OCD40

UNIVERSITY OF BOLTON

WESTERN INTERNATIONAL COLLEGE FZE

BSC (HONS) COMPUTING

SEMESTER ONE EXAMINATION 2019/2020

ADVANCED DATABASE SYSTEMS

MODULE NO: CPU6007

Date: Friday 17th January 2020 **Time: 2:00 PM – 4:00 PM**

INSTRUCTIONS TO CANDIDATES:

There are FIVE questions on this paper.

Answer ANY FOUR questions.

All questions carry equal marks.

Marks for parts of questions are shown in brackets.

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Q1.

Table 1. Staff_Project_Details

StaffID	StaffName	ProjectNo	Project Name	ProjectContact No	Project Location
S1	Freddy	P3	Aetna	1234 200	New York, USA
S2	Bill	P3	Aetna	3335 2504	Toronto, Canada
S3	George	P5	Metlife	1267 1901	Washington, USA
S4	Jim	P5	Metlife	3394 1905	Ottawa, Canada

a. A distributed database management system for Table 1 is created. It has been decided to develop a number of fragmentations based on this table for the convenience of the users. Give an example of a horizontal fragmentation of table 1, and an example of a vertical fragmentation, and explain why each might be useful. In each case, just list the contents of the fragmentations. Also, you are required to write the SQL query, with its pros and cons.

(10 marks)

b. Compare and contrast homogeneous and heterogeneous databases with respect to distributed databases.

(6 marks)

c. Analyse 'two phase commit' protocol' (2PC) in distributed databases.

(3 marks)

d. Discuss about OODBMS and its features.

(6 marks)

Total 25 marks

Q2.

a. A multinational mobile company has an Oracle Database to handle its daily transactions. Recently the senior management decided to create a data warehouse for the company. You are supposed to be the database consultant for this company.
Explain, the term 'ETL' with respect to data warehouses construction. Use suitable examples and/or diagrams as needed.

(7 marks)

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Q2 Continued over the page

Q2 continued

b. For the management, describe the key characteristics of a data warehouse and how it differs in content, structure and function from an online transaction processing (OLTP) database.

(8 marks)

c. Identify the major data mining operations and critically analyse the data mining operations for the mobile data warehouse. Use your own suitable examples as needed.

(10 marks)

Total 25 marks

Q3.

a. Describe how the lost update anomaly which violates isolation property could arise if two or more transactions access the same database item concurrently. Use examples of simple transactions to illustrate your answer.

(4 marks)

b. Explain, with aid of examples, the difference between serial and serialisable schedules of transactions.

(5 marks)

c. Explain Conflict serialisability with your own conflict serialisable schedule with transactions T_i and T_j .

(6 marks)

d. Explain how 2-Phase locking ensures that transactions are serialisable.

(4 marks)

e. When using timestamp-based ordering protocol, what would happen in each of the following scenarios?
   i. A read on an item which has been updated by a younger transaction
   ii. A write on an item which has been updated by a younger transaction
   iii. A write on an item which has been read by a younger transaction

(6 marks)

Total 25 Marks

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Please turn the page

Q4.

a. Describe various types of failure that may occur in a database environment. Identify which failure can be recovered in database management systems with the help of log.

(4 marks)

b. Discuss the RAID technique which helps to recover against disk failure.

(3 marks)

c. Database management systems have to make provision to recover from situations such as system crashes. The following is a transaction log. For each of the transactions explain what recovery option is needed following the crash using Immediate Update and Deferred Update:
[start_transaction, T1]
[write_item, T1, X, 0, 20]
[start_transaction, T3]
[commit, T1]
[write_item, T3, Y, 14, 30]
[checkpoint]
[start_transaction, T2]
[write_item, T2, B, 0, 15]
[commit, T3]
[write_item, T2, A, 0, 20]
[commit, T2]
[start_transaction, T5]
[write_item, T5, B, 15, 12]
[start_transaction, T4]
[write_item, T4, A, 20, 30]
[write_item, T4, X, 20, 25]
←→CRASH ←→

(10 marks)

d. A major problem for locking mechanism is the issue of Deadlock. Give an example of deadlock occurring in two transactions named T_3 and T_4. Suggest a mechanism to detect the deadlock and two techniques to prevent the problem.

(8 marks)

Total 25 Marks

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Q5.

a. Consider a data warehouse for an event management system which consists of dimensions such as event, audience, location and date. It measures count and charge for every event. Assume meaningful attributes for each dimension. Events considered are sports, concerts, seminars, etc. Charge is the fare when the audience pays to watch the event on a given date. Audience can be students, adults and children. Each category has its own charge rate. Explain the steps involved in constructing a data warehouse. This Star schema developed will help the higher management to make effective decisions on event arrangement and management. Design and show a star-schema for the ROLAP.

(11 marks)

b. List out any four MOLAP operations for above mentioned event management system data warehouse. For ease, consider the events, location and date as the dimensions required for the data warehouse. Use your own suitable examples and/or diagrams as needed with description.

(14 marks)

Total 25 marks

END OF QUESTIONS