

## Sample Exam Questions

### Question 1: Normalisation

The table below lists sample dentist/patient appointment data. A patient is given an appointment at a specific time and date with a dentist located at a particular surgery. On each day of patient appointments, a dentist is allocated to a specific surgery for that day.

staffID	dentistName	patientID	patientName	appointment date	time	surgery ID
S1011	David Smith	P100	Janet Child	01-Jun-16	10:00	S15
S1011	David Smith	P105	Gill Key	01-Jun-16	12:00	S15
S1024	Brian Jones	P108	John Smith	01-Jun-16	10:00	S10
S1024	Brian Jones	P108	John Smith	04-Jun-16	14:00	S10
S1032	Robert Cook	P105	Gill Key	04-Jun-16	16:30	S15
S1032	Robert Cook	P110	Jon Walker	05-Jun-16	18:00	S15

- a) The table is susceptible to data anomalies. Provide examples of insertion, deletion, and update anomalies. [6 marks]
- b) Identify the functional dependencies represented by the attributes shown in the above. State any assumptions you make about the data and the attributes shown in this table. [10 marks]
- c) Describe and illustrate the process of normalizing the above table to 3NF relations. Identify the primary and foreign keys in your 3NF relations. [9 marks]

### Question 2 (25 marks) – Transaction Processing

- a) Explain what you understand by a *Transaction*, and give an example to support your explanation. [ 6 marks ]
- b) Describe the ACID properties and identify which one is the responsibility of the user [ 7 marks ]
- c) Draw a serializability graph for the following schedule of operations.

R3(x), R2(x), W3(x), R1(x), W1(x)

[ 6 marks ]

- d) State whether the schedule of operations above is serializable. Provide explanations for your answer.

[ 6 marks ]

### **Question 3: Security and Emergent Databases**

- a) Describe two general types of problem that Big Data is ideal for solving.  
[4 marks]
- b) Name and describe the three main objectives which are required to be met when designing a secure database application providing an example of each.  
[12 marks]
- c) Views can be utilised in the Student Records System at a large university. Consider an example where views could be used to:
- Provide efficient access to relevant data
  - Restrict access to sensitive data
  - Provide context dependant data

In each case describe the situation where the view would be used and how the table data would be restricted or projected by the underlying SQL.

[9 Marks ]

### **Question 4: Data Warehousing**

- a) Describe what a Data Warehouse is and what it is typically used for in contrast to Online Transaction Processing Relational Databases (OLTP).  
[12 marks]
- b) Suppose that a Data Warehouse consists of 4 dimensions;

Date, Spectator, Location and Game

and the measure “Charge”, where charge is the fare that a spectator pays when watching a game on a given date.

Spectators may be students, adults, or seniors with each category having its own charge rate.

The Dimension Date has the attributes date and time.

The Dimension Location has the attributes;  
location\_id, ground\_name, addressl1, addressl2, city, county.

The Dimension Game has the attributes;

game\_id, team1, team2, score.

The Dimension Spectator has the attributes;

spectator\_id, spec\_name, address, phone, type, charge rate

Draw a Star Schema design for the data warehouse.

[10 marks]

- c) Using an example, explain the difference between a Star Schema and Snow Flake Schema in Data Warehouse design.

[3 marks]