

2 A relational database, WORKEXPERENCE, stores data about students and the companies where they complete work experience.

Students can complete multiple work experience placements but can only complete one placement at a time.

Students can complete more than one placement at the same company.

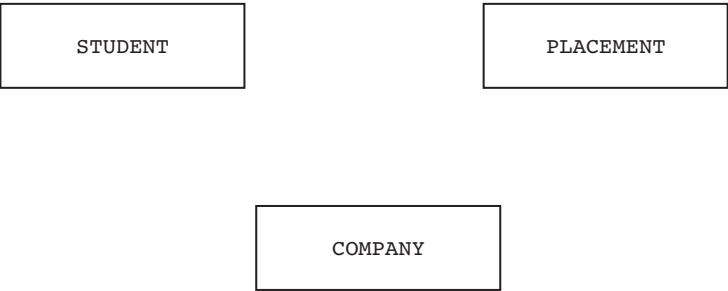
Part of the database is shown:

STUDENT(StudentID, FirstName, TelephoneNumber, UniversityName)

PLACEMENT(PlacementID, StudentID, CompanyID, StartDate, EndDate, Complete)

COMPANY(CompanyID, CompanyName, MaxStudentsPerPlacement)

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



[2]

(b) Explain why the database WORKEXPERENCE is in Third Normal Form (3NF).

[2]

(c) Some example data from the PLACEMENT table is shown:

PlacementID	StudentID	CompanyID	StartDate	EndDate	Complete
PC001	LDEA01	MSCM	01/01/2023	12/07/2023	TRUE
PC002	LDEA01	MSCM	01/04/2024	08/05/2024	FALSE
PC003	ALAU02	NEAM	09/03/2020	10/03/2021	FALSE
PC004	LOLI75	GOUZ	07/06/2018	11/09/2018	TRUE

(i) Write a Structured Query Language (SQL) script to delete all placements that have been completed.

[2]

(ii) Write an SQL script to return the total number of placements completed by the student with ID LDEA01 at the company with ID NEAM. The total should be given an appropriate name.

[4]

(d) The database tables are repeated here:

```
STUDENT(StudentID, FirstName, TelephoneNumber, UniversityName)

PLACEMENT(PlacementID, StudentID, CompanyID, StartDate, EndDate,
          Complete)

COMPANY(CompanyID, CompanyName, MaxStudentsPerPlacement)
```

Explain what is meant by referential integrity, and how it applies to this database.

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..... [3]

4 A relational database, SHIPPING, stores data about the ships in a company and the containers that are carried on the ships.

The database has the following tables:

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CONTAINER(ContainerID, Type, Weight, OwnerName, ShipID)

SHIP(ShipID, Type, Capacity, ShipName)
```

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

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..... [2]

(b) The table CONTAINER needs an additional field to store the data for the last inspection date.

Write a Structured Query Language (SQL) script to add **one** field to the table CONTAINER to store the date of last inspection of the container, for example 08/07/2019.

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(c) Write an SQL script to return the number of containers stored in the database for the ship with the name Caledonia.

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(d) Describe the purpose of a developer interface in a Database Management System (DBMS).

..... [2]

5 A company creates a relational database to store data about its customers.

The database, `REVIEWS`, stores data about the customers, products, complaints and staff.

The database has four tables:

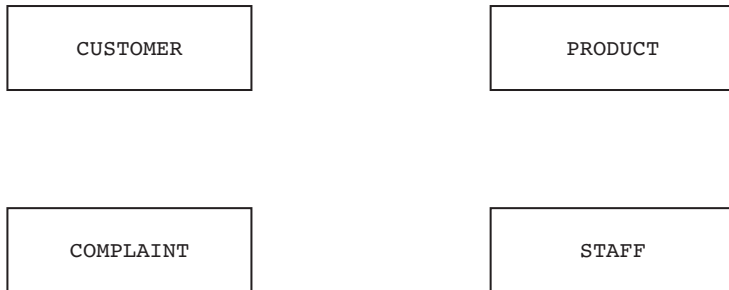
CUSTOMER(CustomerID, CustomerFirstName, CustomerLastName, CustomerEmail)

```
PRODUCT(ProductID, ProductName, ProductDetail, Price, Rating)
```

```
COMPLAINT(ComplaintID, ProductID, CustomerID, ComplaintDetails, StaffID)
```

```
STAFF(StaffID, StaffFirstName, StaffLastName, Department, RemoteWorker)
```

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



[3]

(b) Some example data from the `STAFF` table is shown.

StaffID	StaffFirstName	StaffLastName	Department	RemoteWorker
1	Ralph	Jura	E	Yes
2	Luca	Emcee	A	Yes
3	Darwin	Acula	F	No

Write a Structured Query Language (SQL) script to define the table `STAFF`.

[4]

(c) Products are given a rating between 1 and 10 inclusive.

Write an SQL script to return only the **ProductID**, **ProductName** and **ComplaintDetails** for all products with a rating of 5 or less. The results need to be displayed in descending order of rating.

[illegible]

(d) A Database Management System (DBMS) is used to maintain and manage the database.

Describe **two** ways in which the DBMS can be used to ensure the security of the customer data.

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- 2
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[4]

Question 6 starts on the next page.

5 A company builds and sells furniture to customers. The company stores data about customers, their payment cards and their furniture orders in a database.

The database, FURNITURE, has the following tables:

CUSTOMER(CustomerID, Name, Phone)

CUSTOMER_CARD_DATA(CardID, CustomerID, CardType, CardNumber, EndDate)

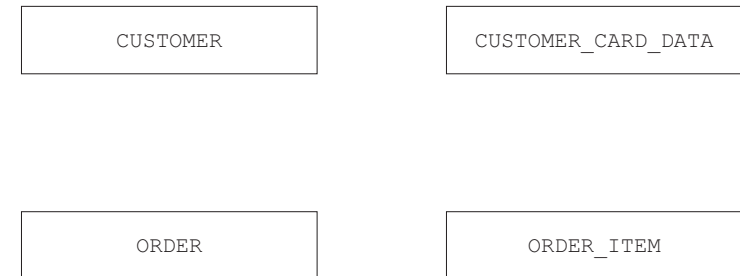
ORDER(OrderID, CustomerID, TotalCost, Paid, OrderDate, Complete)

ORDER_ITEM(OrderItemID, OrderID, Type, Height, Width, Depth, Details)

The primary keys are underlined in each table.

The attribute Complete in the table ORDER stores the Boolean value TRUE if the order has been built and FALSE if the order has not been built.

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



[3]

(b) Identify **one** attribute in the table CUSTOMER_CARD_DATA that could be a candidate key.

..... [1]

(c) Identify **two** tables in the database that contain one or more foreign keys.
Give **one** attribute that is a foreign key in each table.

	Table	Foreign key
1		
2		

[2]

- (d) Explain the reasons why the data in the table `ORDER_ITEM` cannot be stored in the table `ORDER`

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[3]

- (e) Write an Structured Query Language (SQL) script to output the customer ID, the customer's name and the total cost of the customer's orders that have **not** been paid.

The output of the total cost must have an appropriate title.

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[4]

- 2 A shop repairs electronic devices, for example mobile phones and tablet computers. The shop owner stores the data about the repairs using a file-based approach.

- (a) Give **one** limitation of using a file-based approach to store the data **and** explain how a relational database addresses this limitation.

Limitation

Explanation

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[3]

- (b) The shop owner creates a relational database called `FIXIT`.

The database stores data about the customers and the devices for repair.

Some devices need new parts that are ordered from suppliers.

The database `FIXIT` is designed to include the following tables:

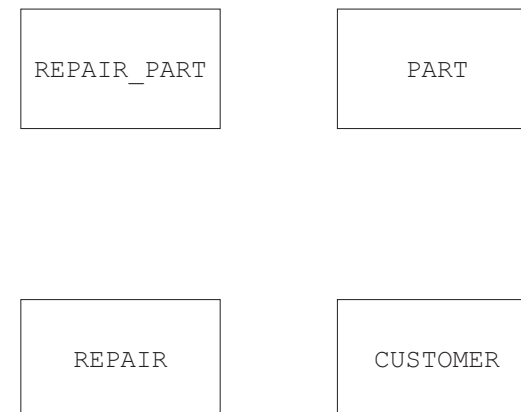
`PART(PartID, Description, Price, SupplierID)`

`CUSTOMER(CustomerID, FirstName, LastName, ContactNumber)`

`REPAIR(RepairNumber, StartDate, EndDate, CustomerID, Device)`

`REPAIR_PART(PartID, RepairNumber, Quantity)`

- (i) Complete the entity-relationship (E-R) diagram for the given tables.



- | Term | Definition |
|-----------------------|---------------------------|
| Referential integrity | <p>.....</p> <p>.....</p> |
| Candidate key | <p>.....</p> <p>.....</p> |
| Tuple | <p>.....</p> <p>.....</p> |

[3]

(ii) The database also has the table `INVOICE` that stores data about each invoice that is sent to a customer.

Example data from the table `INVOICE` is given.

InvoiceID	DateSent	Amount	Paid	JobID
29262	12/12/2023	105.20	Y	221
26765	11/11/2023	200.00	Y	315
13290	02/01/2024	50.00	Y	315
34090	05/02/2024	25.95	N	569

..... [3]

The database is normalised and includes these tables:

- (i) Identify each relationship between the database tables **and** explain how each relationship can be implemented in the normalised database.

..... [6

- [4]

- (16)

4 An assessment board wants to store the marks students achieved in exams in a database named RECORDS.

Part of the database design includes these two tables:

EXAM(ExamID, Subject, Level, TotalMarks)

```
EXAM QUESTION (ExamQuestionID, ExamID, QuestionNumber, Question, MaxMark)
```

(a) Identify the relationship between EXAM and EXAM QUESTION.

[1]

(b) Sample data for the table EXAM is shown:

ExamID	Subject	Level	TotalMarks
00956124	Computer Science	2	75
00956125	Computer Science	3	120
00956126	Mathematics	2	100
00956127	Mathematics	3	150
00956128	Physics	2	70
00956129	Physics	3	80

Write a Structured Query Language (SQL) script to define the table `EXAM`.

[3]

(c) The table EXAM QUESTION has been created but the foreign key has not been linked.

Write an SQL script to update EXAM QUESTION and link the foreign key to EXAM.

[2]

(d) The database also needs to store data about the students, the exams the students have taken and the marks the students achieved in each question of each exam.

Describe the additional tables that will need to be included in the database **and** explain how all the tables in the database will be linked.

[5]