

B262 2001

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Answer Question 1 and TWO other questions. Question 1 is worth 40 marks, the other questions are worth 30 marks each

Question 1

Answer this question

The table below lists customer/car-hire data. Each customer may hire cars from various outlets. A car is registered at a particular outlet and can be hired out to a customer on a given date.

CarReg	Make	Model	CustNo	CustName	HireDate	OutletNo	OutletLoc
W 565 CDC	Ford	Escort	C100	Smith, J.	14/5/01	21	Woodstock
W 565 CDC	Ford	Escort	C222	Patel, V.	15/5/01	21	Woodstock
V 734 HSB	Nissan	Sunny	C100	Smith, J.	14/5/01	21	Woodstock
W 104 RSM	Ford	Escort	C303	Brown, F.	14/5/01	24	Denham
W 104 RSM	Ford	Escort	C100	Smith, J.	16/5/01	24	Denham
W 611 SBH	Nissan	Sunny	C222	Patel, V.	15/5/01	24	Denham

- The data in the table is subject to *update anomalies*. Provide examples of how *insertion, deletion, and modification* anomalies could occur on this table.
[5 marks]
- Identify the *functional dependencies* represented by the data in the table. State any assumptions you make about the data.
[10 marks]
- Using the functional dependencies identified, describe and illustrate the process of *normalization* by converting the table to Third Normal Form (3NF) relations.
[10 marks]
- Identify the *primary* and *foreign* keys in your relations.
[3 marks]
- Draw an *Entity-Relationship model* for the data in the table. Show all the entities, relationships, and attributes.
[12 marks]

[Total 40 marks]

Question 2

The following relations are part of a relational database.

Resort	<u>(ResortID)</u> , ResortName, Address)
Hotel	<u>(HotelID, ResortID)</u> , HotelName, Rating, Price)
Customer	<u>(CustomerID)</u> , CustomerName, Address)
Reservation	<u>(ResortID, CustomerID, FromDate)</u> , ToDate, HotelID)

The primary key in each table is shown by underlining.

Write expressions in **BOTH relational algebra AND in SQL** to retrieve each of the following:

- a) a list of the names of all the resorts
[2 x 2 marks]
- b) a list of all three star hotels that are under £60 per night. You may identify each hotel by its HotelID
[2 x 3 marks]
- c) the names and addresses of all customers who have reservations at the Grand Hotel Slais, which has a HotelID of SLAIS.
[2 x 4 marks]
- d) a list of all hotels, showing the reservations for the 5 June 2001. For each reservation show the CustomerID. You should include in your list hotels that have no reservations.
[2 x 4 marks]

Also write an expression in SQL to retrieve

- e) a count of the hotels in the resort of Datamania.
[4 marks]

[Total 30 marks]

Question 3

- a) Discuss the concept of *data independence*, explaining its importance in a database environment. [6 marks]

- b) To address the issue of data independence, the *ANSI-SPARC three-level architecture* was proposed. Compare and contrast the three levels of this model. [10 marks]

- c) Explain what is meant by a *base relation* and a *view*.

State TWO major benefits of views, one from a user's perspective and from a database administrator's. [10 marks]

- d) An important consideration in the design of databases is the removal of *redundancy*. Explain why, nevertheless, redundancy may be deliberately introduced into a database. (Confine your answer to centralised database systems.) [4 marks]

[Total 30 marks]

Question 4

Distributed database management systems (DDBMS) are more complex than centralised ones for a number of reasons. When a database is both *fragmented* and *replicated* by a DDBMS, query processing and updating are more complex activities than they are for a centralised system.

- a) Explain the terms *fragmentation transparency*, *location transparency*, and *replication transparency*. [4 marks]

- b) Explain through the use of an example how the choice of distributed query processing strategy can have a significant effect on the query response time. [10 marks]

- c) State FOUR reasons why an organisation might move from using centralised to distributed databases, and FOUR disadvantages of so doing. [16 marks]

[Total 30 marks]

END OF PAPER