

2025 CSSA Trial - Software Engineering Answers & Marking Criteria

Question 1: Progressive Web Apps

Answer: A web app that uses modern web capabilities to deliver an app-like experience.

Marking Criteria: None provided.

Question 2: Logistic Regression

Answer: Logistic

Marking Criteria: None provided.

Question 3: Software Development Life Cycle

Answer: Requirements definition

Marking Criteria: None provided.

Question 4: Social and Ethical Use of Data

Answer: Confidentiality

Marking Criteria: None provided.

Question 5: Cross-site Scripting

Answer: Cross-Site Scripting (XSS)

Marking Criteria: None provided.

Question 6: AI vs ML

Answer: AI focuses on building systems that simulate human intelligence, while ML focuses on enabling machines to learn from data.

Marking Criteria: None provided.

Question 7: Artificial Neural Networks

Answer: The correct order of the layers is:

- Original data features for the network are processed.
- Transforms and processes data through weighted connections and activation functions.
- Predictions are based on the input data and hidden layer transformations.

Marking Criteria: None provided.

Question 8: Client-side Programming

Answer: It interacts with the user interface on the browser.

Marking Criteria: None provided.

Question 9: Legal and Ethical Issues

Answer: Meeting data privacy regulations.

Marking Criteria: None provided.

Question 10: Algorithms used in Neural Networks

Answer: Neural networks

Marking Criteria: None provided.

Question 11: Installation Methods

Answer: Direct cut over

Marking Criteria: None provided.

Question 12: Secure Design Features

Answer: Less experienced users may require security features that are automated and simple to use.

Marking Criteria: None provided.

Question 13: HTTPS/SSL Encryption

Answer: The correct order of the steps is:

1. The client initiates a connection request to the server by requesting an HTTPS connection.
2. The server sends its SSL certificate to the client, which contains the server's public key and is verified by a trusted Certificate Authority (CA).
3. The client and server agree on a shared encryption key, which will be used to encrypt data during the session.
4. The client and server use the encryption key to securely exchange data over the HTTPS connection.

Marking Criteria:

Marks	Criterion
2	Correctly orders the HTTPS/SSL encryption process.
1	Correctly orders at least 2 steps.

Question 14: Design Approaches

Sample Answer: The 'security by design' approach integrates security measures throughout the software development process to protect against external threats like unauthorised access and data breaches. In contrast, 'privacy by design' ensures that user privacy is embedded into the design, focusing on minimising data collection, ensuring user control, and complying with privacy laws. While both aim to protect data, security by design is about preventing attacks, whereas privacy by design focuses on respecting users' privacy rights.

Marking Criteria:

Marks	Criterion
3	Demonstrates a good understanding of both approaches and explains the differences.
2	Demonstrates a good understanding of both approaches.
1	Demonstrates some understanding of either approach.

Question 15(a): Security Concepts

Sample Answer:

- **Authorisation:** Implementing role-based access control would allow the manager to restrict certain functions, such as deleting transactions, to specific employees. This would limit access and reduce the likelihood of unauthorized transaction deletions.
- **Accountability:** Enabling audit logging within the system would allow the manager to track all actions taken by employees, including transaction dele-

tions. This would provide a record of who performed specific actions and when, aiding in accountability.

Marking Criteria:

Marks	Criterion
2	Provides a clear and detailed explanation of how a vulnerability assessment could manage the security of the system with reference to the scenario covering identification, evaluation, and action steps.
1	Outlines one relevant security concept or identifies two concepts with partial or unclear explanations.

Question 15(b): Vulnerability Assessment

Sample Answer: A vulnerability assessment would help the café identify security weaknesses in the POS system by analysing its software, network, and user access settings. The assessment would evaluate potential risks, such as the lack of access controls or insufficient logging mechanisms. Based on the findings, the café could then implement changes, such as restricting access to sensitive functions and improving system monitoring, to prevent unauthorised actions and protect against future security threats.

Marking Criteria:

Marks	Criterion
3	Provides a clear and detailed explanation of how a vulnerability assessment could manage the security of the system with reference to the scenario covering identification, evaluation, and action steps.
2	Describes the role of a vulnerability assessment with some detail.
1	Provides a basic description of a vulnerability assessment.

Question 16: Use of OOP

Sample Answer: OOP enhances automation by organising code into reusable classes and methods, which improves structure and maintainability. For example, each ML model (e.g., linear regression, neural network) can be represented as a class with specific methods for training, predicting, and updating. This modular approach allows developers to automate tasks like data processing, training, and deploying models without rewriting code, making it easier to manage, extend, and debug. OOP also allows different model classes to inherit properties,

reducing redundancy and ensuring consistency across models.

Marking Criteria:

Marks	Criterion
3	Explains OOP approach.
2	Outlines OOP approach.
1	Provides some relevant information.

Question 17(a): Web Protocols

Answer:

Action	HTTP	TCP/IP	SFTP
Sending confirmation email for a created account	✓	✓	
Sending private customer data between internal servers		✓	✓
Accessing the store's website	✓	✓	

Marking Criteria:

Marks	Criterion
2	Correctly selects all protocols.
1	Correctly selects ONE row of protocols.

Question 17(b): Back-end and Front-end Collaboration

Sample Answer: Front-end Developers could meet with back-end developers to make sure that the interface they design for a product matches the data stored in the back-end server.

Marking Criteria:

Marks	Criterion
2	Outlines ONE collaborative practice back-end and front-end developers would need to engage to develop this website.
1	Shows an understanding of collaboration OR front-end/back-end developers.

Question 17(c): Use of CSS

Sample Answer: CSS or Cascading Style Sheets, allow developers to store the style of html tags in a single file. To display multiple shopping items, over multiple pages, it is important that each item is displayed in a consistent manner no matter the search query results. Therefore, CSS would allow for the same style

to be applied to all pages of the website, for example how a division aligns an image and text of a product so that the user can quickly identify the items they are trying to search for on each page.

Marking Criteria:

Marks	Criterion
3	Demonstrates a clear understanding of CSS and clearly explains effect of using CSS in this application.
2	Demonstrates a clear understanding of CSS OR describes effect of using CSS in this application.
1	Shows an understanding of CSS.

Question 18(a): Decision Tree

Sample Answer: The logical flow is:

- The first condition checks if the day is a "Public Holiday".
- If Yes, the result is No Discount.
- If No, the next condition checks if the customer has a "Loyalty Card or is a Student".
- If Yes, the result is Discount.
- If No, the result is No Discount.

Marking Criteria:

Marks	Criterion
2	Constructs a substantially correct decision tree.
1	Constructs a partially correct decision tree.

Question 18(b): Algorithm

Sample Answer:

BEGIN

 GET loyalty_card

 GET student

 GET day

 SET Discount = NO

 IF loyalty_card = True OR student = True THEN

 IF day = Public Holiday THEN

 Discount = No

 ELSE

 Discount = Yes

```

        ENDIF
    ENDIF

    IF Discount = Yes THEN
        DISPLAY "Customer can have a half priced burger"
    ELSE
        DISPLAY "Customer must pay full price"
    ENDIF
END

```

Marking Criteria:

Marks	Criterion
4	Provides a substantially correct algorithm including the following features: Appropriate inputs; Use of control structures to complete checks; Use of meaningful outputs.
3	Provides a partially correct algorithm that addresses most features above.
2	Provides a partially correct algorithm that addresses some features above.
1	Attempts an algorithm relating to the scenario.

Question 19(a): SQL Query

Sample Answer:

```

SELECT Username, Rating
FROM Customers
WHERE Rating >= 90.0;

```

Marking Criteria:

Marks	Criterion
1	Constructs an SQL query that satisfies the requirements of the question.

Question 19(b): SQL and ORM

Sample Answer: SQL allows a database to be constructed as a table with fields, and related SQL query syntax to interact with the data. This provides a very structured way to organise the data, which is easily queried with simple statements, although a developer may have to learn the syntax of these queries and learn a library that connects to an SQL database within in python. This could create a learning curve that impacts time of production as the SQL syntax is not native to the python programming language.

ORM allows the developer to use an object-oriented model to interact with a database stored on a server. This is more in line with the python language as it can utilise the python syntax for object-oriented coding, with ORM commands being available in the python standard library, as well as many python web server libraries that have their own libraries. Unfortunately, there may be performance issues when implementing ORM, as requests need to be made over a server which can impact load times, and ORM typically being slower when dealing with complex queries.

Marking Criteria:

Marks	Criterion
4	Provides advantages AND disadvantages of ORM AND SQL to address the scenario.
3	Provides advantages OR disadvantages of ORM AND SQL to address the scenario.
2	Describes ORM OR SQL.
1	Shows an understanding of ORM OR SQL.

Question 20(a): Data Types

Sample Answer: An integer would be used for the total number of tickets purchased. A float could be used for the cost of a ticket. A string could be used for the text to display the total cost with dollar symbols.

Marking Criteria:

Marks	Criterion
3	Provides clear reasoning for THREE data types related to the scenario.
2	Provides reasoning for TWO data types OR states THREE data types related to the scenario.
1	Provides reasoning for ONE data type OR states TWO data types.

Question 20(b): Algorithm for a Function

Sample Answer:

```

BEGIN Main
    GET NumberofTickets
    GET TicketType
    Total = TotalCost(NumberofTickets, TicketType)
    DISPLAY "The total cost of the tickets: $" & Total
END Main

```



```

BEGIN TotalCost(NumberofTickets, TicketType)
  IF TicketType = "GA" THEN
    Total = NumberofTickets * 100
  ELSE
    Total = NumberofTickets * 150
  ENDIF
  RETURN Total
END TotalCost

```

Marking Criteria:

Marks	Criterion
4	Provides a substantially correct algorithm including the following features: Appropriate input data; Use of functions to calculate cost, that pass in parameters; Meaningful outputs.
3	Provides a partially correct algorithm that addresses most features above.
2	Provides a partially correct algorithm that addresses some features above.
1	Attempts an algorithm relating to the scenario.

Question 21(a): Linear vs Polynomial Regression

Sample Answer: Linear regression models the relationship between variables as a straight line, assuming a linear relationship. Polynomial regression, however, fits a curved line by adding polynomial terms, which can capture more complex, nonlinear relationships between variables. For instance, polynomial regression would be more suitable for predicting sales that show seasonal or cyclical patterns, where a linear model would fail to capture the natural peaks and troughs over time.

Marking Criteria:

Marks	Criterion
3	Describes some differences between linear and polynomial regression AND includes an example.
2	Identifies differences OR Outlines one difference between linear and polynomial regression OR provides an example.
1	Provides some relevant information.

Question 21(b): Interactive Web Components

Sample Answer: Client side or front-end development would be required to collect the order from the user. This would involve creating a web page with inputs. These inputs could be dropdown menus, text entry for each product that is sold so that user can select what they want to order, typically written in html and JavaScript to interact and collect the user's choices.

Once collected, server side or back-end development would be required to process this order. This would be implemented on the server of Nicksales, and the code implemented would process the inputs of the sale, assign it to the customer account, calculate the costs of the sale, and requires the transaction to an external financial service. This is typically implemented with server-side code libraries like Flask.

The developer would also need to interact their system with a database. The sales for an order or the data about each customer account could be constructed in separate SQL tables, which would allow easy interaction for each system (front and back end) to retrieve the required data to process or collect a sale.

Marking Criteria:

Marks	Criterion
3	Designs models that address all of the components of: User ordering their items; Website processing the order; Updating the stock inventory/database.
2	Designs models that address TWO of the components.
1	Designs a model that addresses a relevant component of the scenario.

Question 22(a): Modelling Tools

Answer: Structure chart

Marking Criteria:

Marks	Criterion
1	Correctly selects the Modelling Tool.

Question 22(b): Create Python Function

Sample Answer:

```
def HoursAndMinutes(TotalMinutes):  
    hour = TotalMinutes // 60  
    minute = TotalMinutes % 60  
    if hour < 1 and minute < 2:  
        print("It has been converted to: ", minute, " minute.")  
    elif hour < 2 and minute < 1:
```

```

        print("It has been converted to: ", hour, " hour.")
    elif hour < 2 and minute > 1:
        print("It has been converted to: ", hour, " hour & ", minute, " m")
    elif hour > 1 and minute < 2:
        print("It has been converted to: ", hour, " hours & ", minute, " m")
    elif hour < 2 and minute < 2:
        print("It has been converted to: ", hour, " hour & ", minute, " m")
    else:
        print("It has been converted to: ", hour, " hours & ", minute, " m")

```

```

TotalMinutes = int(input("Please enter minutes that you wish to convert to hours: "))
HoursAndMinutes(TotalMinutes)

```

Marking Criteria:

Marks	Criterion
4	Provides a substantially correct solution including all the following features: Appropriate inputs passed to the function; Use of function to perform appropriate calculations; Appropriate outputs; Correct python syntax.
3	Provides a solution that shows understanding of most of the above features.
2	Provides a solution that shows understanding of some features.
1	Shows some understanding of the requirement.

Question 23: Stages of MLOps

Sample Answer:

- **Design:**
 - Defining the business problem to be solved
 - Refactoring the business problem into a machine learning problem
 - Defining success metrics
 - Researching available data
- **Model Development:**
 - Data wrangling
 - Feature engineering
 - Model training
 - Model testing and validation

- **Operations:**
 - Model deployment
 - Supporting operations/use
 - Monitoring model performance

Marking Criteria:

Marks	Criterion
4	Provides a thorough explanation of the use of the 3 areas Design, Model Development and Operation relating to the scenario.
3	Provides a sound explanation of the use of the 3 areas Design, Model Development and Operation relating to the scenario.
2	Shows some understanding of most of the areas.
1	Provides some relevant information.

Question 24: Create Python Program

Sample Answer:

```
def initialize_seating():
    """
    Initialize the seating arrangements for both classes with the
    given "starting "point occupancy.
    """
    # Business Class: rows -AE, seats -18
    business_class = [
        # A      1      2      3      4      5      6      7      8
        [ True, True, True, True, False, False, False, False ],
    # A
        [ True, True, True, True, True, False, False, False ],
    # B
        [ True, True, True, True, True, True, True, False ],
    # C
        [ False, False, False, False, False, False, False, False ],
    # D
        [ False, False, False, False, False, False, False, False ],
    # E
    ]

    # Economy Class: rows -FT, seats -110
    economy_class = [
```

```

# F      1      2      3      4      5      6      7      8
9      10
    [ True, True, True, True, False, False, True, True, False, False]
# F
    [ True, True, True, True, True, False, False, False, False, False]
# G
    [ True, True, True, True, True, True, True, False, False, False]
# H
    ] + [[False]*10 for _ in range(12)] # rows -IT, all seats available

return business_class, economy_class

def display_seating(seating, class_type):
    """
    Print the seating chart for the given class.
    X = occupied, O = available
    """
    print(f"\n{class_type} Class Seating Chart (X = occupied, O = available)")
    for row in seating:
        print(" ".join("X" if seat else "O" for seat in row))
    print()

def allocate_seats(seating, tickets):
    """
    Try to allocate 'tickets' seats in 'seating'.
    Returns a list of (row_index, col_index) or None if allocation fails.
    """
    rows, cols = len(seating), len(seating[0])

    if tickets == 1:
        # single ticket -> first available seat
        for i in range(rows):
            for j in range(cols):
                if not seating[i][j]:
                    seating[i][j] = True
                    return [(i, j)]
    else:
        # multiple tickets -> look for adjacent seats
        for i in range(rows):
            for j in range(cols - tickets + 1):
                if all(not seating[i][j+k] for k in range(tickets)):
                    for k in range(tickets):
                        seating[i][j+k] = True
                    return [(i, j+k) for k in range(tickets)]

    return None

```

```

def main():
    business_class, economy_class = initialize_seating()

    # select class
    cls = input("Enter class (Business/Economy): ").strip().lower()
    if cls not in ('business', 'economy'):
        print("Invalid class. Exiting.")
        return

    seating = business_class if cls == 'business' else economy_class
    class_name = "Business" if cls == 'business' else "Economy"

    # select ticket count
    try:
        t = int(input("Enter number of tickets -(14): "))
    except ValueError:
        print("Not a number. Exiting.")
        return
    if not (1 <= t <= 4):
        print("Ticket count must be between 1 and 4. Exiting.")
        return

    # allocate and display updated chart
    result = allocate_seats(seating, t)
    if result is None:
        print("Cannot find seats together. Booking restarted.")
    else:
        # map row indices back to letters for output
        row_letters = (
            ['A', 'B', 'C', 'D', 'E'] if cls == 'business'
            else [chr(ord('F')+i) for i in range(15)]
        )
        seats_str = ", ".join(
            f"{row_letters[i]}{j+1}" for i, j in result
        )
        print(f"\nAllocated seats: {seats_str}")

    display_seating(seating, class_name)

if __name__ == "__main__":
    main()

```

Marking Criteria:

Marks	Criterion
6	Provides a substantially correct solution including all of the following features: accepts input; searches the array for appropriate seats; updates the array; displays allocated seats; provides suitable messages.
5	Provides a solution that addresses most of the requirements.
4	Provides a solution that addresses some of the requirements.
3	Provides a solution that addresses an aspect of the requirements.
2	Attempts a solution of the requirements.
1	Shows some understanding of the requirements.

Question 25: Social, Ethical & Legal Issues of Data Breach

Sample Answer: The data breach in MetroWave's internal CRM software raises significant social, ethical, and legal issues for both the company and its clients. Socially, the breach has damaged MetroWave's reputation, as clients may no longer trust the company to securely manage sensitive data. This loss of trust can lead to digital disruption, where clients shift to competitors who claim better security practices, resulting in potential long-term financial losses and reduced client loyalty. Furthermore, the breach has affected employees, causing job insecurity, especially for those in the security and client support teams, and damaging overall morale due to the perceived mishandling of the situation.

Ethically, MetroWave has failed to uphold its responsibility to protect client privacy. The exposure of confidential business reports, financial data, and proprietary intellectual property (as highlighted in the slideshow) presents serious privacy violations. Clients rely on MetroWave to safeguard this information, and its failure to do so can lead to unethical consequences such as stolen intellectual property, which can be used by competitors to gain an unfair advantage, or the misuse of financial data that could lead to identity theft.

Legally, MetroWave faces severe ramifications. With potential lawsuits for negligence in data protection, the company could incur significant financial penalties. Furthermore, failure to comply with regulations such as the Privacy Act (1988) regarding data security could result in fines.

MetroWave must immediately rectify the security flaw in the API to regain some confidence with its existing customer base and prevent any further data leaks. MetroWave must also ensure its systems and policies are updated to prevent future incidents, thereby protecting both its clients' rights and its standing in the marketplace.

Marking Criteria:

Marks	Criterion
7 - 8	Comprehensively evaluates the social, ethical AND legal issues resulting from the data breach. Makes continual reference to the stimulus and demonstrates an excellent understanding of how developing and implementing safe and secure software can affect people and enterprises.
5 - 6	Evaluates the social, ethical and legal issues resulting from the data breach. Referring to the stimulus and demonstrates a sound understanding of how developing and implementing safe and secure software can affect people and enterprises.
3 - 4	Attempts to evaluate social, ethical and legal issues resulting from the data breach. Makes some reference to the stimulus and demonstrates some understanding of how developing and implementing safe and secure software can affect people and enterprises.
1 - 2	Provides some relevant information about social, ethical or legal issues with reference to secure software.