

# QUESTION 4.



8 A school stores a large amount of data. This includes student attendance, contact details. The school's software uses a file-based approach to store this data.

(a) The school is considering changing to a DBMS.

(i) State what DBMS stands for.

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(ii) Describe **two** ways in which the Database Administrator (DBA) could use the DBMS software to ensure the security of the student data.

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(iii) A feature of the DBMS software is a query processor.

Describe how the school secretary could use this software.

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(iv) The DBMS has replaced software that used a file-based approach with a relational database.

Describe how using a relational database has overcome the previous problems associated with a file-based approach.

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**Question 9 begins on page 12.**

# QUESTION 5.



5 (a) A Database Management System (DBMS) provides the following features.

Draw a line to match each feature with its description.

Feature	Description
Data dictionary	A file or table containing all the details of the database design
Data security	Data design features to ensure the validity of data in the database
Data integrity	A model of what the database will look like, although it may not be stored in this way
	Methods of protecting the data including the uses of passwords and different access rights for different users of the database

[3]

A school stores a large amount of data that includes student attendance, qualification and contact details. The school is setting up a relational database to store these data.

(b) The school needs to safeguard against any data loss.

Describe **three** factors to consider when planning a backup procedure for the data.

Justify your decisions.

- 1 .....
  - 2 .....
  - 3 .....
- .....[6]



- (c) The database design has three tables to store the qualifications and grades attained. The following is a sample of the data from each table.

**STUDENT**

StudentID	FirstName	LastName	Tutor
001AT	Ahmad	Tan	11A
003JL	Jane	Li	11B
011HJ	Heather	Jones	10A

**QUALIFICATION**

QualCode	Level	Subject
CS1	IGCSE	Computer Science
MT9	IGCSE	Maths
SC12	IGCSE	Science

**STUDENT-QUALIFICATION**

QualCode	StudentID	Grade	DateOfAward
SC12	011HJ	A	31/8/2014
SC12	003JL	C	31/8/2014
CS1	003JL	B	31/8/2014

- (i) Draw an Entity-Relationship (E-R) diagram to show the relationships between these three tables.

[2]

- (ii) State the type of relationship that exists between **STUDENT** and **STUDENT-QUALIFICATION**.

.....[1]



**(iii)** Describe how the relationship between `QUALIFICATION` and `STUDENT-QUALIFICATION` is implemented.

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**(d) (i)** The database will store each student's date of birth.

Write an SQL script to add a date of birth attribute to the appropriate table.

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.....[2]

**(ii)** Write an SQL script to display the `StudentID`, `Grade` and `DateOfAward` for the `QualCode` value of `SC12`.

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.....[3]

**(iii)** Write an SQL script to display the `FirstName` and `LastName` and `QualCode` for all `STUDENT-QUALIFICATIONS` for which the `Grade` value is `A`.

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# QUESTION 6.



2 (a) State **two** differences between Static RAM (SRAM) and Dynamic RAM (DRAM).

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2 .....

.....[2]

(b) (i) Explain why a computer needs an operating system.

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.....[2]

(ii) Give **two** key management tasks carried out by an operating system.

1 .....

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2 .....

.....[2]

(c) New program code is to be written in a high-level language. The use of Dynamic Link Library (DLL) files is considered in the design.

Describe what is meant by a DLL file.

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# QUESTION 7.



- 9 A health club offers classes to its members. A member needs to book into each class.
- (a) The health club employs a programmer to update the class booking system. The programmer has to decide how to store the records. The choice is between using a relational database or a file-based approach.

Give **three** reasons why the programmer should use a relational database.

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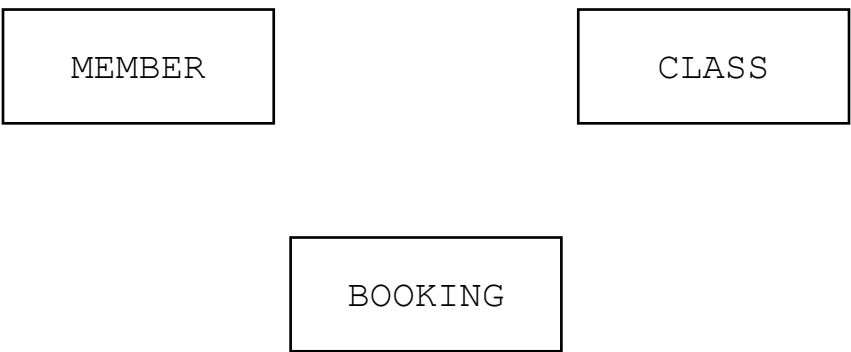
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.....[6]

- (b) The programmer decides to use three tables: MEMBER, BOOKING and CLASS.
- Complete the Entity-Relationship (E-R) diagram to show the relationships between these tables.





8 A programmer is writing a program that includes code from a program library.

(a) Describe **two** benefits to the programmer of using one or more library routines.

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.....[4]

(b) The programmer decides to use a Dynamic Link Library (DLL) file.

(i) Describe **two** benefits of using DLL files.

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.....[4]

(ii) State **one** drawback of using DLL files.

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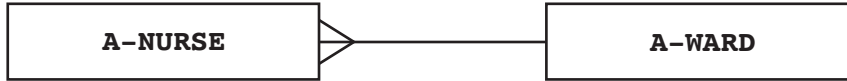
.....[2]

# QUESTION 8.



1 A hospital is divided into two areas, Area A and Area B. Each area has several wards. The ward names are different.

A number of nurses are based in Area A. These nurses always work on the same ward. Each nurse has a unique Nurse ID of `STRING` data type.



(a) Describe the relationship shown above.

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 .....[1]

(b) A relational database is created to store the ward and nurse data. The two table designs for Area A are:

A-WARD (WardName, NumberOfBeds)

A-NURSE (NurseID, FirstName, FamilyName, .....)

(i) Complete the design for the A-NURSE table. [1]

(ii) Explain how the relationship in part (a) is implemented.

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 .....  
 .....[2]

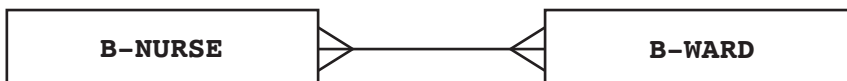
(c) In Area B of the hospital, there are a number of wards and a number of nurses.

Each Area B ward has a specialism.

Each Area B nurse has a specialism.

A nurse can be asked to work in any of the Area B wards where their specialism matches with the ward specialism.

The relationship for Area B of the hospital is:



(i) Explain what the degree of relationship is between the entities B-NURSE and B-WARD.

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 .....[1]



(ii) The design for the Area B data is as follows:

B-NURSE (NurseID, FirstName, FamilyName, Specialism)

B-WARD (WardName, NumberOfBeds, Specialism)

B-WARD-NURSE ( ..... )

Complete the attributes for the third table. Underline its primary key. [2]

(iii) Draw the relationships on the entity-relationship (E-R) diagram.



[2]

(d) Use the table designs in part (c)(ii).

(i) Write an SQL query to display the Nurse ID and family name for all Area B nurses with a specialism of 'THEATRE'.

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.....  
.....[3]

(ii) Fatima Woo is an Area B nurse with the nurse ID of 076. She has recently married, and her new family name is Chi.

Write an SQL command to update her record.

UPDATE .....  
SET .....  
WHERE .....

[3]

## QUESTION 9.



- 1 Some shops belong to the Rainbow Retail buying group. They buy their goods from several suppliers.

Each shop has:

- a unique shop ID
- a single retail specialism (for example, food, electrical, garden).

Each supplier has:

- a unique supplier ID
- a similar single specialism recorded.

Rainbow Retail creates a relational database to record data about the shops and their suppliers.

The entity-relationship (E-R) diagram for the relationship between the `SHOP` and `SUPPLIER` tables is shown.



- (a) Explain what the degree of relationship is between the entities `SHOP` and `SUPPLIER`.

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.....[1]

The database design is as follows:

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SHOP (ShopID, ShopName, Location, RetailSpecialism)
```

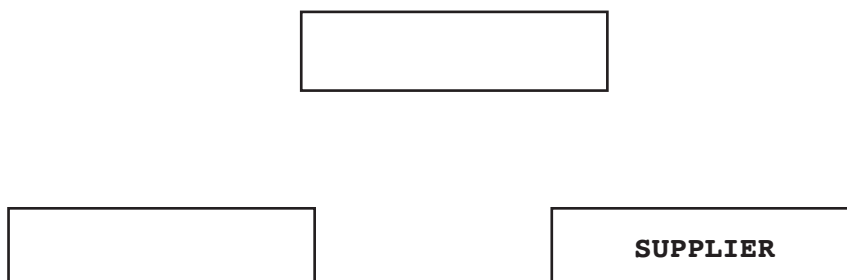
```
SUPPLIER (SupplierID, SupplierName, ContactPerson, RetailSpecialism)
```

```
SHOP-SUPPLIER (ShopID, SupplierID)
```

The `SHOP-SUPPLIER` table stores the suppliers that each shop has previously used.

Primary keys are not shown.

- (b) (i) Label the entities and draw the relationships to complete the revised E-R diagram.



[3]



(ii) Complete the following table to show for each database table:

- the primary key
- the foreign key(s) (if any):
  - Each table may contain none, one or more foreign key(s).
  - For a table with no foreign key, write 'None'.
- an explanation for the use of any foreign key.

Table	Primary key	Foreign key(s) (if any)	Explanation
SHOP			
SUPPLIER			
SHOP-SUPPLIER			

[5]

(iii) The database designer has implemented `SUPPLIER.ContactPerson` as a secondary key.

Describe the reason for this.

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..... [2]

(c) (i) Write an SQL query to display the shop ID and location of all shops with a 'GROCERY' specialism.

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..... [3]

(ii) The existing shop with ID 8765 has just used the existing supplier SUP89 for the first time.

Write an SQL script to add this data to the database.

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..... [3]

## QUESTION 10.



- 7 A clinic is staffed by several doctors. The clinic serves thousands of patients. Each one time, there is only one doctor in the clinic available for appointments.

The clinic stores patient, doctor and appointment data in a relational database.

- (a) (i) Underline the primary key for each table in the following suggested table designs.

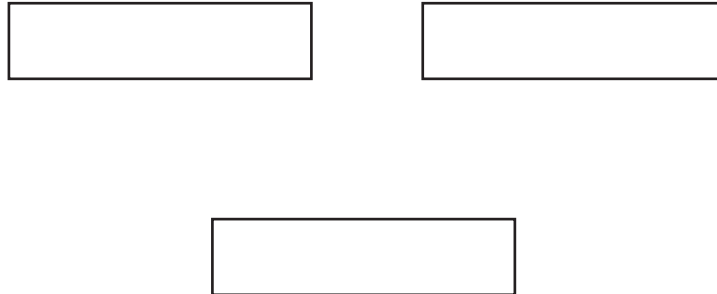
PATIENT(PatientID, PatientName, Address, Gender)

DOCTOR(DoctorID, Gender, Qualification)

APPOINTMENT(AppointmentDate, AppointmentTime, DoctorID, PatientID)

[2]

- (ii) Complete the following entity-relationship (E-R) diagram for this design.



[2]

- (b) The doctors are concerned that many patients make appointments but do not attend them.

Describe the changes to the table designs that could be made to store this information.

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.....[2]



- (c) The doctors are about to set up a new clinic in the neighbouring village, SITE-B. The original location is identified as SITE-A.

A new table is designed to store the ID of the doctor who is able to work at each site.

DOCTOR-AVAILABILITY (DoctorID, Site)

Five entries stored in the table are:

DoctorID	Site
098	SITE-A
074	SITE-A
117	SITE-B
098	SITE-B
033	SITE-B

- (i) State what this data shows about the availability of the doctor with the ID of 098.

.....  
 .....[1]

- (ii) Opening a new clinic in the neighbouring village will not require any additional table for storing appointments. It will need a change to the existing appointment table design.

Show the revised APPOINTMENT table.

APPOINTMENT ( .....  
 ..... ) [1]

- (d) The doctor with the ID of 117 has recently been allocated a new DoctorID of 017.

- (i) Write an SQL script to update this doctor's record in the database.

UPDATE .....  
 SET .....  
 WHERE ..... [3]

- (ii) Describe why this update could cause problems with the existing data stored.

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 .....  
 .....[2]

## QUESTION 11.

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7 A company takes customer service for its clients very seriously.

The client

- The client names are unique.

A visit

- The company arranges a date for a visit to gather feedback from a client.
- A visit to a client never takes more than one day.
- Over time, the client receives many visits.

Staff (Interviewers)

- One or more staff attend the visit.
- If there is more than one staff member visiting, each performs a separate interview.

Interviews

- Each interview is classified as either 'general' or by some specialism, for example, marketing, customer service or sales.
- A report is produced for each interview, *InterviewText*.
- Each interview is conducted by a single staff member.

The client, visit, staff and interview data will be stored in a relational database.

**(a) (i)** Underline the primary key for each table in the following suggested table designs.

STAFF(StaffID, StaffName, Department)

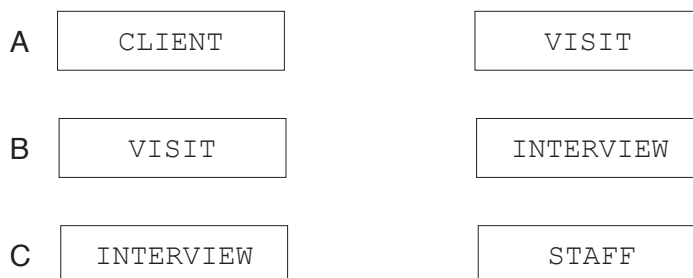
CLIENT(ClientName, Address, Town)

VISIT(ClientName, VisitDate)

INTERVIEW(ClientName, VisitDate, StaffID, SpecialistFocus, InterviewText)

[3]

**(ii)** For each of the pairs of entities, A, B and C, draw the relationship between the two entities.



[3]



## QUESTION 12.



- 7 A movie theatre has a relational database that stores the movie schedule, and information about the movies. The theatre has several screens that play movies at the same time.

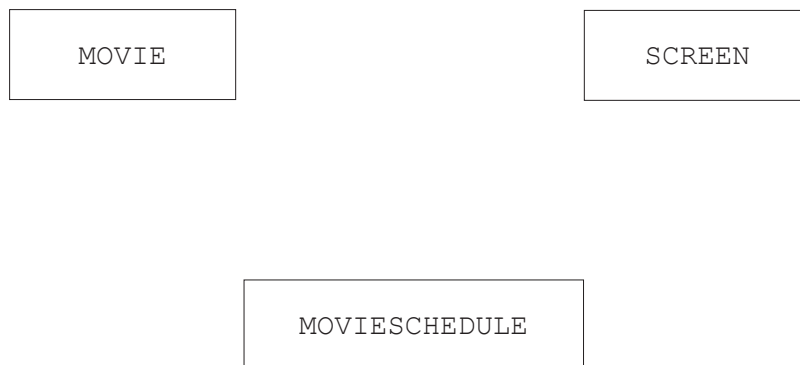
The database has three tables to store information about the movies, the screens and the movie schedule.

```
MOVIE(MovieID, Title, Length, Rating)
```

```
SCREEN(ScreenNumber, NumberSeats)
```

```
MOVIESCHEDULE(ScheduleID, MovieID, ScreenNumber, Time)
```

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



[2]

- (b) Explain how primary and foreign keys are used to link the tables in the movie theatre database.

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## QUESTION 13.



3 Kimmy has written a program in a high-level language.

(a) Kimmy has used library routines in the program.

(i) Describe **two** advantages of using library routines in the program.

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2 .....

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[4]

(ii) Describe what is meant by a **Dynamic Link Library** (DLL).

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[2]

(b) Three translators are compilers, interpreters, and assemblers.

(i) State **one** benefit of Kimmy using an **interpreter** during the development of the program.

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[1]

(ii) State **three** benefits of Kimmy using a **compiler** when the program is complete.

1 .....

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2 .....

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3 .....

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[3]

## QUESTION 14.



3 A company uses a relational database, `EMPLOYEES`, to store data about its departments.

(a) The company uses a Database Management System (DBMS).

(i) The DBMS has a data dictionary.

Describe what the data dictionary stores.

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..... [2]

(ii) The DBMS has a query processor.

Describe the purpose of a query processor.

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.....  
..... [2]

(b) Relationships are created between tables using primary and foreign keys.

Describe the role of a primary and a foreign key in database relationships.

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..... [2]



(c) In the company:

- An employee can be a manager.
- A department can have several managers and several employees.
- An employee can only belong to one department.

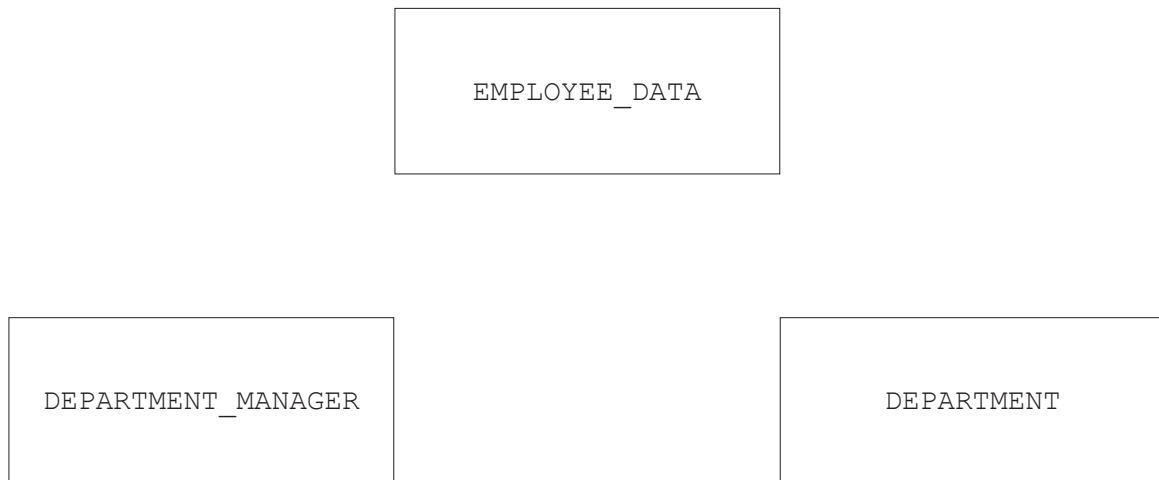
The EMPLOYEES database has three tables:

EMPLOYEE\_DATA(EmployeeID, FirstName, LastName, DateOfBirth, Gender, DepartmentNumber)

DEPARTMENT(DepartmentNumber, DepartmentName)

DEPARTMENT\_MANAGER(DepartmentNumber, EmployeeID, role)

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



[3]

(d) Give **three** reasons why the EMPLOYEES database is fully normalised.

- 1 .....
- 2 .....
- 3 .....

[3]





## QUESTION 15.



4 Anushka needs to store information about bookings at a sports club.

(a) Anushka has a file-based storage system. She wants a relational database.

(i) Describe the features of a relational database that address the limitations of Anushka's file-based system.

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..... [4]

(ii) The relational database design needs to be normalised. The following statements describe the three stages of database normalisation.

Complete the statements by filling in the missing words.

For a database to be in First Normal Form (1NF) there must be no ..... groups of attributes.

For a database to be in Second Normal Form (2NF), it must be in 1NF, and contain no ..... key dependencies.

For a database to be in Third Normal Form (3NF), it must be in 2NF, and all attributes must be fully dependent on the .....

[4]





(b) The **normalised** relational database, SPORTS\_CLUB, has the following tables:

MEMBER (MemberID, FirstName, LastName, MembershipType)

SESSION (SessionID, Description, SessionDate, SessionTime, NumberMembers)

TRAINER (TrainerID, TrainerFirstName, TrainerLastName)

MEMBER\_SESSION (MemberID, SessionID)

SESSION\_TRAINER (SessionID, TrainerID)

(i) Anushka has designed an entity-relationship (E-R) diagram for SPORTS\_CLUB.

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



[2]

(ii) Anushka first needs to create the database that she has designed.

Write a Data Definition Language (DDL) statement to create the SPORTS\_CLUB database.

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..... [1]



(iii) The table shows some sample data for the table `SESSION`.

<code>SessionID</code>	<code>Description</code>	<code>SessionDate</code>	<code>SessionTime</code>	<code>NumberMembers</code>
21PL	Pilates junior	04/04/2020	18:00	15
13AE	Aerobics senior	04/04/2020	19:00	20
33WG	Weightlifting advanced	04/04/2020	10:00	10

Write a DDL script to create the table `SESSION`.

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..... [5]

(iv) Write a Data Manipulation Language (DML) script to return the first name and last name of all members who have `Peak` membership type.

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..... [3]

## QUESTION 16.



3 A hotel needs to record information about customers and their bookings.

(a) The hotel has two types of room: double and family. Each room has a unique room number.

The hotel stores information about the customers including their name, address and contact details.

When a customer books a room, they give the start date and the number of nights they want to stay. If a customer wants more than one room, each room must have a separate booking. Each booking has an ID number.

The hotel creates a normalised, relational database to store the required information. There are three tables:

- CUSTOMER
- ROOM
- BOOKING

(i) Complete the database design for the hotel by writing the attributes for each table.

CUSTOMER ( .....  
.....  
..... )

ROOM ( .....  
.....  
..... )

BOOKING ( .....  
.....  
..... )

[3]

(ii) Identify the primary key for each table that you designed in **part (a)(i)**.

CUSTOMER .....

ROOM .....

BOOKING .....

[2]



(iii) Identify **one** foreign key in the tables that you designed in **part (a)(i)**.

Table name .....

Foreign key .....

(b) The hotel wants to use a Database Management System (DBMS) to set up and manage the database.

Describe, using examples, how the hotel can use the following DBMS tools:

Developer interface .....

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Query processor .....

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[5]

(c) The following table has four SQL scripts.

Tick (✓) **one** box in each row to identify whether the script is an example of a Data Definition Language (DDL) statement or a Data Manipulation Language (DML) statement.

Script	DDL	DML
CREATE TABLE FILMS		
SELECT FilmID FROM FILMS		
ALTER TABLE FILMS ADD PRIMARY KEY (FilmID)		
CREATE DATABASE MYDATA		

[2]