



Rewarding Learning

ADVANCED

**General Certificate of Education
2024**

Centre Number

| | | | | |
|--|--|--|--|--|
| | | | | |
|--|--|--|--|--|

Candidate Number

| | | | | |
|--|--|--|--|--|
| | | | | |
|--|--|--|--|--|

Software Systems Development

Unit A2 1

Systems Approaches and
Database Concepts

MV18

[ADV11]

THURSDAY 23 MAY, AFTERNOON

Time

2 hours, plus your additional time allowance.

Instructions to Candidates

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

You must answer the questions in the spaces provided.

Do not write on blank pages.

Complete in black ink only.

Answer **all eight** questions.

Information for Candidates

The total mark for this paper is 100.

Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in questions **1(a)**, **2(b)**, **4** and **5(b)**.

An insert has been supplied for clarity for use with question **7(c)**

(b) Catherine, the Systems Analyst, has explained to the various stakeholders that the initiation phase will set the foundation for the project at Total Cleaning Services (TCS) and establish its overall direction.

Identify two stakeholders needed to resolve the problems with the **Additional Hours Claim Form** (Document 3 – page 11 of the case study), explaining why their involvement is necessary. [6 marks]

Stakeholder 1: _____

Explanation:

Stakeholder 2: _____

Explanation:

2 Pat, the project manager, and her team have decided to adopt an agile methodology for the development of a new system at TCS, as an alternative to a traditional approach.


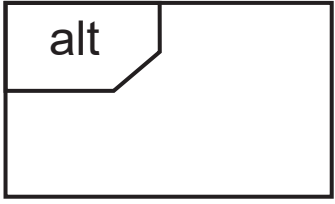




(a) Using the letters from the following list, complete the table below to show the key values of Agile Methodologies. The first match has been done for you. [3 marks]

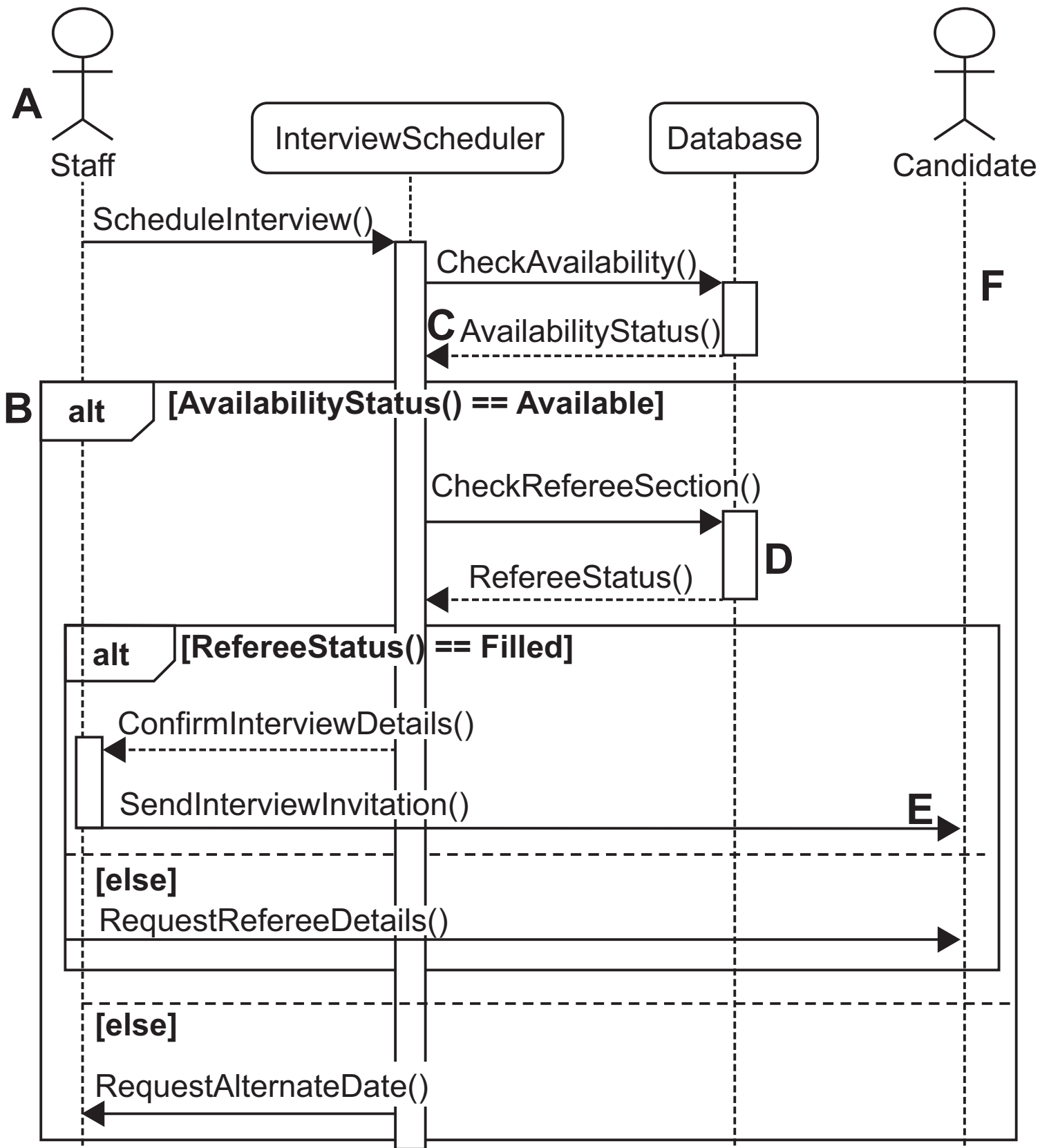
- A Responding to change
- B Customer collaboration
- C Working software
- D Following a plan
- E Processes and tools
- F Contract negotiation
- G Comprehensive documentation
- H Individuals and interactions

| Key Values of Agile | | |
|---------------------|------|---|
| H | over | E |
| | over | |
| | over | |
| | over | |

3 Catherine has used UML to create a sequence diagram which depicts part of the process of scheduling interviews for potential new employees.

(a) Complete the following table to identify the components of the sequence diagram opposite: [4 marks]

| Component Symbol | Component Name |
|---|-------------------|
| A  | |
| B  | Alternative Frame |
| C  | Return Message |
| D  | |
| E  | |
| F  | |



Note: an alternative frame (alt) represents a choice between two or more message sequences and is equivalent to an “if-else”

(b) Describe the interactions in the sequence diagram that ensure there are no missing referees. [3 marks]

(c) Identify two other UML diagrams that could be used during development of the new systems at TCS. For each diagram you choose, specify the intended audience type. [4 marks]

UML Diagram 1: _____

Intended Audience Type: _____

UML Diagram 2: _____

Intended Audience Type: _____

Blank Page
(Questions continue overleaf)

5 Catherine wants to ensure the new system will apply the correct overtime rate for staff and has begun the testing process.

(a) By referring to **Table 1 Overtime Rates** from page 10 of the case study, complete the partial Test Table below to ensure that relevant test data is entered which will produce the expected outcome. [6 marks]

| Partial test table | | |
|---|---|---------------------------------|
| Test Data | Reason for Test Data | Expected Outcome |
| Day Worked: _____ Time Period: _____ Specialist Code: | To ensure that the base rate is applied. | Base rate applied. |
| Day Worked: _____ Time Period: _____ Specialist Code: | To ensure that the base rate +18% is applied. | Base rate applied +18% applied. |

- 6** Catherine is considering the optimal database structure for the proposed software solution at TCS.

Complete the paragraphs opposite by selecting the correct words or phrases from the selection provided. Words and phrases may be used more than once. [10 marks]

attributes

C#

cardinality

child

children

entities

entity

entity-relationship

foreign key

hierarchical

indexing

management

network

normalisation

parents

parent-child

primary key

query

relational

relationships

schema

sibling

SQL

tables

transaction

Databases come in various types, but the three most common ones are the _____, _____, and _____ models.

The _____ model is widely used today due to its flexibility and efficiency. It organises data into _____ and relationships are established using _____ and _____ concepts.

In contrast, the _____ model organises data in a _____ structure, much like a family tree. The _____ model is similar, but it allows a _____ to have multiple _____, creating a more complex set of relationships. A critical part of modern database design is the _____ model. This method of database design involves identifying _____ and their _____, as well as the _____ between them. The _____ of a relationship, that is, the number of instances of an _____ that can be associated with instances of another, is a crucial aspect of this model.

It is important to note that all these operations and manipulations are made possible by a database _____ system which uses languages like _____ for data manipulation and definition.

7 Jean and Henry record client overtime submissions in tabular format on their laptop. A sample of the monthly overtime submissions is displayed on the page 18.

Catherine will examine this data and attempt to normalise it.

(a) Explain the importance of normalising data when developing database systems. [3 marks]

(b) Identify the key focus for the following stages of normalisation:

(i) **1NF** [1 mark]

(ii) **2NF** [1 mark]

(iii) **3NF** [1 mark]

Blank Page
(Question continues overleaf)

**Partial record of overtime hours for employees:
(An Insert has been supplied for clarity.)**

| OTMonthID | StaffID | FName | SName | EmploymentType | ContractHours | FormReceived | OTDate | StartTime | EndTime | DayType | SpecialistID |
|-----------|---------|--------|-----------|----------------|---------------|--------------|------------|-----------|---------|----------|--------------|
| Mar24 | 2001 | Warren | Patterson | Full-time | 40 | 30-03-2024 | 01-03-2024 | 18:00 | 22:00 | Weekday | S1 |
| | | | | | | | | | | | S2 |
| | | | | | | | 02-03-2024 | 07:00 | 08:00 | Saturday | |
| Mar24 | 2002 | James | McArdle | Part-time | 20 | 26-03-2024 | 03-03-2024 | 06:00 | 08:30 | Sunday | S2 |
| | | | | | | | | | | | S3 |
| | | | | | | | 04-03-2024 | 18:00 | 22:00 | Weekday | S1 |
| Apr24 | 2001 | Warren | Patterson | Full-time | 40 | 25-04-2024 | 06-04-2024 | 17:30 | 19:00 | Saturday | |
| | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |

Catherine has identified three repeating groups from the overtime hours table.

(c) Transform the data from the table into 1NF. [3 marks]

1NF

OTMONTH_STAFF

OTMONTH_STAFF_DATE

OTMONTH_STAFF_DATE_SPECIALIST

Blank Page
(Questions continue overleaf)

8 Louise, the database developer, is working on a database structure (**Fig. 1**, opposite) to help automate the matching process between clients and staff.

(a) Declan Downey (StaffID: 3) is available in the morning (SlotID: 1) and afternoon (SlotID: 2).

Write the SQL script that will add these records to the database. [4 marks]

(b) After taking a course, one of Declan's specialities has changed from Basic Sanitisation and Deep Cleaning (SpecialID: 2) to Hazardous Tasks Cleaning (SpecialID: 3).

Write the SQL script that will reflect this change in the database. [4 marks]

Fig. 1: Partial database structure for matching process

| STAFF | | SPECIALITY | | TOWN | |
|--------------|------------------|-------------------|------------------|--------------|------------------|
| Field | Data Type | Field | Data Type | Field | Data Type |
| StaffID | int | SpecialID | int | TownID | int |
| StaffTitle | varchar(5) | SpecialDesc | varchar(20) | TownName | varchar(20) |
| StaffFName | varchar(20) | SpHourlyRate | decimal(4,2) | | |
| StaffSName | varchar(20) | | | | |
| StaffPcode | varchar(12) | | | | |
| StaffTownID | int | | | | |
| StaffTel | varchar(11) | | | | |
| StaffEmail | varchar(20) | | | | |

| STAFF_SPECIALITY | | STAFF_CLIENT_MATCH | |
|-------------------------|------------------|---------------------------|------------------|
| Field | Data Type | Field | Data Type |
| StaffID | int | StaffID | int |
| SpecialID | int | ClientID | int |

| STAFF_AVAILABILITY | |
|---------------------------|------------------|
| Field | Data Type |
| StaffID | int |
| SlotID | int |

(c) A new field, StartDate, needs to be added to the STAFF table. The field's value should be the current date, by default.

(i) Write the SQL script that will reflect this change in the database. [4 marks]

(ii) What will be the StartDate value for existing staff such as Declan, after this change has been made? [1 mark]

Blank Page
(Questions continue overleaf)

This is the end of the question paper

| For Examiner's use only | |
|-------------------------|-------|
| Question Number | Marks |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |

| | |
|--------------------|--|
| Total Marks | |
|--------------------|--|

Examiner Number

