Databases

19th November 2024

Examination Paper

Answer ALL questions.

Clearly cross out surplus answers.

Time: 3 hours

The maximum mark for this paper is 100.

Any reference material brought into the examination room must be handed to the invigilator before the start of the examination.

Answer ALL questions

Marks

Question 1

a) Identify FOUR (4) main functions for which a bookstore may want to use a computerised database system. **4**

b) Explain what data integrity means in the context of a database management system. **2**

c) Provide ONE (1) example of referential integrity in a relational database. **4**

Total 10 Marks

Question 2

a) The following table is in Third Normal Form (3NF). Suggest appropriate data types and key type (if applicable) for the attributes listed. **8**

Attribute Name	Data Type	Key Type
RentalID	Number (Auto increment)	
CustomerID		
CarID		
RentalDuration		
TotalCost		
PaymentMethod		

b) Explain the role of any key type you've identified in a). **2**

Total 10 marks

Question 3

Consider the following scenario: **10**

A wildlife conservation organisation records animal tracking data. Each animal may be tracked by multiple devices (such as collars, GPS tags or sensors). Each tracking record includes the animal's identification details, the GPS location data and the specific device used for that particular record.

Draw an Entity Relationship Diagram to represent the scenario described above. You need to identify entities, relationships (including cardinality) and all the primary and foreign keys.

Total 10 Marks

Marks

Question 4

a) Consider the ER diagram below for a music production company. It manages albums and artists. Each album can have multiple artists and each artist can work on multiple albums. **6**

Create a CRUD matrix to show the following transactions:
Transaction 1 – Add a new artist.

Transaction 2 – Add an existing artist to an album that's already in the database.

Transaction 3 – Remove an artist's association from all albums they have worked on, without deleting the artist from the database.

Transaction 4 – Update the release date of an album.

Transaction 5 – Remove an artist from an album without deleting the artist's other albums.

Transaction 6 – Delete an album and all its associated artists.

b) Consider the following table. **4**

tblRoom

RoomID	Type	DailyRate
1	Single	50
2	Double	70
3	Suite	120

Explain **in detail** the actions of running the following SQL command.

```
ALTER TABLE tblRoom
DROP COLUMN Type;
```

Total 10 Marks

Marks

Question 5

Consider the following tables.

tblReservation

ReservationID	ScientistID	EquipmentID	ReservationDate	ReturnDate
301	1101	501	12/01/2024	11/02/2024
302	1103	502	03/05/2024	02/06/2024
303	1102	503	11/07/2024	10/08/2024

tblScientist

ScientistID	FirstName	LastName	Department
1101	Alice	Smith	Biology
1102	Bob	Stevens	Chemistry
1103	Mo	Irfan	Physics

tblEquipment

EquipmentID	EquipmentType
501	Microscope
502	Distillation
503	Spectrometer

a) Write an SQL statement that retrieves the FirstName and LastName of all scientists in the Chemistry department. **2**

b) Write an SQL statement that retrieves the *EquipmentType* of equipment that was reserved after 15/01/2024. **3**

c) Write an SQL statement that lists the details of all reservations made after 15/01/2024, ordered by ReservationDate in ascending order. **3**

d) Write an SQL statement that updates the return date of all the reservations to the last day of 2024 (December 31, 2024). **2**

Total 10 Marks

Marks

Question 6

Consider the table tblScientist provided in Question 5. The table is reproduced below for clarity.

tblScientist

ScientistID	FirstName	LastName	Department
1101	Alice	Smith	Biology
1102	Bob	Stevens	Chemistry
1103	Mo	Irfan	Physics

a) Write the appropriate SQL statement that will create the table tblScientist defined in question 5. **5**

b) Write the appropriate SQL statement to add the THREE (3) records to the table. **5**

Total 10 Marks

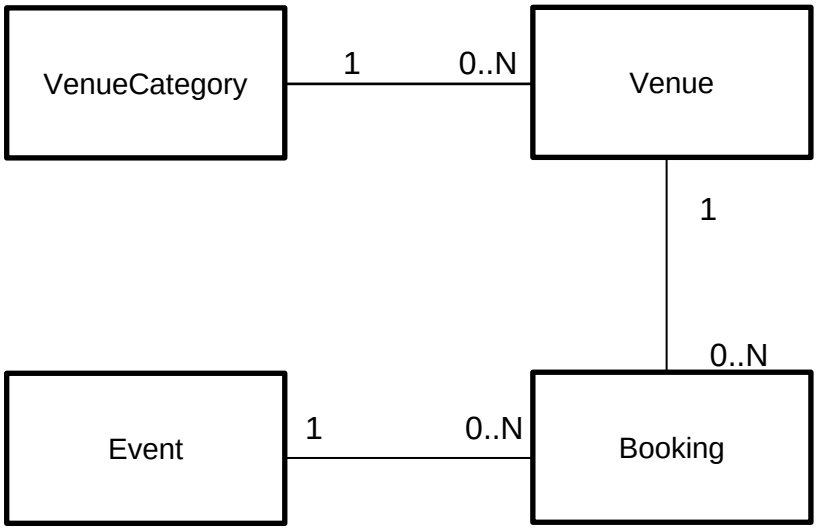
Marks

Question 7

Scenario: Event Venue Booking System **10**

In an event planning company, multiple venues are available for hosting different types of events. Each venue belongs to a specific category (e.g., banquet halls, conference rooms, outdoor spaces) and the company needs to track which venues are booked for specific events, as well as the start and end dates of the bookings.

The completed ERD is shown below.



Using the entities shown in the ERD above, create a list of attributes that you are likely to see in each entity/table.

There is no need to identify the datatypes. But you should identify Primary and Foreign Keys.

Total 10 Marks

Marks

Question 8

Consider the following table:

tblEmployee

EmployeeID	FirstName	LastName	Department
101	Daniel	Davis	Marketing
102	Emily	Johnson	HR
103	John	Brown	IT
104	Luke	Baker	IT
105	Sarah	Stevens	Marketing

a) A student has attempted to normalise the table to Third Normal Form (3NF). Identify a design fault with the table and provide a possible solution. **2**

b) Apply normalisation principles to correct the tblEmployee table so that it adheres to 3NF, addressing the issue you identified in part a). Provide the revised table structure(s), along with their respective fields and keys. Ensure all keys are clearly identified. **6**

c) Using a field constraint, how could we ensure that the data entered into the field named EmailAddress is unique for every record in the table? **2**

Total 10 Marks

Marks

Question 9

A healthcare clinic has multiple departments and it currently uses an electronic medical records system to manage patient information, including appointment scheduling and medical history. Staff in different departments have access to different parts of the system depending on their role (e.g., doctors, nurses, administrative staff). Recently, there have been concerns about unauthorised access to sensitive patient data, as well as a lack of proper data backup procedures. **10**

Identify FIVE (5) measures you would want to implement to improve data security and data backup in the clinic's system and justify each of your measures.

Total 10 Marks

Marks

Question 10

GreenWave Energy is a renewable energy company that has been using spreadsheets to track and manage their customer data, project timelines and financial information. Due to the company's rapid expansion and the increasing complexity of their operations, they are considering switching to a Database Management System (DBMS) to improve data handling and reporting. **10**

They have asked you to explain FIVE (5) possible drawbacks of implementing a DBMS before they make their decision.

Total 10 Marks

End of Paper