**Question 1) a) b)** Conceptual data model with assumptions.

Person

Test

Instructor

Vehicle

Client

Booking

Test Centre

Makes

Contains

Allocated

May Contain

Within

1..1

1..\*

1..1

1..1

0..\*

1..1

1..\*

1..\*

0..1

0..1

Name

**Client ID**

Gender

Date of Birth

Address

Address

Contact Phone Number

Gender

Name

**Instructor ID**

**Test ID**

Contact Number

Address

Name

**Vehicle ID**

Model

Registration Number

**Booking ID**

Date

Time

Valid Driving license number

{Total, OR}

Entity

Attributes

Contact Phone Number

Provisional Driving License Number

**Test Centre ID**

**Assumed:**

A car doesn’t always have an instructor assigned.

An instructor doesn’t always have a car assigned.

Relation

Multiplicity of relationship

1..1

Record reasons for failure.

Test Result

Primary Key

**Assumed:**

The database will record the Test results in a Test record. This will allow additions to the database with regards to the test: i.e. different parts of the test, Theory and Practical Tests.

The entity will also be updated as described by the record relationship (to the left).

**Assumed:**

Booking will encompass ‘Lesson’, so a Booking is a Lesson; in the lesson the client is able to get taught by an Instructor or the Client may attempt a Test at a Test Centre.

This allows the database system to skip the Lesson relationship and turns a booking into a fixed one hour lesson or a test. This also includes the assumption that the driving test will only be 1 hour long.

|  |
| --- |
| Assumptions |
| A Client may book individual lessons with a particular Instructor. |
| A Client may apply for a driving Test at the nearest Test Centre. |
| A Client may make one or more attempts to pass the Test. |
| If a Client fails a Test, the Instructor must record the reasons for failure. |
| A Client may change to a different Instructor at any stage. |
| A Car is allocated to a specific Instructor by the school. |

[Diagram 1: Conceptual Data Model 1.0]

**Question 1) b)** Assumptions Table

|  |
| --- |
| Assumptions |
| A Client may book individual lessons with a particular Instructor. |
| A Client may apply for a driving Test at the nearest Test Centre. |
| A Client may make one or more attempts to pass the Test. |
| If a Client fails a Test, the Instructor must record the reasons for failure. |
| A Client may change to a different Instructor at any stage. |
| A Car is allocated to a specific Instructor by the school. |
| A car doesn’t always have an instructor assigned. An instructor doesn’t always have a car assigned. |
| Booking will encompass ‘Lesson’, so a Booking is a Lesson; in the lesson the client is able to get taught by an Instructor or the Client may attempt a Test at a Test Centre. This allows the database system to skip the Lesson relationship and turns a booking into a fixed one hour lesson or a test. This also includes the assumption that the driving test will only be 1 hour long. |
| The database will record the Test results in a Test record. This will allow additions to the database with regards to the test: i.e. different parts of the test, Theory and Practical Tests. The entity will also be updated as described by the record relationship (to the left). |

**Question 2) a)** Logical data model.

Consists of ‘First line Address’ ‘Second line Address’ ‘Postcode’

Person

Test

Instructor

Vehicle

Client

Booking

Test Centre

Makes

Contains

Allocated

May Contain

Within

1..1

1..\*

1..1

1..1

0..\*

1..1

1..\*

1..\*

0..1

0..1

Name

**Client ID {PK}**

Gender

Date of Birth

Address

Address

Contact Phone Number

Gender

Name

**Instructor ID {PK}**

Test Centre ID **{FK}**

**Test ID {PK}**

Contact Number

Address

Name

**Vehicle ID {PK}**

Model

Registration Number

**Booking ID {PK}**

Instructor ID **{FK}**

Date

Time

Valid Driving license number **{AK}**

{Total, OR}

Entity

Attributes

Contact Phone Number

Provisional Driving License Number **{AK}**

Client ID **{FK}**

**Test Centre ID {PK}**

Relation

Multiplicity of relationship

1..1

Record reasons for failure.

Test Result

Vehicle ID **{FK}**

Primary Key

Foreign Key

{DD-MM-YYYY}

{‘M’/’F’}

Must be equal to 7 Characters

Consists of ‘Forename’ and ‘Surname’

Consists of 11 digits

Consists of 11 digits

Consists of ‘First line Address’ ‘Second line Address’ ‘Postcode’

Consists of ‘Forename’ and ‘Surname’

{DD-MM-YYYY}

Consists of ‘First line Address’ ‘Second line Address’ ‘Postcode’

Consists of 11 digits

Consists of ‘Forename’ and ‘Surname’

{HH:MM}

{‘M’/’F’}

[Diagram 2: Logical Data Model 1.0]

**Question 2) b)** Foreign Key Null Value Justification

|  |  |
| --- | --- |
| Foreign Key | Justification of Null Value |
| Vehicle ID | A null value will be allowed as I have made the assumption that it is possible for an Instructor to not have a vehicle, this could be due to: changing vehicles (may be a gap when they have no car), damage to a vehicle and needs repairs, new Instructor who has not got a car yet. |
| Client ID | This foreign key will not accept a null value as every booking must have a client. |
| Instructor ID | Similar to Client ID, this will not accept a null value as every booking must have an Instructor, however, the Instructor can be changed at any given time. |
| Test Centre ID | Likewise, the Test Centre ID will not have a null value acceptance, as every test must be done at a Test Centre. |

**Question 2)** **c)** AdditionalConstraints of the Logical Data Model (Diagram 2: Logical Data Model 1.0).

In addition to the null value constraints we see above,

|  |  |
| --- | --- |
| Type of Constraint | Constraint |
| Integrity | Each Instructor can only be allocated one Vehicle. |
| Integrity | A Client may make one or more bookings or none at all. (When a client record is made, the client may not have any bookings yet) |
| Integrity | One or more Bookings may have one or more Instructors. |
| Integrity | A Booking allows a Client to attempt a driving Test one or more times, or none at all. |
| Integrity | There may be one or more Tests at a Test Centre. |
| Domain | A person’s Gender can be either ‘M’, Male or ‘F’, Female. |
| Domain | A person’s Address is made from First line of Address, Second line of Address and Postcode. Postcode must be 6 to 7 Characters long. |
| Domain | A person’s Name is made from the person’s first name and last name. |
| Domain | A Vehicle’s Registration Number must be at least 7 Characters long. |
| Domain | A Booking’s Time will be made by 4 digits in the format: HH:MM |
| Domain | A Booking’s Date will be made from 8 digits in the format: DD-MM-YYYY |
| Domain | A Client’s DOB will be made from 8 digits in the format: DD-MM-YYYY |
| Integrity | An Instructor has a unique key, Driving License Number. |
| Integrity | An Client has a unique key, Provisional Driving License Number. |

Referential Integrity: If a foreign key exists in a relation, either the foreign key value must match a candidate key value of some tuple in its home relation or the foreign key value must be wholly null.

Multiplicity Constraint: The number (or range) of possible occurrences of an entity type that may relate to a single occurrence of an associated entity type through a particular relationship.