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: 2016**

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) Identify six resources managed by an operating system.

i. Processor (CPU): Manages the allocation of CPU time to various processes running on the computer.
ii. Memory (RAM): Manages and allocates memory to processes to ensure efficient operation.
iii. Storage (Disk): Controls access to data on hard drives and solid-state drives.
iv. Input/Output Devices: Manages input/output operations for devices such as keyboards, mice, printers, and monitors.
v. Files: Manages file systems, ensuring data integrity and access control.
vi. Network Resources: Manages network connections, including communication between devices and access to remote resources.

(b) Explain three importances of data backup.

i. Data Recovery: Enables restoration of critical information in case of accidental deletion, hardware failure, or system crashes.
ii. Business Continuity: Prevents downtime by ensuring that data is available even after a disaster, helping businesses operate without interruptions.
iii. Protection Against Cyber Threats: Provides a secure copy of data that can be restored in case of ransomware or malware attacks.

2. (a) Describe three advantages of digital data over analog data.
i. Accuracy: Digital data can be processed with high precision, avoiding noise and distortion common in analog systems.
ii. Storage Efficiency: Digital data can be compressed, allowing for efficient storage of large amounts of information.
iii. Ease of Transfer: Digital data can be easily shared across devices and networks with minimal loss in quality.

(b) Explain three main ways of describing the function of a combinational logic circuit.

i. Truth Table: Describes the output of the circuit for all possible input combinations.
ii. Boolean Expression: Represents the logical operation of the circuit in algebraic form.
iii. Logic Diagram: Visual representation using logic gates such as AND, OR, and NOT gates to depict the circuit's functionality.

3. (a) Explain the role of each line in the C++ program given below:

```
#include <iostream>
using namespace std;
int main()
{
  cout << "Hello" << "\n";
  return 0;
```

```
}
```

i. #include <iostream>: Includes the library that enables input and output operations.
ii. using namespace std;: Allows the use of standard library functions without explicitly specifying the std:: prefix.
iii. int main(): Defines the main function where program execution begins.
iv. cout << "Hello" << "\n";: Outputs the string "Hello" followed by a newline.
v. return 0;: Indicates successful program termination.

(b) Write a function which does not return a value named “swap_floats” that takes two floating-point arguments and exchanges the values that are stored in those arguments.

```
void swap_floats(float &a, float &b) {
   float temp = a;
   a = b;
   b = temp;
}
```

4. Write an algorithm which enables customers to withdraw cash from an Automatic Teller Machine (ATM). The algorithm inputs a request for a sum of money and decides if withdraw can be made. It also calculates charges for the following conditions:
- Withdraw is refused if amount entered > current balance.
- Withdraw is refused if amount entered > daily limit.
- If current balance < 150000, then a charge of 2% is made.
- If current balance is 150000, no charge is made. Appropriate output messages should be included.

Algorithm:
i. Start
ii. Input current_balance, daily_limit, and amount_requested
iii. If amount_requested > current_balance, print "Withdrawal denied: Insufficient balance" and stop
iv. If amount_requested > daily_limit, print "Withdrawal denied: Exceeds daily limit" and stop
v. If current_balance < 150000, charge = amount_requested × 2/100
vi. Else, charge = 0
vii. New_balance = current_balance - amount_requested - charge
viii. Print "Withdrawal successful, new balance is: ", new_balance
ix. Stop

5. (a) Giving an example of a code, write the function of the List Box control.

The List Box control in programming is used to display a list of items from which the user can select one or more options.

Example:
In Visual Basic:

```
Dim selectedItem As String
selectedItem = ListBox1.SelectedItem
MsgBox("You selected: " & selectedItem)
```

Function: This example shows how to retrieve the selected item from the List Box and display it using a message box.

(b) Write Visual Basic codes that check the validity of a password entered by a user. The program should display appropriate message in a message box after clicking a command button "Confirm." (Hint. Use "12345" as the correct password.)

```
Private Sub Confirm_Click()
   Dim password As String
   password = TextBox1.Text
   If password = "12345" Then
      MsgBox "Access Granted"
   Else
      MsgBox "Invalid Password"
   End If
End Sub
```

6. (a) Differentiate array from linked list.

i. An array is a collection of elements stored in contiguous memory locations, whereas a linked list is a collection of nodes where each node contains data and a pointer to the next node.
ii. Arrays have a fixed size that must be declared during initialization, while linked lists are dynamic and can grow or shrink as needed.
iii. Accessing elements in an array is faster due to direct indexing, while in a linked list, traversal is required to access elements.

(b) Define quick sorting and explain how it is implemented.

Quick sort is a divide-and-conquer algorithm that sorts elements by selecting a pivot and partitioning the array around the pivot such that elements smaller than the pivot come before it and elements greater than the pivot come after it.

Implementation:
i. Select a pivot element from the array.
ii. Partition the array such that all elements less than the pivot are moved to the left and all greater elements to the right.

iii. Recursively apply the above steps to the sub-arrays formed on either side of the pivot until the entire array is sorted.

7. (a) Define the term relational database.

A relational database is a type of database that stores data in tables (relations) with rows and columns. Each table has a unique key, and relationships between tables are established using foreign keys.

(b) An employee database consists of three relations as shown in the next page. Use the relations given to answer the questions that follow.

(b) (i) Write Structured Query Language (SQL) to retrieve Job title, skill code, and department of an employee whose Job Id is PT 79. Write the record(s) of the output.

SQL Query:

```
SELECT JobTitle, SkillCode, Dept
FROM JobRelation
WHERE JobId = 'PT 79';
```

Output:
Job Title: Manager
Skill Code: FM3
Dept: Sales

(ii) Based on Assignment and Job relation, write Structured Query Language (SQL) to retrieve all employees Id along with their corresponding departments.

SQL Query:

```
SELECT AssignmentRelation.EmployeeId, JobRelation.Dept
FROM AssignmentRelation
JOIN JobRelation ON AssignmentRelation.JobId = JobRelation.JobId;
```

Output:

EmployeeId	Dept
23Y34	Personal
34Y70	Sales
25X15	ICT

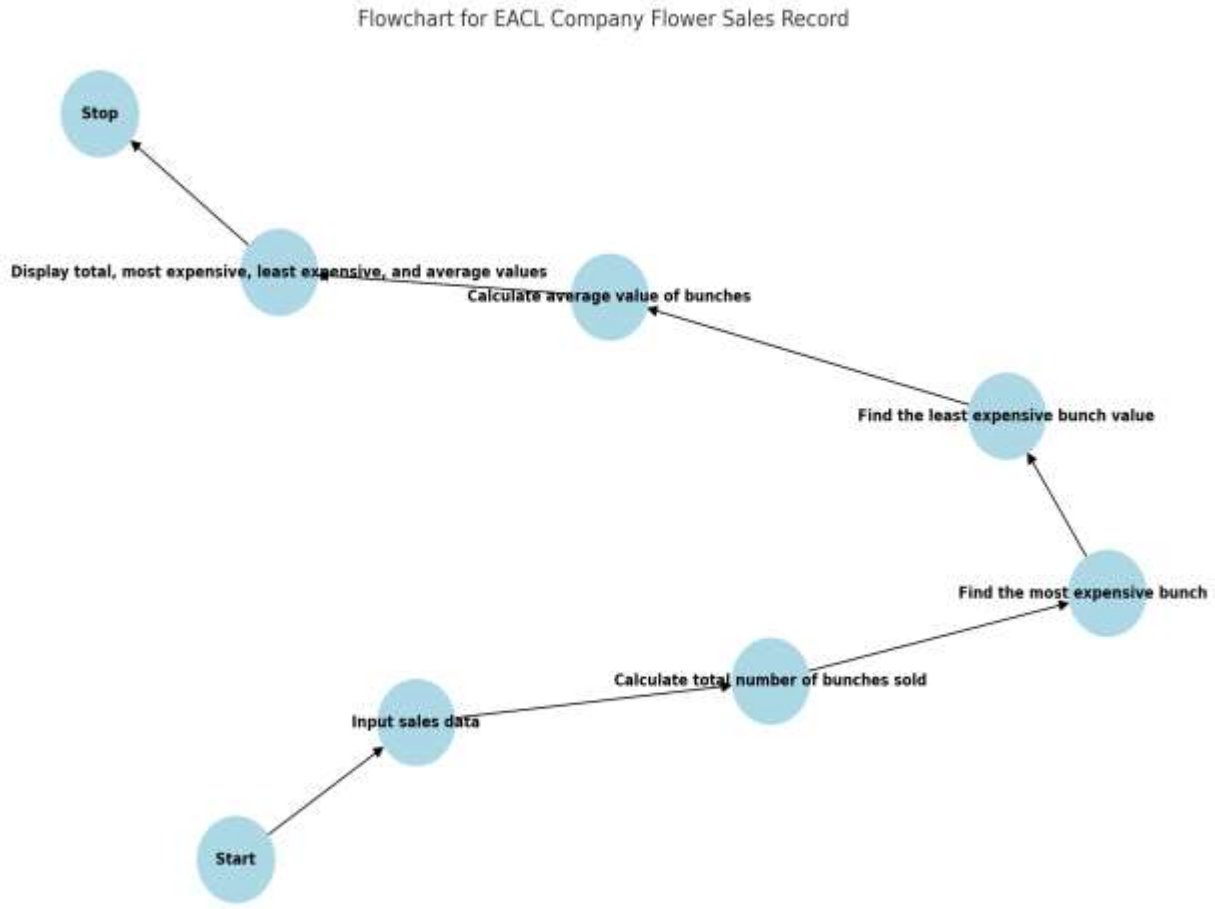
8. By using HTML and JavaScript concepts, write codes which develop HTML form with one input field named “Number” and a submit button called “Process.” The form inputs a value and checks if the entered value is greater than 0. If the value is less than 0, the form displays an alert “Error: provide a number greater than 0.” Then if the 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 Processing</title>
  <script>
    function processNumber() {
      var number = document.getElementById("number").value;
      if (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="number" id="number" name="number">
    <button type="submit">Process</button>
  </form>
</body>
</html>
```

9. EACL company sells bunches of flowers in East Africa. Create a flow chart which enables the company to keep the record of sells for the year 2014. The flow chart should detect the following descriptions:

- Total number of bunches of flowers sold
- The value of the most expensive bunch of flowers sold
- The value of the least expensive bunch of flowers sold
- The average value of bunches of flowers sold in East Africa



10. (a) Explain two responsibilities of a computer engineer.

i. Designing and Developing Systems: Computer engineers design, develop, and test hardware and software systems to meet specific needs.
ii. Troubleshooting and Maintenance: They identify and fix hardware and software issues, ensuring systems operate efficiently and effectively.

(b) Describe two health hazards associated with the use of computers and state the control of each hazard.

i. Eye Strain: Prolonged use of computers can cause discomfort and blurred vision.
Control: Use anti-glare screens, take regular breaks, and ensure proper lighting.

ii. Repetitive Strain Injury (RSI): Continuous typing or mouse use can lead to pain in the hands or wrists.
Control: Use ergonomic keyboards and mice and maintain a proper posture.

11. Explain five roles of each basic element of a computer system.

A computer system consists of five basic elements: hardware, software, data, users, and network. Their roles are:

i. Hardware: Physical components like the CPU, RAM, and storage devices that execute instructions and store data. Hardware performs processing, storage, and input/output functions.

ii. Software: Programs and operating systems that enable the hardware to perform specific tasks. Software acts as a bridge between the user and the hardware, allowing the execution of applications.

iii. Data: The raw input that the computer processes into meaningful information. Data serves as the basis for computations, storage, and analysis.

iv. Users: Individuals who interact with the computer system. Users provide input, make decisions based on the output, and manage system operations.

v. Network: Enables communication between multiple computer systems, facilitating data sharing, resource access, and connectivity.

12. Describe six networking devices used in data communication.

i. Router: Connects different networks and routes data packets between them. It ensures efficient data delivery and internet access.

ii. Switch: Operates at the data link layer to connect devices within a local area network (LAN) and manages data flow between them.

iii. Hub: A basic networking device that connects multiple devices in a LAN. It broadcasts data to all connected devices, regardless of the destination.

iv. Access Point: Provides wireless connectivity to devices in a network, extending the range of a wired network.

v. Firewall: A security device that monitors and controls incoming and outgoing network traffic based on predefined rules to protect against threats.

vi. Modem: Converts digital data into analog signals for transmission over telephone lines and vice versa, enabling internet access.

13. Explain three advantages and three disadvantages of high-level programming languages.

Advantages:

i. Ease of Use: High-level languages use syntax that is closer to human language, making them easier to learn and use compared to low-level languages.
ii. Portability: Programs written in high-level languages can be easily transferred across different platforms with minimal changes.
iii. Efficiency in Development: High-level languages provide built-in libraries and abstractions, reducing the time and effort required for coding.

Disadvantages:
i. Slower Execution: Programs written in high-level languages are slower because they require interpretation or compilation before execution.
ii. Less Control Over Hardware: High-level languages abstract hardware details, limiting the programmer's control over system resources.
iii. Dependency on Compilers/Interpreters: High-level languages rely on compilers or interpreters for execution, which adds complexity and can introduce bugs.