

Normanhurst Exam Marking Criteria and Sample Answers

Software Engineering

Question 1 (3 marks)

Question: Match each task with the correct software project phase.

Sample Answer

- **Analyse requirements:** Identifying and defining
 - **Choose lifecycle model:** Research and planning
 - **Investigate tools & brainstorm:** Research and planning
 - **Optimise compiled code:** Producing and implementing
 - **Research social / ethical issues:** Research and planning
 - **Write source code:** Producing and implementing
 - **Compare expected vs actual output:** Testing and evaluating
 - **Draft algorithms & documentation:** Producing and implementing
-

Question 2 (1 mark)

Question: A real estate agency wants to build a model to predict whether a house is likely to be sold within 60 days based on features such as its price, location score, number of bedrooms, and age. Based on the scenario above, which regression model is most appropriate, and why?

Correct Answer

C, Logistic regression, because the goal is to classify whether a house will be sold within a specific time frame. _____

Question 3 (1 mark)

Question: A new payroll system is first switched on for only the HR department, then gradually for other departments once stability is confirmed. Which implementation strategy is this?

Correct Answer

B, Phased _____

Question 4 (1 mark)

Question: An email client downloads messages from a mail server while leaving copies on the server. Which protocol is used for this purpose?

Correct Answer

D, POP3 _____

Question 5 (4 marks)

Question: What are the benefits of using sandboxing in software development or deployment? (Multiple items may be selected).

Correct Answer

- Isolates untrusted code
 - Enables controlled testing
 - Reduces the risk of security vulnerabilities affecting other parts of the system
 - Protects live data during development and training
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Question 6 (1 mark)

Question: What is the most effective approach to ensuring that automation benefits society as a whole?

Correct Answer

C, Encourage collaboration between policymakers, educators, and businesses to promote inclusivity, skill development, and sustainability. _____

Question 7 (1 mark)

Question: A user logs into their bank's website, which allows money transfers via a button. A hacker sends the user a malicious email containing a link. When the user clicks the link, a money transfer request is executed without their knowledge. What type of attack is this?

Correct Answer

A, Cross-Site Request Forgery (CSRF) _____

Question 8 (4 marks)

Question: Consider the following CSS code. Which of the following is true for pages styled using the above CSS code? (Multiple items may be selected).

```
body {
  background-color: #00ff00;
  color: #ff0000;
  margin: 10px;
  font-family: Aptos, bold;
}
h1 {
  color: #000000;
  text-align: left;
}
p {
  font-size: 18px;
}
```

Correct Answer

- Only the h1 heading text is left-aligned
 - The background of the page is green
 - All fonts will be bold if Aptos is not available
 - Text within <p> tags will be red
-

Question 9 (1 mark)

Question: Which Machine Learning model is most appropriate for predicting new values based on the data given in the graph?

Correct Answer

B, Polynomial regression _____

Question 10 (a) (1 mark)

Question: In which software development step would a software engineering team need to decide on the specific algorithm they will use?

Correct Answer

B, Design _____

Question 10 (b) (3 marks)

Question: Hashing algorithms are used to create a unique representation of data. They have many uses in encryption and security. Identify 3 essential features of a hashing algorithm.

Sample Answer

No marking criteria or sample answer available. A suitable answer would identify features like: Deterministic, Fixed-size output, and Pre-image resistance (one-way). _____

Question 11 (1 mark)

Question: Which language is typically used for client-side programming?

Correct Answer

C, JavaScript _____

Question 12 (1 mark)

Question: A common machine learning model for unsupervised machine learning is:

Correct Answer

D, K-Nearest Neighbour _____

Question 13 (5 marks)

Question: A school library lets students reserve items online and collect them from smart lockers. Draw a class diagram using the four classes: User, Item, Reservation, and Locker.

Marking Criteria

Criterion	Marks
Develops a substantially correct class diagram with correct notation	5
Develops a mostly correct class diagram with one significant omission or minor errors	4
Develops a class diagram with some logical inaccuracies or omissions in detail	3
Develops a partial class diagram	2
Demonstrates some understanding of a class diagram	1

Sample Answer

A correct diagram would show relationships such as: a User makes one or more Reservations; each Reservation is for one or more Items; each Reservation is assigned to one Locker. Attributes for each class (e.g., User has name, role; Item has title) and multiplicities (e.g., 1..* and 1) should be shown. _____

Question 14 (4 marks)

Question: Draw a structure chart that represents the music program based on the provided algorithm.

Marking Criteria

Criterion	Marks
Provides a structure chart that correctly addresses: The hierarchy of modules, Repetition, Choice between modules, Parameters passed	4
Provides a structure chart that addresses THREE of the requirements	3
Provides a structure chart that addresses TWO of the requirements	2
Provides a structure chart that addresses ONE of the requirements	1

Sample Answer

The structure chart should have a main "Music Program" module at the top. Below it, there should be modules for "Get Choice", "Search", "Add to Playlist", and "Play Songs". A loop symbol should indicate the REPEAT..UNTIL structure, and a decision symbol should show the choice between the three function calls. Arrows should show data flow for 'choice', 'song', and 'playlist'. _____

Question 15 (3 marks)

Question: Draw a Level 0 data flow diagram for the "Smart Canteen System".

Marking Criteria

Criterion	Marks
Develops a substantially correct Level 0 DFD	3
Develops a mostly correct Level 0 DFD with some errors	2
Demonstrates some understanding of a Level 0 DFD	1

Sample Answer

The DFD should have one central process bubble labeled "Smart Canteen System". External entities would be "Student", "Payment Gateway", and "Menu/Inventory Database". Data flows should include "Lunch Order" from Student to System, "Payment Details" from System to Payment Gateway, "Payment Confirmation" from Gateway to System, "Menu Request" from System to Database, "Menu Data" from Database to System, and "QR Code" from System to Student. _____

Question 16 (7 marks)

Question: Create a class called 'Vehicle' and two subclasses, 'Car' and 'Truck', with specified methods and attributes. Then, create instances and display their values.

Marking Criteria

Criterion	Marks
Produces a compilable correct algorithm to meet all requirements: OOP Syntax, Correct class/method names and attributes, Constructor, Methods, Inheritance, Polymorphism, Object instantiation, Display output	7
Produces an algorithm which completes at least 6 of the listed steps.	6
Produces an algorithm which completes at least 5 of the listed steps.	5
Produces an algorithm which completes at least 4 of the listed steps.	4
Produces an algorithm which completes at least 3 of the listed steps.	3
Produces an algorithm which completes at least 2 of the listed steps.	2
Produces an algorithm which completes at least 1 of the listed steps.	1

Sample Answer

```
class Vehicle:
    def __init__(self, make, model, year):
        self._make = make
        self._model = model
        self._year = year

    def get_make(self):
        return self._make

    def get_model(self):
        return self._model

    def get_year(self):
        return self._year

class Car(Vehicle):
    def get_type(self):
        return "Car"

class Truck(Vehicle):
    def get_type(self):
        return "Truck"

# Create instances
my_car = Car("Toyota", "Corolla", 2022)
my_truck = Truck("Ford", "Ranger", 2021)

# Display values
for vehicle in (my_car, my_truck):
    print(f"Type: {vehicle.get_type()}")
    print(f"Make: {vehicle.get_make()}")
    print(f"Model: {vehicle.get_model()}")
    print(f"Year: {vehicle.get_year()}")
    print("-" * 20)
```

Question 17 (6 marks)

Question: Write an algorithm for a function called 'knn' that implements the K-Nearest Neighbours algorithm using the provided helper functions.

Marking Criteria

Criterion	Marks
Produces a substantially correct algorithm that accepts correct parameters, calculates all distances, selects k-closest points, determines the most common label, and uses helper functions correctly.	6
Produces an algorithm which completes at least four of the listed steps with minor errors.	5
Produces an algorithm which completes at least three of the listed steps but contains errors.	4
Produces an algorithm which completes at least two of the listed steps but contains errors.	3
Produces an algorithm which attempts some of the listed steps, but with significant errors.	2
Makes an attempt at an algorithm which relates to the question.	1

Sample Answer

```
FUNCTION knn(newPoint, tData, tlabels, k)
    distances = []
    FOR i FROM 0 TO length of tData - 1
        d = distance(newPoint, tData[i])
        APPEND [d, tlabels[i]] TO distances
    ENDFOR

    distances = sort(distances)

    nearest_labels = []
    FOR i FROM 0 TO k - 1
        APPEND distances[i][1] TO nearest_labels
    ENDFOR

    label = mode(nearest_labels)
    RETURN label
ENDFUNCTION
```

Question 18 (4 marks)

Question: Describe how confidentiality, accountability and integrity have been compromised in the described submission portal scenario.

Marking Criteria

Criterion	Marks
Clearly describes how confidentiality, accountability and integrity have been compromised.	4
Describes how confidentiality, accountability and integrity have been compromised.	3
Describes how TWO of confidentiality, accountability and integrity have been compromised.	2
Provides a response with some relevance to compromised confidentiality, accountability or integrity.	1

Sample Answer

- **Confidentiality:** Compromised because the sequential 'studentId' allows any student to access and download the private work of other students without authorization. This is a broken access control vulnerability.
- **Integrity:** Compromised in two ways. First, the ability to overwrite existing files means the data is not protected from unauthorized modification. Second, accepting a client-side timestamp allows the submission time (a key piece of data) to be falsified.

- **Accountability:** Compromised because actions are not properly tracked. The system cannot prove who overwrote a file or when a submission was truly made, as the timestamp can be manipulated. This undermines non-repudiation.

Question 19 (4 marks)

Question: Write a function in Python called ‘GreatestProduct’ which takes in a 2D array (20 x 20) and returns the greatest product of four adjacent numbers in the same direction (up, down, left, or right).

Marking Criteria

Criterion	Marks
Writes a correct algorithm to satisfy the problem requirements.	4
Writes a mostly correct algorithm with minor errors (e.g., off-by-one in loop bounds).	3
Writes an algorithm to satisfy some problem requirements (e.g., only checks one direction).	2
Demonstrates some understanding of an algorithm to solve a problem.	1

Sample Answer

```
def GreatestProduct(grid):
    max_product = 0
    size = 20
    adj = 4

    for r in range(size):
        for c in range(size):
            # Check right
            if c <= size - adj:
                product = grid[r][c] * grid[r][c+1] * grid[r][c+2] * grid[r][c+3]
                if product > max_product:
                    max_product = product

            # Check down
            if r <= size - adj:
                product = grid[r][c] * grid[r+1][c] * grid[r+2][c] * grid[r+3][c]
                if product > max_product:
                    max_product = product

    return max_product
```

Question 20 (2 marks)

Question: Briefly describe the difference between input validation and input sanitisation as defensive data input handling practices, providing an example of each.

Marking Criteria

Criterion	Marks
Describes validation and sanitation with appropriate examples.	2
Describes validation and sanitation with poorly chosen examples or no examples.	1

Sample Answer

Input validation is checking if user input meets certain rules before it is processed. It confirms the data is in the correct format. **Example:** Checking if a user-entered age is a number between 18 and 99.

Input sanitisation is modifying the user input to remove or neutralise potentially dangerous characters or code. **Example:** Removing HTML tags like ‘script’ from a user’s comment to prevent Cross-Site Scripting (XSS) attacks.

Question 21 (4 marks)

Question: Explain how Machine Learning and Business Process Automation can help ‘Click Shoe Warehouse’ determine which shoe sizes and styles sell best in each season.

Marking Criteria

Criterion	Marks
Comprehensive explanation of ML for pattern analysis and BPA for process streamlining, with clear integration and specific examples for the warehouse.	4
Good explanation of ML and BPA, but with less detail or weaker integration and examples.	3
Basic mention of ML and BPA with limited explanation and vague examples.	2
Inadequate or incorrect explanation of the concepts.	1

Sample Answer

Machine Learning (ML) can analyze the 10 years of sales data to identify patterns and predict future trends. A forecasting model could be trained to determine which shoe styles and sizes are likely to be popular in upcoming seasons, directly answering the business’s question.

Business Process Automation (BPA) can then act on these predictions. For example, a BPA system could automatically generate purchase orders for the predicted best-selling items, ensuring stock levels are optimized before the season begins. It could also trigger targeted marketing campaigns for those specific styles. By combining ML’s insights with BPA’s automated actions, the warehouse can proactively manage inventory and marketing to maximize seasonal sales. _____

Question 22 (5 marks)

Question: Assess positive and negative impacts of machine learning and artificial intelligence on production efficiency, waste and the environment.

Marking Criteria

Criterion	Marks
Elaborates on several positive and several negative potential impacts, providing a reasonable balance.	5
Provides several positive and several negative impacts, but does not elaborate sufficiently.	4
Elaborates only on positive impacts or only on negative impacts.	3
Outlines only 1 positive AND 1 negative potential impact without elaborating.	2
Outlines only 1 positive OR 1 negative potential impact without elaborating.	1

Sample Answer

Positive Impacts: ML can significantly increase **production efficiency** by optimizing supply chains and predicting equipment maintenance needs, reducing downtime. It can reduce **waste** by enabling more accurate demand forecasting, which prevents overproduction. Environmentally, ML can optimize energy grids and design more efficient processes, lowering resource consumption.

Negative Impacts: The primary negative environmental impact is the massive **energy consumption** of data centers required to train and run large AI models, which contributes to a significant carbon footprint. Additionally, the rapid hardware obsolescence driven by AI advancements can lead to an increase in electronic **waste** (e-waste). _____

Question 23 (a) (1 mark)

Question: Implement the stub from the flowchart in python code.

Sample Answer

```
def login(username, password):
    if username == "user1" and password == "pass123":
        return "Login successful"
    else:
        return "Login failed"
```

Question 23 (b) (2 marks)

Question: Provide at least TWO more tests that could be used for the login stub, with a comment justifying each one.

Sample Answer

```
# Test case 2: Incorrect password
# Justification: To ensure the system correctly denies access
# when the username is valid but the password is not.
assert login("user1", "wrongpass") == "Login failed"

# Test case 3: Incorrect username
# Justification: To ensure the system correctly denies access
# when the password is valid but the username is not.
assert login("wronguser", "pass123") == "Login failed"
```

Question 23 (c) (2 marks)

Question: What should you consider when creating error messages for failed login attempts?

Marking Criteria

Criterion	Marks
Identifies two considerations, including one related to security.	2
Identifies one security consideration OR two non-security considerations.	1

Sample Answer

A key consideration is **security**. The message should be generic (e.g., "Invalid username or password") and not reveal whether it was the username or the password that was incorrect. This prevents attackers from easily discovering valid usernames. Another consideration is **user experience**: the message should be clear and may offer helpful options, like a link to reset the password. _____

Question 24 (a) (3 marks)

Question: Explain communications issues that may arise due to stakeholders being located all over the country.

Sample Answer

Note: This question was incomplete in the provided source material. A suitable answer would discuss issues like time zone differences leading to scheduling difficulties, lack of non-verbal cues in virtual meetings leading to misunderstandings, and potential for cultural or regional differences in communication styles. _____

Question 24 (b) (2 marks)

Question: Compare and contrast Hybrid (WAgile) and Waterfall software development methodologies for developing software to control toy manufacturing.

Marking Criteria

Criterion	Marks
Clearly identifies and describes both methodologies, and effectively compares and contrasts them in the given context.	2
Identifies and describes both methodologies, but with less detail or a weaker comparison for the context.	1

Sample Answer

The **Waterfall** model is a rigid, sequential process. It would be suitable for defining the core, unchangeable safety and regulatory requirements of the toy manufacturing software upfront. In contrast, the **Hybrid (WAgile)** model combines Waterfall's upfront planning with Agile's flexible, iterative development. This would allow the company to lock in the critical safety features (Waterfall part) while iteratively developing and improving other aspects of the software, like the user interface or reporting tools (Agile part), making it more adaptable than a pure Waterfall approach. _____

Question 25 (3 marks)

Question: Write SQL to output all books published after 2015, listed from the newest title to the oldest.

Marking Criteria

Criterion	Marks
Writes correct SQL code, addressing all criteria (SELECT, FROM, WHERE, ORDER BY DESC).	3
Writes SQL code addressing most criteria (e.g., forgets the ORDER BY clause).	2
Demonstrates some understanding of SQL (e.g., only a valid SELECT FROM clause).	1

Sample Answer

```
SELECT title, author, published_year
FROM Books
WHERE published_year > 2015
ORDER BY published_year DESC;
```