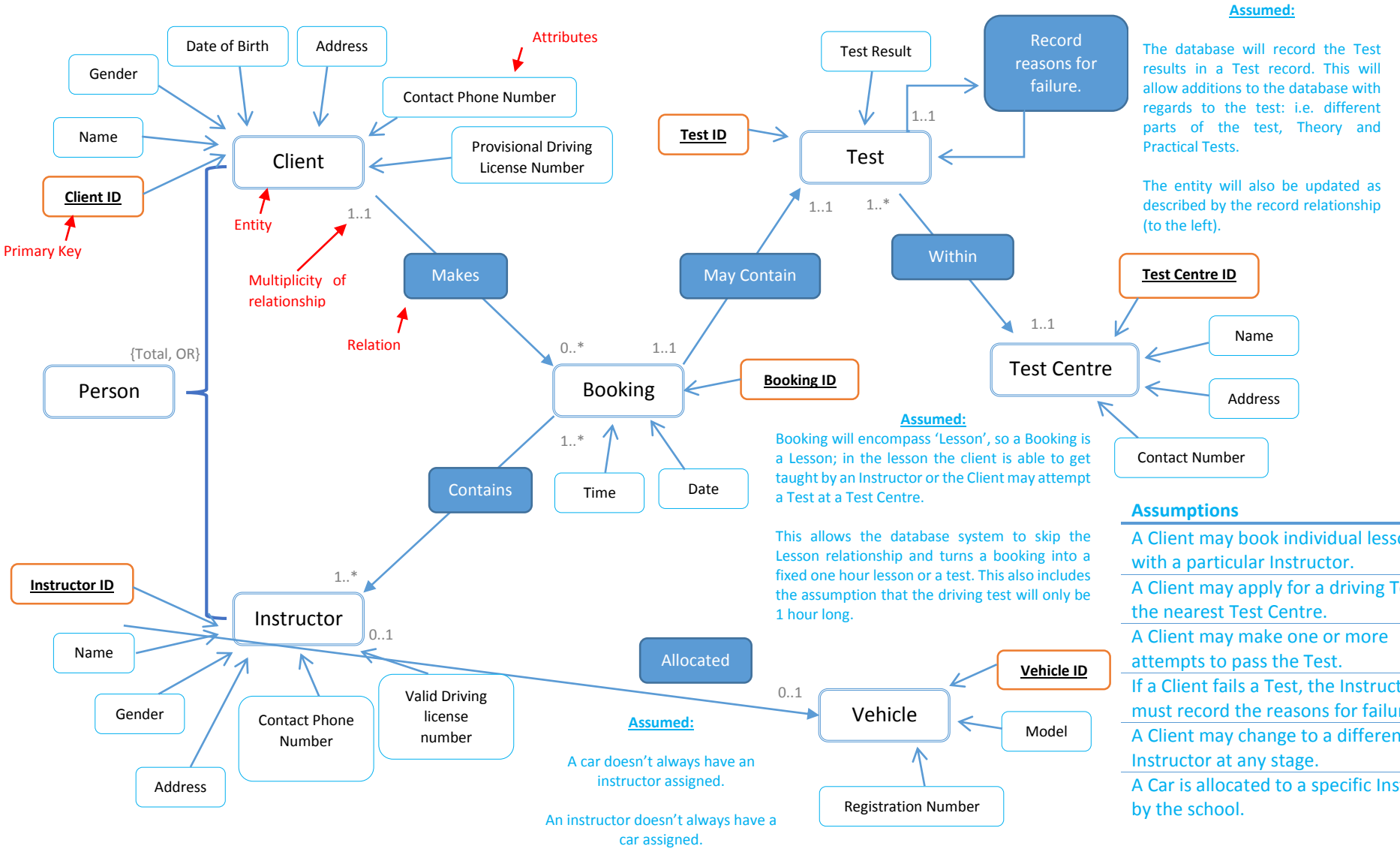
Assessment 2 – Database design
CO532 – Database Systems

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



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]

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CO532 – Database Systems

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).

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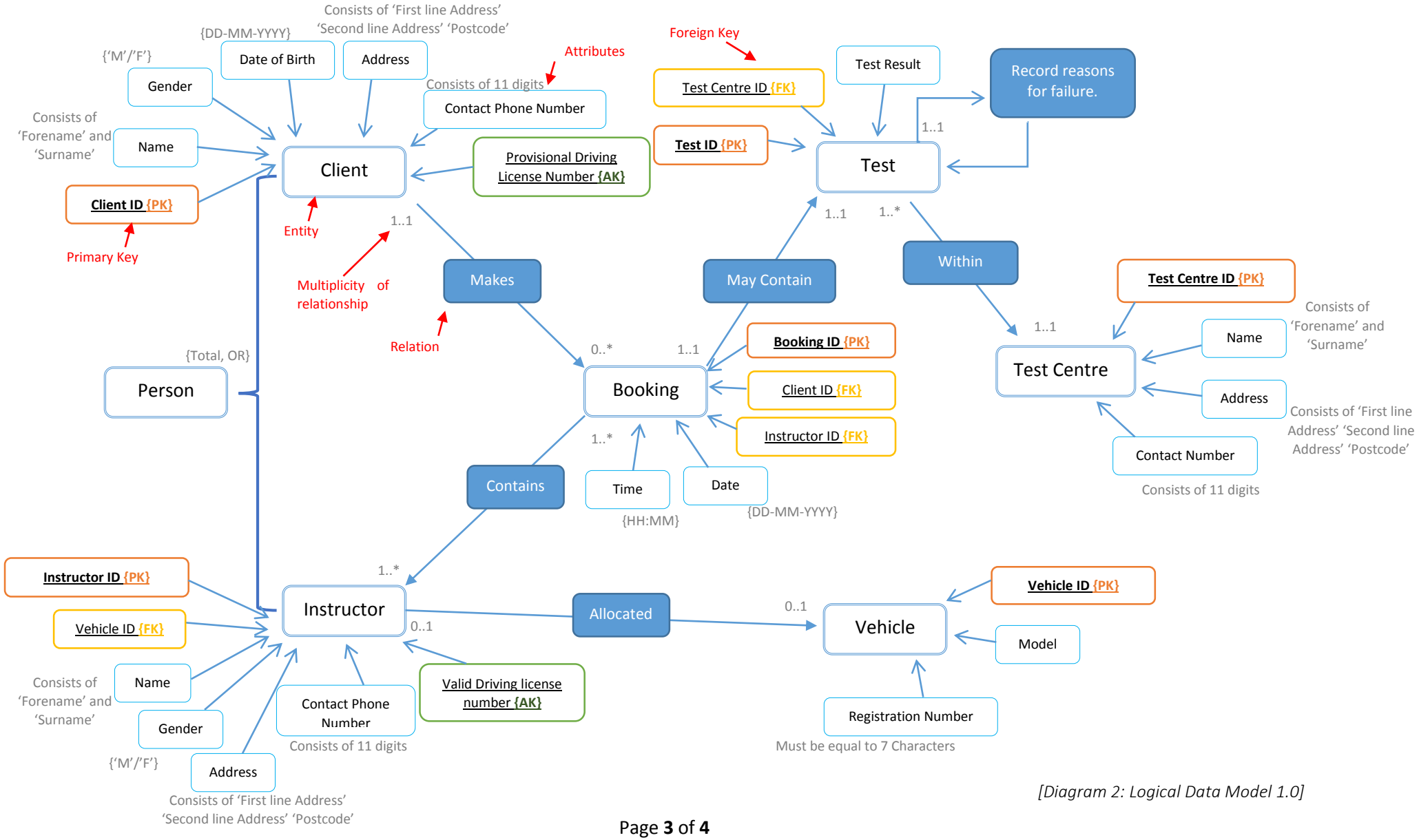
Question 2) a) Logical data model.



[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) Additional Constraints 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.