[OCD015]

UNIVERSITY OF BOLTON

OFF CAMPUS DIVISION

WESTERN INTERNATIONAL COLLEGE FZE

BSC(HONS)COMPUTING

TRIMESTER ONE EXAMINATION 2021/2022

ADVANCED DATABASE SYSTEMS

MODULE NO: CPU6007

Date: Friday 7th January 2022 **Time: 10:00 – 12:00**

INSTRUCTIONS TO CANDIDATES:

There are FIVE questions in this paper.

Answer ANY FOUR questions.

All questions carry equal marks.

Marks for parts of questions are shown in brackets.

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Module No. CPU6007

Q1.

a. Discuss checkpoints with regard to data recovery procedure.

(5 marks)

b. Discuss the ACID properties of database transactions.

(6 marks)

c. Compare and contrast shadow paging and log-based techniques for data recovery.

(4 Marks)

d. 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, D, 0, 20]
[start_transaction, T3]
[commit, T1]
[write_item, T3, C, 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, D, 20, 25]
□ □ CRASH □ □

(10 Marks)

Total 25 marks

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Q2

a. Describe the dirty read problem which could arise if two or more transactions access the same database item concurrently. Use examples of simple transactions T_5 and T_6 to illustrate your answer.

(6 marks)

b. Differentiate between Shared exclusive locking and Strict 2-phase locking protocol in concurrency control of databases.

(4 marks)

c. Consider the following two transactions with initial values as A=12 and B=0:

T7	T8
read(A);	
	read(B)
read(B);	
if A=0 then B:=B+1;	
	read(A);
write(B);	
	if B=0 then A:=A+1;
	write(A);

Discuss the Two-phase locking protocol for the concurrency control database. Add lock and unlock instructions to transactions T_7 and T_8, so that they observe Two- phase locking protocol.

(8 marks)

d. Explain Conflict serialisability with your own conflict serialisable schedule with transactions T_{10} and T_{11} .

(7 marks)

Total 25 Marks

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Q3.

a. Explain with suitable example classification and clustering data mining operations. Use your own suitable examples as needed.

(8 marks)

b. Compare and contrast OLTP and OLAP operations.

(10 marks)

c. A UAE based Furniture showroom 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)

Total 25 marks

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Q4.

a. Consider the following relations for the distributed database for IELTS Exam for students

Student(Student_id, Student_name, Exam_id, Student_phone)

Exam(Exam_id,Exam_date ,Exam_center)

It has been decided to develop a number of fragmentations based on these relations for the convenience of the users and improve the efficiency of the DDBMS. Do meaningful horizontal and vertical fragmentation for the above mentioned relations. In each case, give the fragments. Also, you are required to list any one advantage for each fragmentation.

(12 marks)

b. Identify and list the types of Distributed databases. Discuss any three differences.

(7 marks)

c. Discuss OODBMS with any two of its required features of OODBMS.

(6 marks)

Total 25 marks

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Q5.

a. Design a data warehouse structure for a national car dealer chain to provide business decision makers with the important data they need. The company records information about its dealerships, cars and sales details in its database. For each dealership it records location and manufacturer. For each car it records make, model and total cost. For each sale the dealership, date, customer phone number and car are recorded. Using the four-step dimensional modelling process design a star schema for the data warehouse. Explain the steps involved in constructing a data warehouse. This Star schema developed will help the higher management to make effective decisions on improving services provided for the car dealer chain.

(12 marks)

b. For car dealer data warehouse, consider the dealerships, cars and sales month as the dimensions required for easiness. Use your own suitable data and/or diagrams as needed for MOLAP. Include description as required for every diagram used.

   i. Draw a data cube for the above car dealer data warehouse.

   ii. Do “slicing” MOLAP for dealer sales in December.

   iii. Do “roll-up” MOLAP for a year sales for a particular car model.

(13 marks)

Total 25 marks

END OF PAPER