: Macros automate repetitive tasks, reducing the time required for manual operations.
ii. Accuracy: They minimize human errors by ensuring consistent execution of tasks.
iii. Efficiency: Macros can handle large volumes of data quickly, improving productivity.

(b) Mention three types of cell referencing used when creating formulae and manipulating cell(s) content.

i. Relative Referencing: The reference changes when the formula is copied to another cell.
ii. Absolute Referencing: The reference remains constant, regardless of where the formula is copied.
iii. Mixed Referencing: Combines relative and absolute referencing; part of the reference changes, while the other part remains constant.

2. (a) Write four steps required to change a binary number to a decimal number system.

i. Write down the binary number.
ii. Multiply each binary digit by 2 raised to the power of its position (starting from 0 from right to left).
iii. Sum all the results of the multiplications.
iv. The total is the decimal equivalent of the binary number.

(b) Write the Boolean expression of the following logic gate circuit.

Expression: X = AB' + B C'

(c) Use Boolean laws of algebra to show that (A'B'C) + (A'BC') + (AB'C) + (ABC) = C.

Simplification:
(A'B'C) + (A'BC') + (AB'C) + (ABC)
= (A'(B'C + BC')) + (A(B'C + BC')) (Group terms)
= (B'C + BC') (Factor out common terms)
= C (Simplified form)

3. (a) List four steps to be followed in the development process of a program.
i. Define the problem and requirements.
ii. Design the algorithm and plan the program structure.
iii. Write the program code in a programming language.
iv. Test and debug the program to ensure correctness.

(b) Describe the role of algorithms and explain two types of algorithms used in programming languages.
Algorithms are step-by-step procedures or formulas for solving problems or performing tasks in a finite number of steps. They serve as the foundation for programming logic.
Types:
i. Iterative Algorithms: Use loops to repeat steps until a condition is met, such as calculating a factorial.
ii. Recursive Algorithms: Solve problems by dividing them into smaller sub-problems of the same type, such as the Fibonacci sequence.
4. (a) With an example in each case, distinguish Procedural Programming languages from Object Oriented Programming (OOP) languages.

Procedural Programming: Focuses on functions or procedures to perform tasks. Example: C.
OOP: Focuses on objects that encapsulate data and methods. Example: Java.

(b) Use "For loop" to write a C++ program which can be used to calculate a factorial of a number entered by a user. The program should check if the entered number is positive and give the appropriate message if the number is not positive.

```
#include <iostream>
using namespace std;

int main() {
   int n, factorial = 1;
   cout << "Enter a positive number: ";
   cin >> n;

   if (n < 0) {
      cout << "Error: Factorial is not defined for negative numbers." << endl;
   } else {
      for (int i = 1; i <= n; i++) {
         factorial *= i;
      }
      cout << "Factorial of " << n << " is " << factorial << endl;
   }
   return 0;
}
```

5. (a) Mention four major components of networking. Give one example for each.

i. Network Interface Card (NIC): Allows devices to connect to a network. Example: Ethernet card.
ii. Switch: Connects devices within a Local Area Network (LAN) and forwards data. Example: Cisco Catalyst switch.
iii. Router: Connects different networks and directs data packets. Example: TP-Link router.

iv. Access Point: Provides wireless connectivity to devices in a network. Example: Ubiquiti UniFi access point.

(b) Differentiate microwave transmission from satellite transmission.
i. Microwave Transmission: Uses high-frequency radio waves to transmit data between fixed stations over short distances. It requires line-of-sight communication.
ii. Satellite Transmission: Uses satellites in orbit to transmit data over long distances. It can cover a wide geographical area and does not require direct line-of-sight.

6. (a) Define a term “form” as applied in Visual Basic.
A form is a graphical interface in Visual Basic that contains controls (such as buttons, text boxes, and labels) to allow users to interact with the program.

(b) Explain the function of “show method” and “load statement” as used in Visual Basic. Give an example of Visual Basic code for each. Use “frmLogin” as the name of the form.
i. Show Method: Displays a form to the user.
Example:
```vb
frmLogin.Show
```
ii. Load Statement: Loads a form into memory without displaying it.

Example:

Load frmLogin

(c) Differentiate DirListBox from OLE control.

i. DirListBox: Used to display and navigate directory structures in a Visual Basic application.
ii. OLE Control: Enables embedding and linking to external applications, such as embedding an Excel worksheet or Word document into a form.

7. (a) Outline two control measures which may be used to protect an information system against viruses.

i. Use antivirus software to detect and remove malicious programs.
ii. Regularly update system software and applications to fix security vulnerabilities.

(b) Explain two key principles of securing data or information.

i. Confidentiality: Ensures that data is accessible only to authorized users and remains private. This can be achieved through encryption and access controls.
ii. Integrity: Ensures that data remains accurate, consistent, and unaltered during storage or transmission. This can be maintained using checksums and secure communication protocols.

8. (a) Explain two roles of frame tag (<iframe>) in webpage development.

i. Embedding External Content: The `<iframe>` tag allows embedding external content, such as videos, documents, or other web pages, into a webpage without redirecting the user.
ii. Content Isolation: The `<iframe>` tag isolates embedded content, ensuring that it does not interfere with the parent webpage's layout or functionality.

(b) Write HTML and JavaScript codes that develop HTML form with one input field named “Number” and a submit button called “Process.” The form should accept a value, check if the value is a number and is greater than 0. If not, it alerts “Error: Provide a number greater than 0.” If the entered value is an even number, it alerts “The number provided is divisible by 2,” otherwise it alerts “The number provided is not divisible by 2.”

HTML and JavaScript Code:

```html
<!DOCTYPE html>
<html>
<head>
  <title>Number Validation</title>
  <script>
    function processNumber() {
      var number = document.getElementById("number").value;
      if (isNaN(number) || number <= 0) {
        alert("Error: Provide a number greater than 0");
      } else if (number % 2 === 0) {
        alert("The number provided is divisible by 2");
      } else {
        alert("The number provided is not divisible by 2");
      }
    }
  </script>
</head>
<body>
  <form onsubmit="event.preventDefault(); processNumber();">
    <label for="number">Number:</label>
    <input type="text" id="number" name="number">
    <button type="submit">Process</button>
  </form>
</body>
</html>
```

9. (a) Explain the term “Normalization” as used in the database development process.

Normalization is the process of organizing data in a database to reduce redundancy and improve data integrity. It involves dividing tables into smaller, related tables and defining relationships between them to ensure efficient data storage and retrieval.

(b) Describe three types of modification anomalies in the database.
i. Insertion Anomaly: Occurs when adding new data requires inserting unnecessary or unrelated information.
ii. Deletion Anomaly: Happens when deleting a record inadvertently removes useful information from the database.
iii. Update Anomaly: Arises when changes to data require multiple updates to maintain consistency, increasing the risk of errors.
10. (a) Name parts of the Visual Basic Integrated Development Environment (IDE) window given below and give the purpose of part C.

- A: Toolbox - Provides a list of controls and components that can be added to the form.
- B: Form Designer - Used to design the graphical user interface (GUI) of the application.
- C: Properties Window - Allows viewing and modifying the properties of selected controls or objects, such as name, size, and color.
- F: Menu Bar - Provides access to various tools and features of the IDE.
- G: Project Explorer - Displays the hierarchical structure of the project, including forms, modules, and references.

(b) Give four steps required to open an empty Visual Basic form.

i. Launch the Visual Basic IDE.
ii. Create a new project by selecting "File > New Project."
iii. Choose "Windows Forms Application" from the available templates.
iv. A blank form will automatically be created and displayed in the Form Designer.

11. Analyze six causes for information system failure.

i. Poor Planning and Design: Failure to properly plan or design the system leads to unclear requirements, incompatible components, and an inability to meet organizational needs. For example, a system without scalability options might fail as the user base grows.

ii. Inadequate Testing: Insufficient testing during development can result in undetected bugs and errors, which can cause the system to crash or perform poorly in real-world scenarios.

iii. Lack of User Training: If users are not adequately trained to use the system, they may misuse or underutilize it, reducing its effectiveness and possibly causing system errors.

iv. Hardware Failures: Issues such as server crashes, disk failures, or power outages can disrupt system operations and lead to data loss if no backup mechanisms are in place.

v. Cybersecurity Threats: Information systems can fail due to attacks like malware, ransomware, or unauthorized access that compromise system integrity or make it inaccessible.

vi. Budget Constraints: Insufficient funding can result in poorly developed systems or a lack of necessary maintenance and upgrades, leading to failures over time.

12. Explain two positive and three negative impacts of Information Technology (IT) on environmental sustainability.

Positive Impacts
i. Reduction in Paper Use: IT promotes digital communication and storage, reducing the need for paper and saving trees. For instance, emails and digital documentation eliminate the need for physical copies.
ii. Smart Energy Management: IT enables the development of energy-efficient systems, such as smart grids and automation, to minimize energy waste and promote sustainability.

Negative Impacts
i. E-Waste Generation: Rapid advancements in IT lead to frequent device upgrades, resulting in significant electronic waste. Improper disposal can harm the environment.
ii. Energy Consumption: Data centers and IT infrastructure consume substantial amounts of electricity, contributing to higher carbon emissions.
iii. Resource Depletion: Manufacturing IT equipment requires rare earth materials, and excessive mining for these resources negatively impacts ecosystems.

13. Explain two advantages and two disadvantages of an array over a linked list. Describe programming situations which will lead a programmer to choose either an array or a linked list.

Advantages of an Array over a Linked List
i. Direct Access: Arrays allow constant time (O(1)) access to elements using their index, making them ideal for situations where quick data retrieval is required.
ii. Memory Contiguity: Arrays store elements in contiguous memory locations, which allows better cache performance and faster processing.

Disadvantages of an Array over a Linked List
i. Fixed Size: The size of an array must be defined at the time of declaration, making it inflexible for situations requiring dynamic resizing.
ii. Costly Insertion and Deletion: Inserting or deleting elements in an array requires shifting elements, which is time-consuming (O(n)).

Programming Situations to Choose

i. Array. Use arrays when the number of elements is fixed, and frequent access or sorting operations are required. For example, storing a list of student IDs in a school database.
ii. Linked List: Use linked lists when the size of the data structure may grow or shrink dynamically and frequent insertions and deletions are needed. For instance, managing an event queue in a simulation.