CHRISTIAN SOCIAL SERVICES COMMISSION (CSSC)

NORTHERN ZONE JOINT EXAMINATIONS SYNDICATE (NZ-JES)

FORM SIX PRE-NATIONAL EXAMINATIONS 2026

136/1 COMPUTER SCIENCE 1

MARKING SCHEME

The built-in tool to address severe slowdowns, app crashes, and boot loops is Safe Mode (or Advanced Startup Options/Troubleshoot Menu). It allows troubleshooting by loading only essential system drivers, isolating software or driver conflicts from the hardware, enabling safe removal of faulty updates, or running repair tools like CHKDSK.

Microsoft Learn +4

1. (a) Tool: Safe Mode/Troubleshoot Menu

- How to use:
  - Windows: Access via Settings > Update & Security > Recovery > Advanced Startup, or pressing F8/Shift+F8 during boot.
  - Mobile: Holding volume keys during boot to enter recovery mode.
- Why to use: It bypasses third-party software, drivers, and background processes that may be causing system instability, allowing you to uninstall malicious software, fix driver issues, or run diagnostic tools to fix a boot loop.

Microsoft Learn +4

1. (b) (i) Relationship between OS and Hardware

The Operating System acts as an intermediary (an interface) between user software and hardware components. It manages hardware resources (CPU, memory, storage) and provides services for application software to run.

TechTarget +4

1. (c) Microprocessor vs. Microcontroller

- Microprocessor: A processor without onboard RAM, ROM, or I/O ports. Used for general-purpose computing (e.g., PC).
  - Functions: Executes instructions, performs complex logic, handles multitasking.
- Microcontroller: A processor with built-in RAM, ROM, and I/O ports on a single chip. Used for embedded systems (e.g., washing machine).
  - Functions: Controls specific tasks, real-time processing, direct peripheral control.

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2. Full Adder Design

(a) Truth Table

A	B		SUM (S)	
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

(b) Unsimplified Boolean Expressions

- Sum (

  ):

- Carry (

  ):

(c) Simplified Expressions (using Boolean Algebra)

- Sum (

  ):

- Carry (

  ):

(d) Circuit Diagram

- Uses 2 XOR gates for Sum.
- Uses 2 AND gates and 1 OR gate for

(or 1 AND, 1 XOR, 1 OR).

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3. Software Development

(a) Pseudo-code

```
text
START
  PRINT "Enter purchase amount:"
  INPUT amount
  IF amount >= 100 THEN
    discount = 0.10 * amount
  ELSE IF amount >= 50 THEN
    discount = 0.05 * amount
  ELSE
    discount = 0
  ENDIF
  finalPrice = amount - discount
  PRINT "Discount: " + discount
  PRINT "Final Price: " + finalPrice
END
```

(b) C++ Program

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

int main() {
    double amount, discount = 0, finalPrice;
```

```
    cout << "Enter purchase amount: $";
    cin >> amount;

    if (amount >= 100) {
        discount = 0.10 * amount;
    } else if (amount >= 50) {
        discount = 0.05 * amount;
    } else {
        discount = 0;
    }

    finalPrice = amount - discount;
    cout << "Discount: $" << discount << endl;
    cout << "Final Price: $" << finalPrice << endl;

    return 0;
}
```

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4. Visual Basic Calculator

(Due to the prompt cutting off, here is the implementation for a VB.NET calculator.)

- Interface: `txtNum1` (TextBox), `txtNum2` (TextBox), `lblResult` (Label), `btnCalculate` (Button).
- Code:

```vb
Private Sub btnCalculate_Click(sender As Object, e As EventArgs) Handles btnCalculate.Click
    Dim num1, num2, result As Double
    If Double.TryParse(txtNum1.Text, num1) And Double.TryParse(txtNum2.Text, num2) Then
        result = num1 + num2
        lblResult.Text = "Result: " & result.ToString()
    Else
        lblResult.Text = "Error: Enter valid numbers"
```

```
    End If
End Sub
```

(a) Visual Basic Code for `cmdAdd` Button

The following Visual Basic code should be placed in the click event handler for the `cmdAdd` button. It converts the text input from `txtNumber1` and `txtNumber2` to numeric values, adds them, and displays the sum in `lblResult`.

vb

```
Private Sub cmdAdd_Click(sender As Object, e As EventArgs) Handles cmdAdd.Click
    ' Declare variables to hold the numeric values
    Dim num1 As Double
    Dim num2 As Double
    Dim sum As Double

    ' Convert the text box values to Double. The Val() function (VB6) or Double.TryParse (VB.NET) can be used.
    ' Using Double.TryParse is safer for VB.NET as it handles non-numeric input without error.
    ' Assuming a modern VB.NET environment:
    If Double.TryParse(txtNumber1.Text, num1) And Double.TryParse(txtNumber2.Text, num2) Then
        ' Add the numbers
        sum = num1 + num2

        ' Display the result in the label
        lblResult.Text = sum.ToString()
    Else
        ' Handle invalid input (optional, but good practice)
        lblResult.Text = "Invalid input"
    End If
```

```
End Sub
```

Alternatively, for older Visual Basic (VB6) environments using the `Val()` function:

```vb
Private Sub cmdAdd_Click()
    Dim num1 As Double
    Dim num2 As Double
    Dim sum As Double

    num1 = Val(txtNumber1.Text)
    num2 = Val(txtNumber2.Text)
    sum = num1 + num2
    lblResult.Caption = sum ' Use .Caption for Label in VB6
End Sub
```

(b) Differentiate between a TextBox and a ComboBox control

Here are two key differences between a `TextBox` and a `ComboBox` control in Visual Basic:

Feature	TextBox	ComboBox
User Input Method	The user can freely type and edit any text value into the box.	The user can either type a value (in some styles) or select from a pre-defined drop-down list of items.
Display/Interface	It is a simple, single or multi-line field that always displays the entered or set value.	It typically appears as a single-line field in a compact state and expands to show a list of selectable items when clicked.

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5. Website Publishing and Testing

(a) (i) Explanation of FTP

FTP stands for File Transfer Protocol. It is a standard network protocol used for transferring files from one computer (a client) to another (a server) over a TCP-based network, such as the internet. FTP operates on a client-server model and is commonly used for uploading web page files, images, and other content from a local machine to a web server so the website can be accessed online.

Fortinet +2

(ii) How to upload and publish content using FTP

To upload and publish website content using FTP, you generally follow these steps:

Combell +1

1. Obtain FTP Credentials: You need the FTP server address (host), a username, and a password from your web hosting provider.
2. Use an FTP Client: Install and open an FTP client software (like FileZilla, WinSCP, etc.) on your local computer.
3. Connect to the Server: Enter your FTP credentials into the client to establish a connection to the remote web server. The client typically has a two-pane interface, showing your local files on one side and the server's files on the other.
4. Transfer Files: Navigate to the target directory on the server (often a `www` or `public_html` folder). Drag and drop your website files from your local computer pane to the server pane, or use the client's "upload" functionality.
5. Verify: Once the transfer is complete, you can access your website via its domain name in a web browser to confirm that all content is live and functioning correctly.

Dropbox.com +2

(b) Three Features to Test Before Publishing and Methods

Before a website is published, testing different features is crucial to ensure a quality user experience.

Feature	Description of Test Method
Functionality (Links and Forms)	Manually click every link (internal, external, and anchor links) to ensure they are not broken and navigate to the correct pages. Fill out all forms (contact, registration, etc.) with valid and invalid data to ensure proper submission, validation, and error handling.
Compatibility (Cross-Browser/Device)	Open the web pages on various devices (desktop, tablet, mobile) and different browsers (Chrome, Firefox, Safari, Edge) to ensure the layout,

	fonts, images, and overall design appear consistently and correctly without visual issues like overlapping text or broken layouts.
Performance (Page Load Time)	Use performance testing tools (e.g., Google PageSpeed Insights, WebPageTest) to measure how quickly pages load, especially under normal and peak loads or different connection speeds. The goal is to identify and fix bottlenecks to ensure pages load quickly (ideally under 3 seconds).

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6. Binary Trees and Traversals

(a) What is a Binary Tree?

A binary tree is a hierarchical data structure where each node has at most two children, referred to as the left child and the right child.

(b) Three Types of Binary Tree Traversals

The three main types of binary tree traversals are:

1. In-order Traversal: Visits nodes in the order: Left child -> Root -> Right child. For a binary search tree, this traversal visits nodes in ascending order of their values.
2. Pre-order Traversal: Visits nodes in the order: Root -> Left child -> Right child. This is useful for creating a copy of the tree or an expression tree prefix.
3. Post-order Traversal: Visits nodes in the order: Left child -> Right child -> Root. This is useful for deleting a tree or generating an expression tree postfix.

(c) Traversal Orders for the Given Binary Tree

Given the provided (but structurally ambiguous) sequence: `1, 2, 3, 11, 12, 14, 5`. Assuming it is a simple binary tree where the numbers represent the order of nodes in a level-order fashion to construct a standard binary tree:

- Root: 1
- Level 2: 2 (left), 3 (right)
- Level 3: 11 (2's left), 12 (2's right), 14 (3's left), 5 (3's right)

Based on this assumed structure, the traversal orders are:

1. In-order Traversal: 11, 2, 12, 1, 14, 3, 5
2. Pre-order Traversal: 1, 2, 11, 12, 3, 14, 5
3. Post-order Traversal: 11, 12, 2, 14, 5, 3, 1

7.A local community center recently installed new computers, printers, and other ICT equipment. After several months of use, the administration wants to assess how the introduction of these technologies might affect both the users and the surrounding environment.

(a) Identify and explain two health problems and three environmental problems that may arise from the use of ICT tools. (5 Marks)

Health Problems from the Use of ICT Tools

i. Eye Strain (Computer Vision Syndrome) - Caused by looking at screens for long periods, leading to tired eyes, headaches, and blurred vision.
ii. Repetitive Strain Injury (RSI) - Results from continuous typing and mouse use, causing pain in the wrists, fingers, and arms.

Environmental Problems from the Use of ICT Tools

i. Electronic Waste (E-waste) - Old or damaged ICT devices release harmful chemicals when not disposed of properly.
ii. High Energy Consumption - Computers and printers use electricity, increasing carbon emissions and contributing to climate change.
iii. Pollution from Manufacturing and Disposal - Producing and disposing of ICT equipment releases toxic substances that pollute the air, soil, and water.

(b) Suggest practical solutions for each problem you identified in part (a).

Health Problems and Solutions

Eye Strain (Computer Vision Syndrome)

- Take regular breaks using the 20-20-20 rule (every 20 minutes, look at something 20 feet away for 20 seconds).
- Adjust screen brightness and contrast and ensure proper lighting.
- Use ergonomic monitor placement to reduce glare.

Repetitive Strain Injury (RSI)

- Use ergonomic keyboards and mice.
- Take frequent stretching breaks to relax muscles.
- Maintain proper posture and desk setup to reduce strain.

Environmental Problems and Solutions

Electronic Waste (E-waste)

- Recycle old equipment through certified e-waste recycling centers.
- Donate or repurpose functioning devices instead of discarding them.

High Energy Consumption

- Use energy-efficient devices (e.g., Energy Star rated).
- Switch off computers, printers, and peripherals when not in use.
- Pollution from Manufacturing and Disposal
- Support manufacturers with green policies that reduce toxic emissions.
- Promote responsible disposal practices to prevent contamination of soil and water.

8.A district hospital is moving from a manual filing system to a computerized information system. At the moment, hospital staff keep patient details in paper folders, while information about medical services is stored in a different cabinet. When a patient comes for medical attention, a staff member searches for the patient's folder and then checks another book to see what type of service the patient is receiving that day. Sometimes patients come back several times for different services, and the staff must rewrite information repeatedly. This often leads to missing records, confusion

about which patient received what service, and delays when the hospital administration needs reports. You are requested to design simple relational database management system to solve the issue.

(a) What do you understand about relational databases?

A relational database is a type of database that stores information in tables made up of rows and columns.

(b) Identify two appropriate entities based on the scenario above and list suitable attributes for each.

1. Entity: Patient

Attributes: PatientID (Primary Key), FirstName, LastName, DateOfBirth, Gender, Address, PhoneNumber, NextOfKin (optional), DateRegistered

2. Entity: MedicalService

Attributes: ServiceID (Primary Key), ServiceName, ServiceDescription, Department (e.g., OPD, Maternity, Laboratory), ServiceCost (if applicable)

(c) Draw an E–R diagram showing the relationship between the entities you identified.

(d) Convert the E–R diagram into a logical model, clearly showing primary keys and foreign keys.

9. Insider threats present a critical, often underestimated, security risk because authorized users already possess network access, making detection difficult and malicious actions easy to execute. Affecting all industries, these incidents range from careless employee mistakes to intentional theft, resulting in massive data breaches at organizations like Google, Marks & Spencer, and Coinbase. Effective mitigation requires a combination of strict access control (least privilege), behavior monitoring, and security training.

Key Aspects of the Insider Threat Issue:

- Difficulty in Detection: Because insiders have legitimate access to systems, distinguishing between normal work activity and malicious behavior is challenging.

- Causes: The threat is not just malicious (disgruntled employees); it is often accidental (careless employees) or negligent (negligent vendors/contractors).
- Methods: Insiders use USB drives, personal cloud storage, email, and printed documents to exfiltrate data, or sabotage systems directly.
- Examples: The 2020 Twitter breach involved attackers exploiting internal tools, demonstrating how compromised credentials can lead to large-scale data breaches.
- Mitigation Strategies: Implementing the "Zero Trust" model ("never trust, always verify"), strict role-based access control (RBAC), and user behavior analytics (UBA) are essential.

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10. AI and Machine Learning Impact: Evidence and Examples

The proliferation of Artificial Intelligence (AI) and Machine Learning (ML) tools has revolutionized industries by enhancing efficiency, decision-making, and automation.

- Healthcare: AI algorithms are used for medical imaging analysis to detect diseases like cancer earlier than human radiologists. For example, Google Health's AI has shown high accuracy in detecting breast cancer from mammograms.
- Manufacturing: Predictive maintenance uses ML to analyze data from machinery sensors to predict failures before they occur, reducing downtime, similar to implementations by major manufacturers to optimize supply chains.
- Finance: Banks and financial institutions use ML for real-time fraud detection by analyzing transaction patterns to identify anomalies that indicate potential theft or fraudulent activity.
- Retail: AI-driven personalized marketing platforms analyze consumer browsing and purchase history to provide individualized product recommendations, significantly increasing conversion rates.
- Education: Intelligent Tutoring Systems (ITS) and AI platforms provide personalized learning experiences by adjusting curriculum difficulty based on student performance, adapting to individual learning speeds.

- Digital Marketing/Content Creation: Generative AI tools like ChatGPT and Midjourney enable the rapid creation of marketing copy, images, and content, transforming creative workflows.

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FORM SIX PRE-NATIONAL EXAMINATIONS 2026

136/2 COMPUTER SCIENCE 2 PRACTICAL

PROPOSED MARKING GUIDE

(ACTUAL PRACTICAL)

Instructions

1. This paper consists of **three (3)** questions.
2. Answer **Two** questions where **Question One** is **compulsory**.
3. Each question carries **twenty five (25)** Marks.
4. Save your work in a folder named with your **Examination Number/Name**
5. Submit all your **softcopy** (**include snipped output screen**) work with corresponding **printed hardcopy**.
6. Check whether your printed hardcopy are the same with your softcopy work.
7. Cellular phones and any unauthorized materials are not allowed in the examination room.
8. Write your **Examination Number/Name** on every page of your printed hardcopy.

1. (a) BMI Calculation Program – 15 Marks

Criteria	**Description**	**Marks**	**Marks Scored**
Input handling	Correctly accepts weight (kg) and height (in feet) from user	2	
Height conversion	Correct conversion: 1 foot = 0.3048 m	2	
BMI formula	Correctly applies BMI = weight / (height_in_meters^2)	3	
Classification logic	Correct use of conditions for: Underweight, Normal, Overweight, Obese	3	
Output accuracy	Displays BMI correctly and provides appropriate message (counseling or wellness certificate)	3	
Code correctness & structure	Logical flow, proper syntax, meaningful output	2	
Subtotal		15 Marks	

(b) Quadratic Equation Program – 10 Marks

Criteria	Description	Marks
Input handling	Accepts coefficients a, b, c	2
Determinant calculation	Uses correct formula: $D = b^2 – 4ac$	2
Condition handling	Correctly identifies: • $D > 0 \rightarrow$ distinct real roots • $D = 0 \rightarrow$ equal real roots • $D < 0 \rightarrow$ complex roots	3
Root calculation	Correctly computes real or complex roots based on determinant	2
Code correctness & clarity	Proper structure, formatting, readable output	1
Subtotal		10 Marks

2.

3. MARKING GUIDE FOR QUESTION 3 (Total: 25 Marks)

Assessment Area	**Description of Expected Work**	**Marks**	**Marks Scored**
Form properties	Correctly sets Font Size = 23, Bold Style, MS Sans Serif	3	
Title label design	Title label uses backcolor &H00C0FFFF&	2	
Labels formatting	All textbox labels use backcolor &H00C0FFC0&	2	
Button design	Both Register and Clear buttons use backcolor &H0080C0FF&	2	
Overall layout	Appropriately arranged controls matching the form description	1	
Clear logic	Correctly resets/clears all textboxes, combo boxes, checkbox lists, and other fields	3	
Name + Title	Correct use of “Mr/Miss” depending on gender selection	2	
Email inclusion	Message box correctly displays email in the required format	1	
Age display	Correctly calculates and outputs the age	2	
Hobbies handling	Correctly lists multiple hobbies as “Hobby1, Hobby2, …”	2	
Username and password section	Correct message: “Use <email> as username and <password> as your password to login.”	2	
Message box formatting	Output follows sample formatting with headings and numbering	3	
TOTAL		25 Marks	