s21 qp11:

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

.....

.....

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`.

.....

..... [1]

(c) A database has a data dictionary.

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

1 .....

2 .....

3 .....

[3]

s21 qp12:

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]

s21 qp13:

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.....

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.....

.....

[3]

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[1]

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

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(c) A database has a data dictionary.

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

1 .....

2 .....

3 .....

[3]

w21 qp11:

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]

w21 qp12:

8 An employment agency keeps records of its contracts with employers and workers in a relational database.

These are some of the tables in the database:

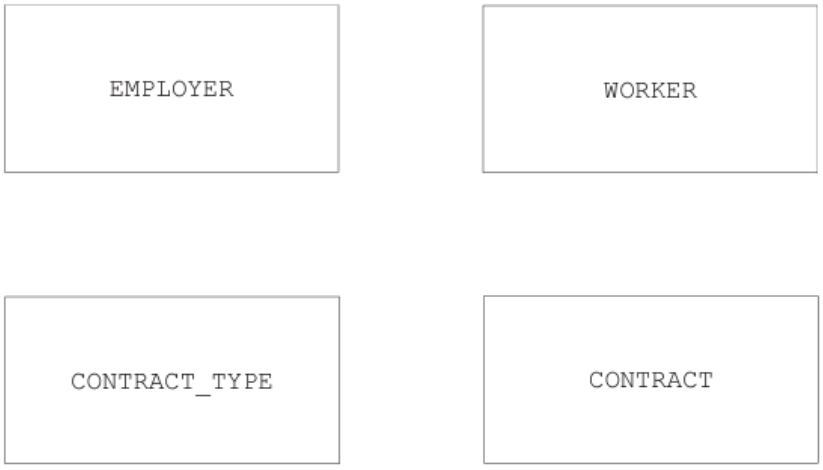
```
EMPLOYER(EmpId, EmpName, EmpAddress, EmpPhoneNumber)

WORKER(WkId, WkFirstName, WkLastName, WkAddress, WkPhoneNumber)

CONTRACT_TYPE(ConTypeId, ConName)

CONTRACT(ConId, ConTypeId, EmpId, WkId, RefConNumber)
```

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



[3]

(b) Write a Data Definition Language (DDL) statement to change the `CONTRACT` table to remove the attribute `RefConNumber`.

.....

.....

.....

..... [2]

(c) The following table has examples of DDL and Data Manipulation Language (DML) statements.

Tick (✓) **one** box in each row to identify whether each statement is an example of DML or DDL.

Statement	DML	DDL
`ADD PRIMARY KEY`		
`ALTER TABLE`		
`SELECT FROM`		
`INNER JOIN`		
`CREATE DATABASE`		

[2]

(d) The field `WkPhoneNumber` cannot be empty **and** must have a maximum of 14 characters.

Describe **two** ways the field `WkPhoneNumber` can be validated.

1 .....

.....

.....

.....

2 .....

.....

.....

.....

[4]

(e) State what is meant by a **candidate key**.

.....

..... [1]

(f) Describe what is meant by a **secondary key**.

.....

.....

.....

..... [2]

w21 qp13:

9 A company uses a relational database.

(a) The company stores data about its customers and their bank details.

Explain the ways in which the database can be set up to only allow certain people to see the bank details.

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..... [2]

(b) The database contains the following tables that store data about suppliers and stock.

`SUPPLIER(SupId, SupName, SupAddress, SupPhone, SupContactName)`

`STOCK(StockId, SupId, StockName, StockImage, NumberInStock)`

(i) Write Data Manipulation Language (DML) statements to return the supplier name, phone number and contact name, and the number of items in stock for the item with the stock ID of D930.

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..... [4]

(ii) The stock price needs to be included in the stock table.

$10.55 and $299.99 are two examples of stock prices.

Write Data Definition Language (DDL) statements to insert the attribute `StockPrice` into the table `STOCK`.

.....

.....

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..... [2]

(c) Three examples of items stored in the data dictionary of a relational database are:

Item	Purpose
Field name	to store the names of fields so they cannot be repeated in a table
Primary key	to uniquely identify each record in a table
Validation rule	to ensure that data entered is sensible

Identify **three other** examples of items stored in a data dictionary **and** give the purpose of each.

Item 1 .....

Purpose .....

.....

.....

Item 2 .....

Purpose .....

.....

.....

Item 3 .....

Purpose .....

.....

.....

[6]

(d) Draw **one** line from each database term to its matching description.

Database term	Description
Logical schema	An attribute that could be a primary key but is not selected to be a primary key
Referential integrity	An attribute in one table that is a primary key in another table
Query processor	The overview of a database structure
Primary key	An attribute or set of attributes that uniquely identifies each tuple
Secondary key	Data between linked tables is consistent
	Changing data to see what would happen in different scenarios
	The part of the DBMS that allows a user to search for data

[5]

s22 qp11:

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]

(d) The mark a student is awarded in a test will be entered into the database. This mark needs to be a whole number between 0 and the maximum number of marks for that test (inclusive).

Explain how data validation **and** data verification can be used when a mark is entered.

.....

.....

.....

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.....

..... [4]

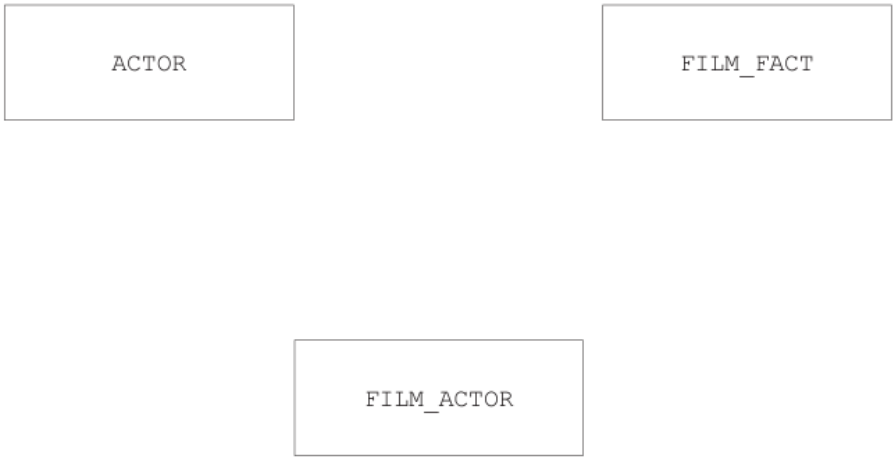
s22 qp12:

5 A database, FILMS, stores information about films and actors.

Part of the database is shown:

ACTOR(ActorID, FirstName, LastName, DateOfBirth)
FILM_FACT(FilmID, FilmTitle, ReleaseDate, Category)
FILM_ACTOR(ActorID, FilmID)

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



[2]

(b) A composite primary key consists of two or more attributes that together form the primary key.

Explain why the table FILM_ACTOR has a composite primary key.

.....

.....

.....

..... [2]

(c) Complete the SQL script to return the IDs of all the actors in the film with the title Cinderella.

```
SELECT .....

FROM FILM_ACTOR

INNER JOIN .....

ON FILM_FACT.FilmID = .....

WHERE FILM_FACT.FilmTitle = ..... ;
```

[4]

(d) Write an SQL script to count the number of films that were released in January 2022.

.....

.....

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.....

.....

..... [3]

(e) A Database Management System (DBMS) is used to create and manipulate the database.

Complete the descriptions of the features and tools found in a DBMS using the given terms. Not all terms will be used.

Boolean	**data dictionary**	**data redundancy**	**field names**
input	**interface**	**logical schema**	**normalisation**
operating system	**output**	**primary keys**	**query**
structure			

A DBMS provides data management. This includes the development of a

..... that stores information about the data stored, such as

..... and ..... .

The ..... uses methods, such as an E-R diagram, to show the structure of the database and its relationships.

The ..... processor allows a user to perform searches to find specific data. The DBMS also provides a developer ..... that allows the user to create tables, forms and reports.

[6]

s22 qp13:

6 A relational database, TECHNOLOGY, stores data about the staff in a company and the computer devices used by the staff.

The database has the following tables:

STAFF(StaffID, FirstName, LastName, DateOfBirth, JobTitle)

DEVICE(DeviceID, Type, DatePurchased, StaffID)

(a) Describe the relationship between the two tables. Refer to the primary and foreign keys in your answer.

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..... [4]

(b) The database uses a Data Definition Language (DDL) and Data Manipulation Language (DML).

(i) Complete the SQL script to return the number of devices stored in the database for the staff member with the first name 'Ali' and last name 'Khan'.

```
SELECT ..... (STAFF.StaffID)

FROM .....

INNER JOIN DEVICE

..... STAFF.StaffID = DEVICE.StaffID

WHERE STAFF.FirstName = 'Ali'

..... STAFF.LastName = 'Khan';
```

[4]

(ii) The table `DEVICE` needs a new attribute to store whether the device has been returned by the staff member, or not.

Write a Structured Query Language (SQL) script to insert the new attribute into the table `DEVICE`.

.....

.....

.....

..... [2]

(c) The database is in Third Normal Form (3NF).

Complete the table by describing the three normal forms.

Normal Form	Description
First Normal Form (1NF)	....
Second Normal Form (2NF)	....
Third Normal Form (3NF)	....

[3]

w22 qp11:

4 A photographer creates a relational database to store data about photographs taken at birthday parties.

The database, PHOTOGRAPHS, stores details of the customer, the party, the photographs taken and the cameras used.

The photographer has several cameras that are used for taking the photographs at the parties.

Each camera has a specific lens type (for example, XY32Z) and lighting type (for example, F1672).

Data about each photograph is stored in the database including the party at which it was taken, the time it was taken and the camera used.

The database has these four tables:

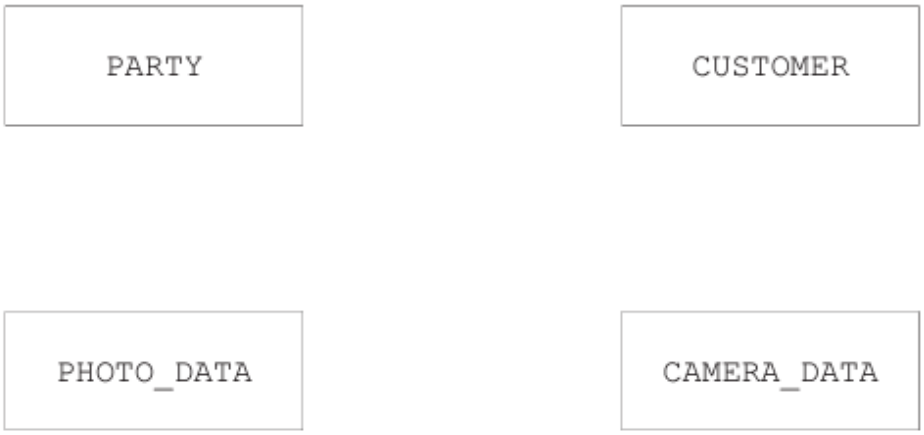
CUSTOMER(CustomerID, FirstName, LastName, Telephone)

PARTY(PartyID, CustomerID, PartyDate, StartTime)

PHOTO_DATA(PhotoID, PartyID, TimeTaken, CameraID)

CAMERA_DATA(CameraID, LensType, LightingType)

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



[3]

(b) The database is normalised and is in Third Normal Form (3NF).

Describe the characteristics of a database that is in Third Normal Form (3NF).

.....

.....

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.....

.....

..... [3]

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

PhotoID	PartyID	TimeTaken	CameraID
ST23-56	BD987	08:34	NIK-02
ST23-57	BD987	08:55	NIK-02
ST23-60	BC08	09:01	CAN-01
ST23-61	BC08	10:23	CAN-12
ST23-62	BC08	10:56	NIK-01

(i) State what is meant by a **tuple**. Give an example of a tuple from `PHOTO_DATA`.

Tuple .....

.....

Example .....

.....

[2]

(ii) Complete the Structured Query Language (SQL) script to display the total number of photographs that have been taken using a camera with a camera ID starting with `CAN`.

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

FROM .....

WHERE CameraID LIKE .....;
```

[4]

(d) Write an SQL script to include two new fields in `CAMERA_DATA` to store the number of photographs currently on the camera **and** the date the camera was last used.

.....

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.....

..... [3]

w22 qp12:

5 A relational database, GARDEN, has the following tables:

OWNER(OwnerID, FirstName, TelephoneNo, TreeID, TreePosition)

TREE(TreeID, ScientificName, MaxHeight, FastGrowing)

(a) The database is **not** in Third Normal Form (3NF).

Explain how the database can be normalised to 3NF.

.....

.....

.....

.....

.....

..... [3]

(b) Write the Structured Query Language (SQL) script to add a new record in the table TREE to store the following data:

Attribute	Value
TreeID	LOW_1276
ScientificName	Salix_Alba
MaxHeight	30.00
FastGrowing	TRUE

.....

.....

.....

..... [3]

(c) State what is meant by a **candidate key** in a relational database.

.....

..... [1]

(d) **(i)** Describe, using an example, what is meant by a **data dictionary**.

.....

.....

.....

..... [2]

(ii) Describe what is meant by a **logical schema**.

.....

.....

.....

..... [2]

w22 qp13:

2 The relational database ASTRONOMY is used to store data about telescopes, the companies that own the telescopes and the photographs taken by the telescopes.

The database has these three tables:

```
COMPANY(TelephoneNumber, CompanyID, CompanyName)

PHOTOGRAPH(PhotoID, TelescopeID, DateTaken, TimeTaken, Elevation)

TELESCOPE(TelescopeID, CompanyID, SerialNumber)
```

(a) Complete the following table by writing the correct answer for each item.

Item	Answer
a suitable field for the primary key in COMPANY	
a candidate key in TELESCOPE	
the degree of relationship between TELESCOPE and PHOTOGRAPH	

[3]

(b) A Database Management System (DBMS) has several features.

Identify the feature that describes the relationship between data and its structure.

..... [1]

(c) Complete the SQL script to return the total number of telescopes owned by the company whose ID begins with HW.

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

FROM TELESCOPE

WHERE ..... LIKE .....;
```

[4]

(d) Write the SQL script to add **one** field to the table `PHOTOGRAPH` to store the resolution of the photograph, e.g. 1920 × 1068.

.....

.....

.....

..... [2]

(e) The photographs are stored as bitmap images.

Complete the statements about bitmap images by writing the missing words.

The ..... of a bitmap image is the number of bits that are used to store each pixel.

Metadata about the image is stored in the ..... of the file.

[2]

(f) Describe the purpose of a query processor in a DBMS.

.....

.....

.....

..... [2]