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: 2024**

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.

1. (a) Half adder and full adder are both combination circuits that perform binary addition. In two points, differentiate them according to their logic circuit operations.

Solution:
- A half adder can only add two single-bit binary numbers and provides two outputs: the sum and the carry. It does not consider a carry input from a previous stage.
- A full adder can add three single-bit binary numbers: two inputs and a carry from a previous stage. It produces two outputs: sum and carry.

(b) Draw the half adder using only NAND gates.
Solution:
A half adder uses XOR for the sum and AND for the carry. To implement this using only NAND gates:
1. XOR is constructed using four NAND gates.
2. AND is constructed using two NAND gates.

(c) Construct the truth table of the Boolean expression F = A + AB + ABC.
Solution:
For the Boolean expression F = A + AB + ABC, simplify first using Boolean algebra:
F = A + AB + ABC = A (1 + B + BC) = A.

Truth Table:

A	B	C	F
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

2. (a) Under which condition does the function return zero or one value?

Solution:
A function returns a zero or one value when it contains conditions or logical expressions that evaluate to either 0 (false) or 1 (true).

(b) Outline two special roles of the "main function" in C++ programming.
Solution:
- The main function is the entry point of a C++ program, where execution starts.
- It returns an integer value to the operating system, typically 0 to indicate successful program termination.

(c) There are two methods of calling a function in C++ programming. What is the main benefit of using a call by value over a call by reference?

Solution:
The main benefit of using call by value is that the original data is not modified. Changes made to the parameters within the function do not affect the actual arguments outside the function.

(d) Study the following C++ program and answer the questions that follow:

```
int main()
{
   void change(int);  // Function prototype
   int orig = 2;  // Declare and initialize variable

   cout << "The original value is: " << orig << "\n";  // Line 3
   change(orig);  // Call the change function
   cout << "The new value after change: " << orig << "\n";  // Line 5

   return 0;
}

void change(int orig)
{
   orig = 4;  // Change the value of orig
   cout << "Value of origin in function change() is: " << orig << "\n";  // Line 9
   return;
}
```

(i) What will be the output of the codes labeled with lines 3, 5, and 9?
Solution:
- Line 3: The original value is: 2
- Line 5: The new value after change: 2
- Line 9: Value of origin in function change() is: 4

(ii) What will be the output when a call by reference method is used in function change()?

Solution:
If call by reference is used, the output will be:
- Line 3: The original value is: 2
- Line 5: The new value after change: 4
- Line 9: Value of origin in function change() is: 4

3. (a) Which group used the best practice of programming? Give a reason.

Solution:
The second group used the best practice because designing an algorithm before writing the program ensures clarity, reduces errors, and facilitates easier debugging.

(b) Identify three criteria that indicate the successful algorithm.
Solution:
i. The algorithm is well-defined, with clear inputs and outputs.
ii. The algorithm terminates after a finite number of steps.
iii. The algorithm is efficient in terms of time and space complexity.

(c) Draw a flowchart for finding the summation of the first N positive numbers.

Solution:
A flowchart would typically include:
Start.
Input N.
Initialize sum = 0 and counter = 1.
Add counter to sum.
Increment counter.
If counter <= N, repeat step 4.
Output sum.
End.

4. (a) Explain three ways which aid illegal data access organizations to access customers' bank account information.
Solution:
i. Phishing scams: Fraudulent emails or messages that deceive customers into providing sensitive information such as account numbers or passwords.
ii. Weak cybersecurity measures: Poorly protected systems with weak firewalls or outdated software that make databases vulnerable to hacking.
iii. Insider threats: Employees or individuals with access to sensitive data selling or leaking information to unauthorized parties.

(b) Which two laws were violated by the incident?
Solution:
i. Data Protection Laws: These laws ensure the safeguarding of personal and financial data of customers.
ii. Anti-Terrorism Financing Laws: Laws that prohibit the use of financial systems to support terrorist activities.

(c) Explain two control measures that the bank can use to avoid such problems in the future.

Solution:
i. Implementing robust cybersecurity protocols: Regularly updating firewalls, using encryption, and conducting vulnerability assessments.
ii. Employee training and monitoring: Educating staff on data protection practices and monitoring their access to sensitive information.

5. (a) How would you assist the school management to solve the following existing problems:
(i) Network performance worsens noticeably as more computers are added.
Solution: Upgrade network hardware like routers or switches to high-performance devices and increase bandwidth to accommodate more users.

(ii) Staff members could not get access to the internet.
Solution: Troubleshoot the internet connection and ensure proper configuration of the network gateway and DNS settings.

(iii) Some staff in a network could not access a file from the server.
Solution: Verify user permissions and ensure shared resources are correctly configured to allow access.

(b) Identify the type of physical arrangement used by the school.
Solution: The type of physical arrangement is likely a star topology, as issues with performance and access are common in this setup when poorly configured or overloaded.

6. (a) How do you declare an array `Length` with a fixed size of 9 as an `Integer` in Visual Basic?

Solution:
`Dim Length(8) As Integer`
(Note: Arrays in Visual Basic are zero-indexed, so an array of size 9 has indices 0 to 8.)

(b) How would you declare a user-defined Data Type `ProductDetails` with `ProdID` and `ProdName` holding `String` values, as well as `Price` holding `Currency` value in Visual Basic?

Solution:

```
Type ProductDetails
   ProdID As String
   ProdName As String
   Price As Currency
End Type
```

(c) Extract all errors from the following Visual Basic code segment.

Solution:
The errors in the code are:
i. The variable `class type` should be renamed as `class_type` or another valid name since spaces are not allowed in variable names.
ii. A semicolon `;` is used after `End Select`, which is incorrect in Visual Basic.
iii. The `Case` statements do not have a `Case Else` to handle undefined cases.
iv. The variable `fare` is declared but not initialized, which may cause runtime errors if `class type` does not match any `Case`.

Corrected code:

```
Private Sub Command1_Click()
   Dim class_type As String
   Dim number, fare As Single
   Dim amount As Single
   number = Val(Text1.Text)
   class_type = Combo1.Text
   Select Case class_type
      Case "FIRST CLASS"
         fare = 500
      Case "SECOND CLASS"
         fare = 400
      Case "AC"
         fare = 650
      Case "UNRESERVED"
         fare = 250
      Case Else
         fare = 0
   End Select
   amount = fare * number
   Text2.Text = Str(amount)
End Sub
```

(d) The following figure shows the screenshot of the Visual Basic (VB) Program that finds the summation of two numbers. Which codes activate the button "Add" in order to perform the intended task?

Solution:

```
Private Sub Command1_Click()
   Dim num1 As Integer
   Dim num2 As Integer
   Dim sum As Integer
   num1 = Val(Text1.Text)
```

```
    num2 = Val(Text2.Text)
    sum = num1 + num2
    Text3.Text = Str(sum)
End Sub
```

7. Currently, many of the workplaces in our country are automated with Information Technology facilities. Assess the positive impact of using Information Technologies according to:

(a) The number of jobs available.
Solution: Automation creates new job opportunities in IT-related fields such as software development, system maintenance, and data analysis.

(b) The skills needed to find a job.
Solution: IT encourages workers to acquire technical skills like programming, database management, and networking, increasing employability.

(c) The exposure of employees to dirty and dangerous working conditions.
Solution: Automation reduces the need for human involvement in hazardous tasks, improving workplace safety and health.

(d) The productivity of workers.
Solution: IT tools and systems enhance efficiency by automating repetitive tasks, enabling workers to focus on more complex and creative activities.

8. You have been appointed to prepare a presentation that explains the benefits that the government of Tanzania and private sectors will get after improving their performance from using computers in the daily operations. Describe five points which will guide your presentations.

Solution:
i. Increased efficiency: Computers automate routine tasks, speeding up processes and reducing errors in both public and private sectors.
ii. Enhanced communication: Digital platforms facilitate quick and reliable communication across departments and organizations.
iii. Better data management: Computers enable proper storage, analysis, and retrieval of data, improving decision-making.
iv. Cost reduction: Automation of processes reduces the need for manual labor, cutting operational costs.
v. Improved service delivery: Enhanced speed and accuracy in operations lead to better customer and citizen satisfaction.

9. Juma has a project of developing new software for the supermarket owned by XYZ Company Ltd. Suppose he hired you to participate in preparing system documentation for the software developed, what are the five important components required to achieve the goal?

Solution:
i. System requirements specification: Defines the hardware and software requirements needed for the software to function.
ii. Functional requirements: Details the tasks the software is expected to perform.
iii. User documentation: Guides end-users on how to operate the software effectively.
iv. Technical documentation: Provides information for developers and maintainers on the system's architecture and code structure.
v. Testing and maintenance plans: Documents procedures for software testing and long-term maintenance.

10. (a) Write an algorithm for a program that would track the growth of the deposit over a period of seven years.

Solution:
Algorithm:
1. Start
2. Initialize deposit = 20000
3. Set interest_rate = 0.20
4. For year = 1 to 7, do:
   a. interest = deposit * interest_rate
   b. deposit = deposit + interest
   c. Display year and deposit
5. End

(b) Use HTML and JavaScript to construct a program that would implement the algorithm in part (a).

Solution:
HTML and JavaScript code:

```
<!DOCTYPE html>
<html>
<head>
   <title>Deposit Growth</title>
</head>
<body>
   <h1>Deposit Growth Over 7 Years</h1>
   <div id="output"></div>
   <script>
      let deposit = 20000;
      const interestRate = 0.20;
      let output = "<table border='1'><tr><th>Year</th><th>Deposit</th></tr>";
      for (let year = 1; year <= 7; year++) {
         let interest = deposit * interestRate;
         deposit += interest;
```

```
        output += `<tr><td>${year}</td><td>${deposit.toFixed(2)}</td></tr>`;
      }
      output += "</table>";
      document.getElementById("output").innerHTML = output;
    </script>
</body>
</html>
```