7 Bobby and Kim are discussing databases.

(a) Bobby tells Kim that a file-based approach is usually better than a relational database.

Explain why Bobby is incorrect.

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..... [3]

(b) Bobby has a shop that sells products to customers. His database will store data about his customers, their payment details, orders and the products he sells. Customers will have login details to access their accounts. The database will update customers' payment and login details without keeping any historical records.

(i) Give **one** example of each of the following relationships from Bobby's database.

one-to-one

.....

.....

one-to-many

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.....

many-to-many

.....

.....

[3]

(ii) Tick (✓) **one** box to identify the relationship that cannot be directly implemented in a normalised relational database.

Relationship	**Tick (✓)**
one-to-one	
one-to-many	
many-to-many	

[1]

(iii) Bobby wants to name his database `SHOPORDERS`.

Write a Data Definition Language (DDL) statement to define a new database with the name `SHOPORDERS`.

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..... [1]

(c) A database has a data dictionary.

Give **three** items that are stored in a data dictionary.

1 .....

2 .....

3 .....

[3]

1 Raj owns houses that other people rent from him. He has a database that stores details about the people who rent houses, and the houses they rent. The database, HOUSE_RENTALS, has the following structure:

CUSTOMER(CustomerID, FirstName, LastName, DateOfBirth, Email)

HOUSE(HouseID, HouseNumber, Road, Town, Bedrooms, Bathrooms)

RENTAL(RentalID, CustomerID, HouseID, MonthlyCost, DepositPaid)

(a) Give the definition of the following database terms, using an example from the database HOUSE_RENTALS for each definition.

Term	Definition and example
Field	....
Entity	....
Foreign key	....

[6]

(b) Tick (✓) **one** box to identify whether the database HOUSE_RENTALS is in Third Normal Form (3NF) or not in 3NF.
Justify your choice using one or more examples from the database HOUSE_RENTALS.

In 3NF	
Not in 3NF	

Justification .....

.....

.....

..... [2]

(c) Example data from the table `RENTAL` are given:

RentalID	CustomerID	HouseID	MonthlyCost	DepositPaid
1	22	15B5L	1000.00	Yes
2	13	3F	687.00	No
3	1	12AB	550.00	Yes
4	3	37	444.50	Yes

(i) Complete the following Data Definition Language (DDL) statement to define the table `RENTAL`.

```
CREATE ..... ..... (
      RentalID INTEGER NOT NULL,
      CustomerID INTEGER NOT NULL,
      HouseID ..... (5) NOT NULL,
      MonthlyCost ..... NOT NULL,
      DepositPaid BOOLEAN NOT NULL,
      ..... (RentalID)
);
```

[4]

(ii) Write a Data Manipulation Language (DML) script to return the first name and last name of all customers who have **not** paid their deposit.

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..... [4]

5 Javier owns many shops that sell cars. He employs several managers who are each in charge of one or more shops. He uses the relational database `CARS` to store the data about his business.

Part of the database is shown:

```
SHOP(ShopID, ManagerID, Address, Town, TelephoneNumber)

MANAGER(ManagerID, FirstName, LastName, DateOfBirth, Wage)

CAR(RegistrationNumber, Make, Model, NumberOfMiles, ShopID)
```

(a) Tick (✓) **one** box in each row to identify whether each field is a primary key or a foreign key.

Table	Field name	Primary key	Foreign key
MANAGER	ManagerID		
SHOP	ManagerID		
CAR	RegistrationNumber		
CAR	ShopID		

[2]

(b) Describe the ways in which access rights can be used to protect the data in Javier's database from unauthorised access.

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..... [3]

(c) Javier uses Data Definition Language (DDL) and Data Manipulation Language (DML) statements in his database.

(i) Complete the following DML statements to return the number of cars for sale in each shop.

```
SELECT COUNT(.....)

FROM .....

..... ShopID
```

[3]

(ii) Complete the DML statement to include the following car in the table `CAR`.

Field	Data
RegistrationNumber	123AA
Make	Tiger
Model	Lioness
NumberOfMiles	10500
ShopID	12BSTREET

```
.....  ..... CAR

..... ("123AA","Tiger","Lioness",10500,"12BSTREET")
```

[2]

4 A teacher uses a relational database, MARKS, to store data about students and their test marks.

The database has the following structure:

STUDENT(StudentID, FirstName, LastName)

TEST(TestID, Description, TotalMarks)

STUDENT_TEST(StudentID, TestID, Mark)

(a) Describe the advantages of using a relational database compared to a file-based approach.

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..... [4]

(b) Give the highest level of Normal Form (NF) the database MARKS is in **and** justify your choice.

Normal Form .....

Justification .....

.....

.....

[3]

(c) (i) Sample data to be stored in the table `STUDENT_TEST` is shown.

StudentID	TestID	Mark
12	A1	50
12	P10	100
13	A1	75
14	P10	60

Write a Structured Query Language (SQL) script to create the table `STUDENT_TEST`.

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..... [5]

(ii) Write a Structured Query Language (SQL) script to find the average mark of students in test A7.

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..... [3]

5 A company runs activity courses. It is creating a relational database to store details of the courses it runs.

The database has five tables:

EMPLOYEE(EmployeeID, FirstName, LastName, Role, Language)

BOOKING(BookingID, CustomerID, CourseID)

CUSTOMER(CustomerID, FirstName, LastName)

COURSE(CourseID, Title, Level, Date)

COURSE_EMPLOYEE(CourseID, EmployeeID)

(a) Complete the entity relationship (E-R) diagram for the database.

[4]

(b) Describe what is meant by **referential integrity**.
Give an example from the CUSTOMER and BOOKING tables in your answer.

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.....

..... [2]

(c) A Data Definition Language (DDL) is used to create the structure of the database. One item that can be created is the database.

Identify **three other** items that can be created in the database using the DDL.

1 .....

2 .....

3.....

[3]

(d) Part of the `EMPLOYEE` table is shown.

EmployeeID	FirstName	LastName	Role	Language
001	Jasmine	Chen	Leader	French
002	Kenton	Archer	Leader	English
003	Michael	Roux	Cook	French
004	Conrad	Slavorski	Leader	Russian

Write a Data Manipulation Language (DML) statement to return the first name and last name of all employees, who are leaders, and speak either French or English.

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.....

..... [4]

9 An airline company uses a relational database to store data about passengers and flights.

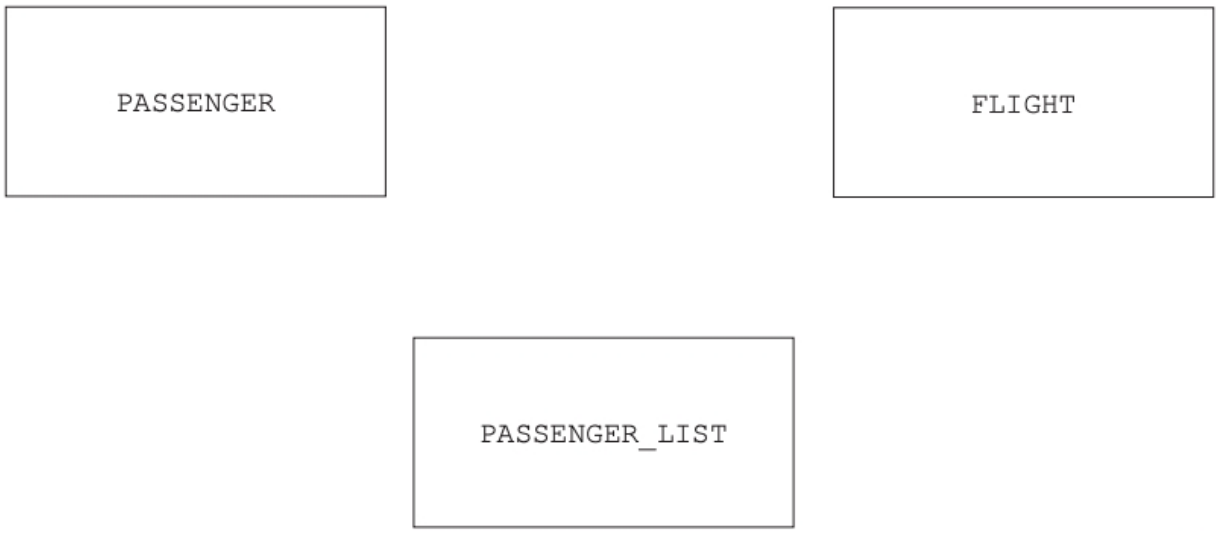
Part of the database is shown.

PASSENGER(PassengerID, FirstName, LastName)

FLIGHT(FlightID, FlightDate, FlightTime)

PASSENGER_LIST(FlightID, PassengerID, SeatNo)

(a) Complete the entity-relationship (E-R) diagram to show the relationships between the given tables.



[2]

(b) The following is example data for the table FLIGHT:

FlightID	FlightDate	FlightTime
MO126	05/05/21	09:00
GK6708	06/09/21	00:30
BA0897	08/12/21	15:30

Write Data Definition Language (DDL) statements to define the table FLIGHT.

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..... [5]

7 A driving school teaches people how to drive cars. The school has a relational database, DRIVING_SCHOOL, to store information about instructors, students, lessons and the cars used by instructors.

INSTRUCTOR(InstructorID, FirstName, LastName, DateOfBirth, Level)

CAR(Registration, Make, Model, EngineSize)

INSTRUCTOR_CAR(InstructorID, Registration)

STUDENT(StudentID, FirstName, LastName, DateOfBirth, Address1)

LESSON(LessonID, StudentID, InstructorID, LessonDate, LessonTime)

(a) Give **two** benefits to the **driving school** of using a relational database instead of a flat file.

1.....

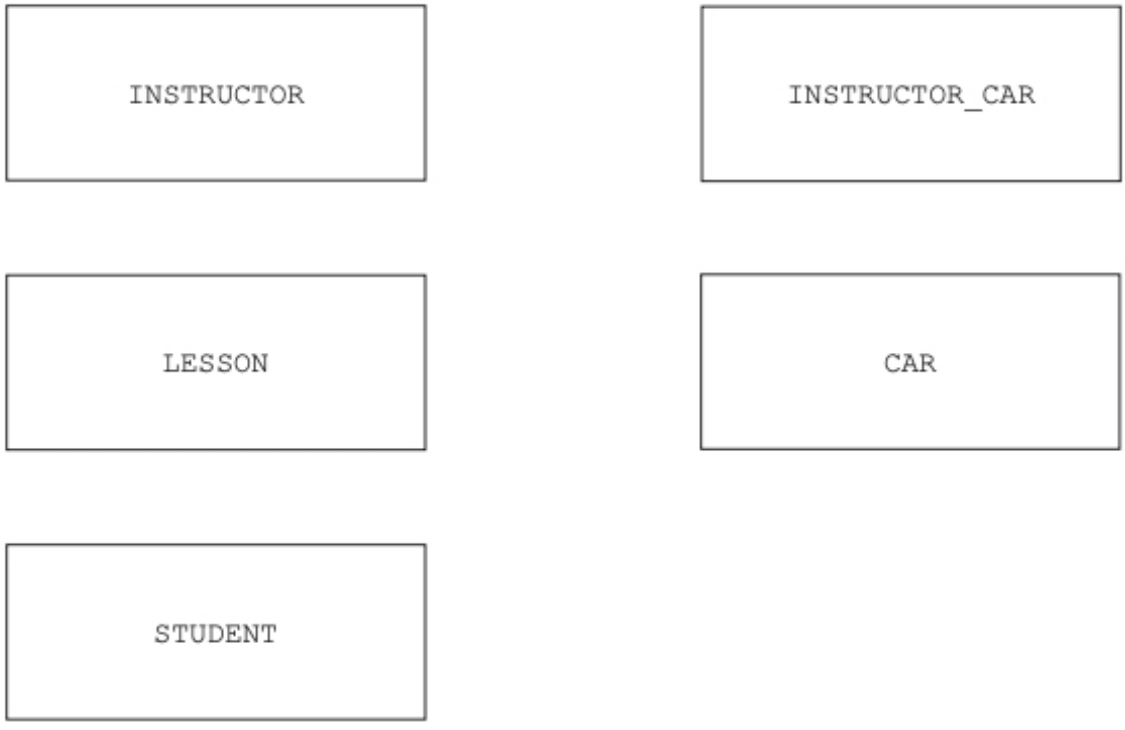
.....

2.....

.....

[2]

(b) Complete the entity-relationship diagram for the database DRIVING_SCHOOL.



[4]

(c) The table shows some sample data for the table `INSTRUCTOR`.

InstructorID	FirstName	LastName	DateOfBirth	Level
Ins01	Jayden	Han	05/06/1974	1
Ins02	Freda	Choi	06/02/1978	2
Ins03	Kelly	Kim	01/12/1966	1
Ins04	Santana	Thompson	09/09/1985	3

Complete the Data Definition Language (DDL) statement to create the table `INSTRUCTOR`.

```
..... TABLE INSTRUCTOR(
    InstructorID VARCHAR(5),
    FirstName VARCHAR(15),
    LastName VARCHAR(15),
    DateOfBirth DATE,
    Level ..... ,
    ..... (InstructorID)
);
```

[3]

(d) The table `STUDENT` needs an additional field to store the student's telephone number, for example 012-3456.

Write a Data Definition Language (DDL) statement to add the new field to the table `STUDENT`.

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..... [2]

(e) Write a Data Manipulation Language (DML) statement to return the date and time of all future lessons booked with the instructor whose `InstructorID` is Ins01.

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..... [4]

2 A veterinary surgery cares for sick animals. The surgery has a file-based database that stores data about the pets, their owners, and appointments made with the surgery.

The surgery wants to upgrade to a relational database.

(a) Explain the reasons why the surgery should upgrade their database.

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..... [4]

(b) The design for the surgery database, `SURGERY`, is:

```
PET(PetID, OwnerFirstName, OwnerLastName, PetName, PetBreed,
    PetDateOfBirth, TelephoneNumber)

APPOINTMENT(AppointmentID, Date, Time, StaffID, PetID)
```

(i) Give **one** reason why the database design for `SURGERY` is **not** in Third Normal Form (3NF).

.....

..... [1]

(ii) The database needs to be normalised to 3NF. A pet may have more than one owner an owner may have more than one pet.

The appointment table does not need to change and has been repeated below.

Give the name **and** attributes of three **additional** tables in 3NF. Identify the pri key(s) in each table.

APPOINTMENT(AppointmentID, Date, Time, StaffID, PetID)

Table 1 .....

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Table 2 .....

.....

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Table 3 .....

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.....

(c) Part of the table APPOINTMENT is shown. The veterinary surgery uses Data Manipul Language (DML) statements to search for appointments.

AppointmentID	Date	Time	StaffID	PetID
222010	02/02/2021	12:40	JK1	20CF
222011	02/02/2021	12:40	PP2	10DT
222012	02/02/2021	12:50	JK1	9RR
222013	02/02/2021	13:00	JK1	7MR

(i) Identify the industry standard language that provides both DML and Data Defi Language (DDL) statements.

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(ii) Write a DDL statement to update the table `APPOINTMENT` and define `Appointmer` as the primary key.

.....

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(iii) Complete the DML script to display the times and Pet IDs of all appointments 02/02/2021 with staff ID of 'JK1', in descending order of time.

```
SELECT ..... , .....
FROM APPOINTMENT
WHERE ..... AND .....
ORDER BY Time ..... ;
```

d) New pet owners complete a paper-based form to register their pets at the surgery.

(i) Describe **two** verification checks that can be carried out when the data from the pa based form is entered into the database.

1 .....

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.....

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2 .....

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(ii) Appointments can be booked between 09:00 and 16:50 on Monday to Friday.

Describe the ways in which the appointment date and time can be validated to make sure they are reasonable.

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.....

..... [2]

(e) The surgery has five computers that can all access the database. A copy of the database is stored centrally.

(i) Complete the description of this type of network model by filling in the missing terms.

The ..... model has one ..... that stores all the data for the surgery. The other computers are ..... . When a user requests data, a request is sent to the ..... .

[4]

(ii) The surgery wants to keep all data secure. The surgery network is not connected to the Internet.

Identify **two** authentication techniques the surgery could use to restrict access to the data.

1 .....

2 .....

[2]