AS/A Level Computer Science Exam Question 1:

Mehrdad has a holiday company database that includes:

.

- data about holidays, such as the location, date, duration (in days)
- data about the customers and the holidays they have booked.

(a) Mehrdad has **normalised** the database, which has three tables.

(i) Draw an entity–relationship (E–R) diagram for the **normalised** tables.

[3]

AS/A Level Computer Science Exam Question 1:

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(ii) Complete the table to identify the primary key and foreign key(s) for each of the tables you identified in **part (a)(i)**. If the table has no foreign key(s), write 'None'.

Table name	Primary key	Foreign key

[3]

(iii) Explain why the holiday database is in Third Normal Form (3NF).

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..... [2]

AS/A Level Computer Science Exam Question 1:

(b) The holiday company has several members of staff. The database has **two** additional tables to store data about the staff.

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STAFF(StaffID, FirstName, SecondName, DateOfBirth, Role, Salary)

SCHEDULE(ScheduleID, StaffID, WorkDate, Morning, Afternoon)

The following table shows some sample data from the table SCHEDULE.

ScheduleID	StaffID	WorkDate	Morning	Afternoon
210520-1	BC	21/05/2020	TRUE	TRUE
210520-2	JB	21/05/2020	TRUE	FALSE
220520-1	BC	22/05/2020	FALSE	TRUE
220520-2	LK	22/05/2020	TRUE	FALSE

(i) Write an SQL script to display the first name and second name of all staff members working on 22/05/2020.

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AS/A Level Computer Science Exam Question 1:

(ii) Write an SQL script to count the number of people working on the morning of 26/05/2020.

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AS/A Level Computer Science Exam Question 2:

A software company produces software and distributes it under different software licences.

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(a) Four descriptions of software licences are given.

Write the type of software licence that best fits each description. Use a different type of licence for each description.

1. The software can be legally used, only after a fee has been paid.

Licence type .....

2. The source code comes with the software. If the software is modified, the edited source code must be released under the same conditions as the original software.

Licence type .....

3. The software is free for a trial period and then a fee is requested, or expected, if the user wants to continue to use the software.

Licence type .....

4. The source code comes with the software. The software is free to be downloaded, edited, and distributed, possibly without restriction.

Licence type .....

[4]

AS/A Level Computer Science Exam Question 2:

(b) The software company stores information about customers and the software licences they have purchased. The company considers a file-based approach for the storage and retrieval of data.

(i) Give **three** limitations of a file-based approach to store the data.

1 .....

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2 .....

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3 .....

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[3]

(ii) The software company decides to use a database to overcome the limitations of a file-based system. Some of these limitations are addressed through the logical schema.

Name **and** describe **two** levels of the schema of a database.

Name 1 .....

Description .....

.....

Name 2 .....

Description .....

.....

[4]

AS/A Level Computer Science Exam Question 2:

(c) The database has the following tables:

```
CUSTOMER(CustomerID, CompanyName)

SOFTWARE(SoftwareID, SoftwareName, OperatingSystem, Description)

LICENCE(LicenceID, CustomerID, SoftwareID, DateOfPurchase,
        LicenceType, Cost, ExpiryDate)
```

(i) Identify the type of relationship that exists between the tables CUSTOMER and LICENCE.

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..... [1]

(ii) Describe how the relationship is created between the tables CUSTOMER and LICENCE.

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..... [2]

AS/A Level Computer Science Exam Question 2:

(iii) The company needs a list of all software licences that have an expiry date on or before 31/12/2019.

Write an SQL query to return the fields `CustomerID`, `SoftwareID`, `LicenceType`, `Cost` and `ExpiryDate` for all licences that expire on, or before 31/12/2019. Group the output by `CustomerID`, and in ascending order of cost.

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..... [5]

AS/A Level Computer Science Exam Question 3:

. Moheem is creating a relational database to store data about his customers.

(a) Moheem has been told a relational database addresses some of the limitations of a file-based approach by reducing data redundancy.

(i) State what is meant by the term **data redundancy**.

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..... [1]

(ii) Explain **how** a relational database can help to reduce data redundancy.

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AS/A Level Computer Science Exam Question 3:

(b) Moheem uses a Database Management System (DBMS) to ensure the security and integrity of the data.

(i) Explain the difference between security and integrity.

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..... [2]

(ii) Name **and** describe **two** security features provided by a DBMS.

Feature 1 .....

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Feature 2 .....

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AS/A Level Computer Science Exam Question 3:

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(iii) The DBMS provides software tools for the database developer.

Fill in the names of the missing software tools in the following statements.

A ..... allows a developer to extract data from a database.

A ..... enables a developer to create user-friendly forms and reports.

[2]

AS/A Level Computer Science Exam Question 4:

. A company uses a relational database, EMPLOYEES, to store data about its employees and 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]

AS/A Level Computer Science Exam Question 4:

(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]

AS/A Level Computer Science Exam Question 4:

(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.

AS/A Level Computer Science Exam Question 4:

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

1 .....

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2 .....

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3 .....

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[3]

AS/A Level Computer Science Exam Question 4:

(e) Part of the EMPLOYEE_DATA table is shown.

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EmployeeID	FirstName	LastName	DateOfBirth	Gender	DepartmentNumber
156FJEK	Harvey	Kim	12/05/1984	Male	S1
558RRKL	Catriona	Moore	03/03/1978	Female	F2
388LMDV	Oscar	Ciao	01/01/1987	Male	F2

(i) Write a Data Definition Language (DDL) statement to create the EMPLOYEES database.

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..... [1]

(ii) Write a DDL statement to define the table EMPLOYEE_DATA, and declare EmployeeID as the primary key.

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AS/A Level Computer Science Exam Question 4:

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(iii) Write a Data Manipulation Language (DML) statement to return the first name and last name of all female employees in the department named Finance.

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..... [5]

AS/A Level Computer Science Exam Question 5:

A social media website has a relational database, WEBDATA, that stores the site's information.

The database has three tables to store users' details, and details of the images and text that they post.

USER(UserName, FirstName, SecondName, DateOfBirth)

PHOTO(PhotoID, UserName, Comment, UploadDate)

TEXTPOST(PostID, UserName, DateOfPost, TheText)

(a) (i) Explain how the relationship between the tables USER and PHOTO has been implemented.

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.....[2]

AS/A Level Computer Science Exam Question 5:

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(ii) Draw the entity-relationship (E-R) diagram to show the relationships between the three tables.

[2]

AS/A Level Computer Science Exam Question 5:

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(b) A database administrator decides to enforce referential integrity.

Use an example from the database `WEBDATA` to explain what is meant by **referential integrity**.

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.....[3]

AS/A Level Computer Science Exam Question 5:

(c) The database has been normalised to Third Normal Form (3NF).

Define the three stages of database normalisation.

1NF .....

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2NF .....

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3NF .....

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[3]

AS/A Level Computer Science Exam Question 5:

(d) The following shows sample data from the USER table.

UserName	FirstName	SecondName	DateOfBirth
gem123	John	Smith	01/01/1995
purpleSky	Muhammed	Ali	23/02/1956
OpenWindow	Sunny	Amir	03/03/1997
bluebird127	Raziya	Bello	04/03/1982

(i) Write an SQL script to create the USER table.

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AS/A Level Computer Science Exam Question 5:

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(ii) The database administrator needs to alter the `USER` table. A new field, `Country`, needs to be added.

Write an SQL script to add the field `Country` to the `USER` table.

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.....[2]

AS/A Level Computer Science Exam Question 6:

A company writes applications (apps) for smartphones. The company has a relational database, PURPLEGAME, which stores the information for one of its online game apps.

The database has three tables to store player's details, dates when they have logged into the app and in-app purchase details.

LOGIN(LoginID, PlayerID, Date)

PURCHASE(PurchaseID, PlayerID, PurchaseDate, Cost)

PLAYER(PlayerID, PlayerName, SkillLevel)

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

[2]

AS/A Level Computer Science Exam Question 6:

(b) The database manager is concerned about data integrity.

State what is meant by **data integrity**. Give an example of how the manager can ensure data integrity in the `PURPLEGAME` database.

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.....[2]

(c) The database designer states that the `PURPLEGAME` database is in Third Normal Form (3NF).

Tick (✓) **one** box to indicate whether this statement is true or false.

True	False

Justify your choice.

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.....[3]

AS/A Level Computer Science Exam Question 6:

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(d) (i) The following table shows some sample data for the `PLAYER` table.

PlayerID	PlayerName	SkillLevel
fly918	Kylie	3
elephant11	Mehrdad	9
candy22	Suzi	15
greenGrass	Jason	22

Write an SQL script to create the `PLAYER` table.

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AS/A Level Computer Science Exam Question 6:

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(ii) The table, `PLAYER`, needs to be altered. A new field, `DateOfBirth`, needs to be added.

Write an SQL script to add the `DateOfBirth` field to the `PLAYER` table.

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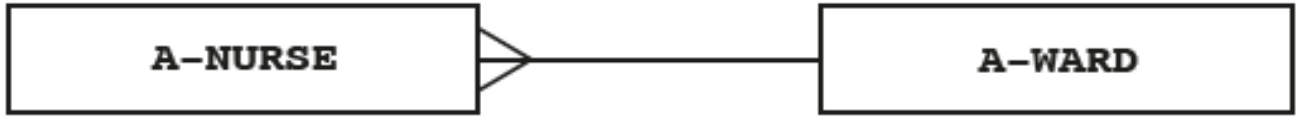
.....[2]

AS/A Level Computer Science Exam Question 7:

A hospital is divided into two areas, Area A and Area B. Each area has several wards. All 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.

.....

.....[1]

AS/A Level Computer Science Exam Question 7:

(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]

AS/A Level Computer Science Exam Question 7:

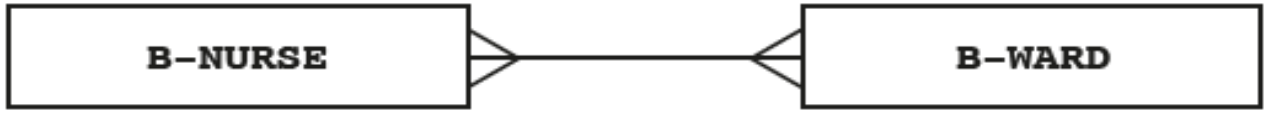
(c) In Area B of the hospital, there are a number of wards and a number of nurses.

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`.

.....

.....[1]

AS/A Level Computer Science Exam Question 7:

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

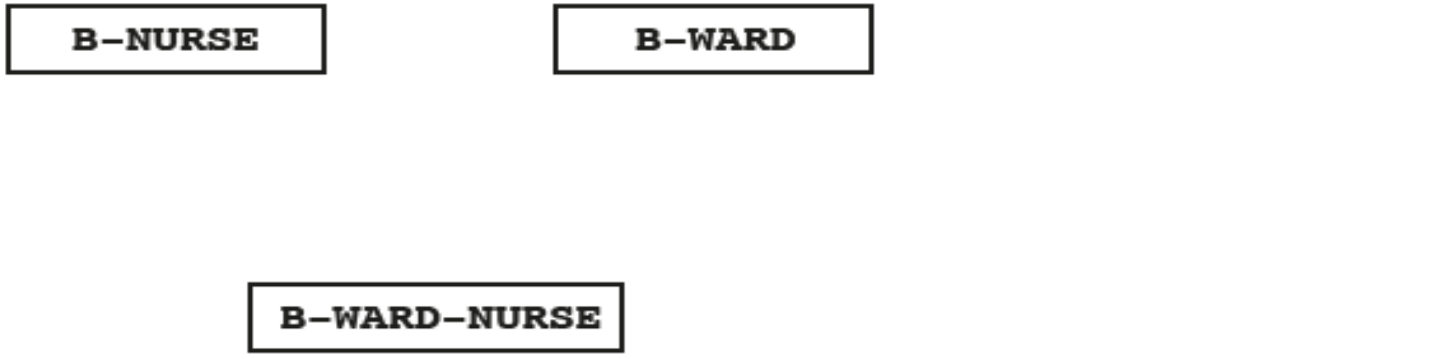
B-NURSE(NurseID, FirstName, FamilyName, Specialism)

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]

AS/A Level Computer Science Exam Question 7:

(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]

AS/A Level Computer Science Exam Question 8:

Some shops belong to the Rainbow Retail buying group. They buy their goods from one or more 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`.

.....

.....[1]

AS/A Level Computer Science Exam Question 8:

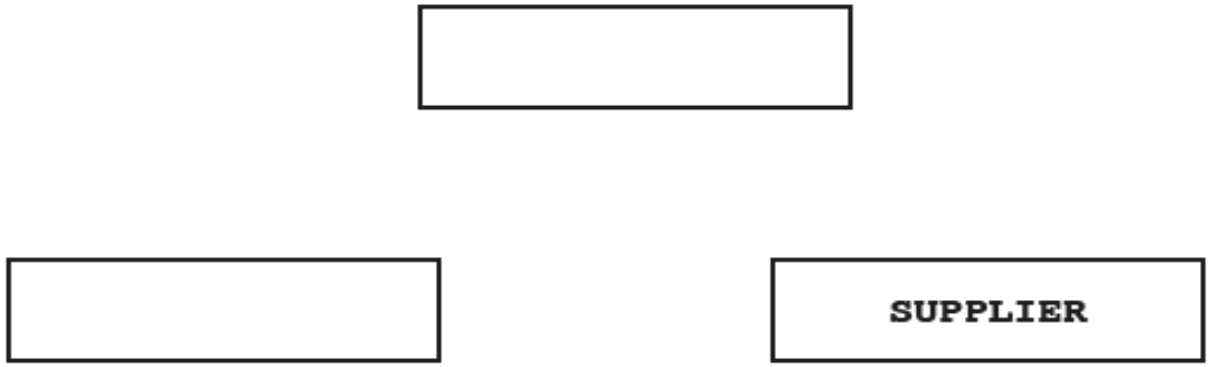
The database design is as follows:

```
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]

AS/A Level Computer Science Exam Question 8:

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(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]

AS/A Level Computer Science Exam Question 8:

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

Describe the reason for this.

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.....

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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.

.....

.....

.....[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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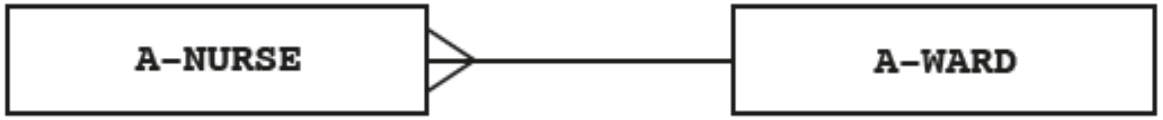
.....

.....[3]

AS/A Level Computer Science Exam Question 9:

A hospital is divided into two areas, Area A and Area B. Each area has several wards. All 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]

AS/A Level Computer Science Exam Question 9:

. **(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]

AS/A Level Computer Science Exam Question 9:

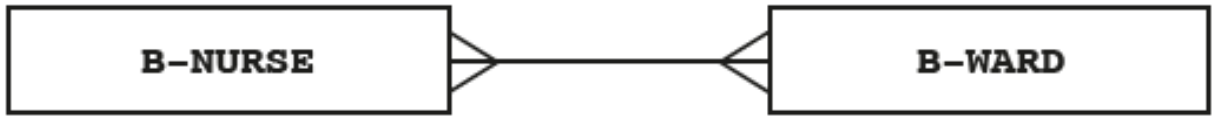
(c) In Area B of the hospital, there are a number of wards and a number of nurses.

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]

AS/A Level Computer Science Exam Question 9:

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(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]

AS/A Level Computer Science Exam Question 9:

(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'.

.....

.....

.....[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]

AS/A Level Computer Science Exam Question 10:

A Local Area Network is used by staff in a hospital to access data stored in a Database Management System (DBMS).

(a) Name **two** security measures to protect computer systems.

1 .....

2 .....

[2]

AS/A Level Computer Science Exam Question 10:

(b) A frequent task for staff is to key in new patient data from a paper document. The document includes the patient's personal ID number.

(i) The Patient ID is a seven digit number. The database designer decides to use a check digit to verify each foreign key value that a user keys in for a Patient ID.

When a user assigns a primary key value to a Patient ID, the DBMS adds a modulus-11 check digit as an eighth digit. The DBMS uses the weightings 6, 5, 4, 3, 2 and 1 for calculating the check digit. It uses 6 as the multiplier for the most significant (leftmost) digit.

Show the calculation of the check digit for the Patient ID with the first six digits 786531.

Complete Patient ID .....[4]

AS/A Level Computer Science Exam Question 10:

(ii) Name and describe **two** validation checks that the DBMS could carry out on each primary key value that a user keys in for a Patient ID.

1 Validation check .....

Description .....

.....

2 Validation check .....

Description .....

.....

[4]

AS/A Level Computer Science Exam Question 11:

A Local Area Network is used by school staff who access data stored in a Database Management System (DBMS).

(a) (i) Explain the difference between security and privacy of data.

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.....[3]

(ii) Give an example for this application where privacy of data is a key concern.

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.....[1]

AS/A Level Computer Science Exam Question 11:

(b) Name and describe **two** security measures the Network Manager has in place to protect the security of the data held in the DBMS.

1 .....

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2 .....

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[4]

AS/A Level Computer Science Exam Question 11:

(c) A task for staff at the start of the school year is to key in new pupil data from a paper document.

The data is entered to a screen form and includes the data verification of some fields.

Describe what is meant by **verification**.

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.....[2]

AS/A Level Computer Science Exam Question 12:

A school stores a large amount of data. This includes student attendance, qualification, and 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.

.....[1]

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

1 .....

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2 .....

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.....[4]

AS/A Level Computer Science Exam Question 12:

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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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.....[2]

(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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.....[3]

AS/A Level Computer Science Exam Question 12:

(b) The database design has three tables to store the classes that students attend.

STUDENT(StudentID, FirstName, LastName, Year, TutorGroup)

CLASS(ClassID, Subject)

CLASS-GROUP(StudentID, ClassID)

Primary keys are not shown.

There is a one-to-many relationship between **CLASS** and **CLASS-GROUP**.

(i) Describe how this relationship is implemented.

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.....[2]

(ii) Describe the relationship between **CLASS-GROUP** and **STUDENT**.

.....[1]

AS/A Level Computer Science Exam Question 12:

(iii) Write an SQL script to display the `StudentID` and `FirstName` of all students who are in the tutor group 10B. Display the list in alphabetical order of `LastName`.

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.....[4]

(iv) Write an SQL script to display the `LastName` of all students who attend the class whose `ClassID` is CS1.

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.....[4]

AS/A Level Computer Science Exam Question 13:

(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]

AS/A Level Computer Science Exam Question 13:

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 .....

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2 .....

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3 .....

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.....[6]

AS/A Level Computer Science Exam Question 13:

(c) The database design has three tables to store the qualifications and grades each student has 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

AS/A Level Computer Science Exam Question 13:

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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]

AS/A Level Computer Science Exam Question 13:

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(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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AS/A Level Computer Science Exam Question 13:

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

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.....[2]

(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]

AS/A Level Computer Science Exam Question 14:

(a) Five descriptions and seven relational database terms are shown below.

Draw a line to link each description to its correct database term.

Description	Database term
Any object, person or thing about which it is possible to store data	Secondary key
Dataset organised in rows and columns; the columns form the structure and the rows form the content	Candidate key
Any attribute or combination of attributes that can act as a unique key	Entity
Attribute(s) in a table that link to the primary key in another table to form a relationship	Foreign key
Attribute or combination of attributes that is used to uniquely identify a record	Primary key
	Table
	Tuple

[5]

AS/A Level Computer Science Exam Question 14:

(b) Explain what is meant by referential integrity.

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AS/A Level Computer Science Exam Question 15:

A health club offers classes to its members. A member needs to book into each class in advance.

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(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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AS/A Level Computer Science Exam Question 15:

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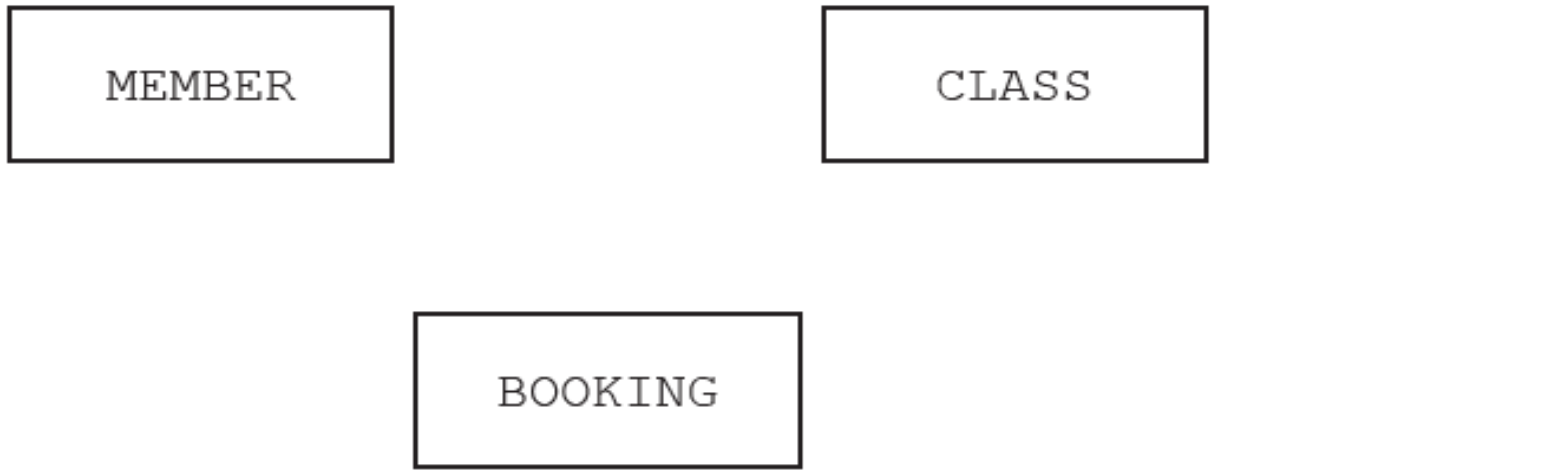
(b) The programmer decides to use three tables: `MEMBER`, `BOOKING` and `CLASS`.

Complete the Entity-Relationship (E-R) diagram to show the relationships between these tables.



[2]

AS/A Level Computer Science Exam Question 15:

(c) The `CLASS` table has primary key `ClassID` and stores the following data:

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ClassID	Description	StartDate	ClassTime	NoOfSessions	AdultsOnly
DAY01	Yoga beginners	12/01/2016	11:00	5	TRUE
EVE02	Yoga beginners	12/01/2016	19:00	5	FALSE
DAY16	Circuits	30/06/2016	10:30	4	FALSE

Write an SQL script to create the `CLASS` table.

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AS/A Level Computer Science Exam Question 16:

A database has been designed to store data about salespersons and the products they have sold.

The following facts help to define the structure of the database:

- each salesperson works in a particular shop
- each salesperson has a unique first name
- each shop has one or more salespersons
- each product which is sold is manufactured by one company only
- each salesperson can sell any of the products
- the number of products that each salesperson has sold is recorded

The table `ShopSales` was the first attempt at designing the database.

FirstName	Shop	ProductName	NoOfProducts	Manufacturer
Nick	TX	television set refrigerator digital camera	3 2 6	SKC WP HKC
Sean	BH	hair dryer electric shaver	1 8	WG BG
John	TX	television set mobile phone digital camera toaster	2 8 4 3	SKC ARC HKC GK

(a) State why the table is **not** in First Normal Form (1NF).

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……[1]

AS/A Level Computer Science Exam Question 16:

(b) The database design is changed to:

SalesPerson (FirstName, Shop)

SalesProducts (FirstName, ProductName, NoOfProducts, Manufacturer)

Using the data given in the first attempt table (ShopSales), show how these data are now stored in the revised table designs.

Table: SalesPerson

FirstName	Shop

AS/A Level Computer Science Exam Question 16:

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Table: SalesProducts

FirstName	ProductName	NoOfProducts	Manufacturer

[3]

AS/A Level Computer Science Exam Question 16:

(c) (i) A relationship between the two tables has been implemented.

Explain how this has been done.

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(ii) Explain why the `SalesProducts` table is **not** in Third Normal Form (3NF).

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(iii) Write the table definitions to give the database in 3NF.

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