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Final Assessment Test (FAT) - APRIL/MAY 2023

Programme	B.Tech	Semester	Winter Semester 2022-23
Course Title	DATABASE SYSTEMS	Course Code	BCSE302L
Faculty Name	Prof. Tamilarasi K	Slot	B1+TB1
		Class Nbr	CH2022235000585
Time	3 Hours	Max. Marks	100

PART-A (4 X 10 Marks)
Answer All questions

01. A retail business outlet maintain product, vendors, customers, sales and other related information **[10]** in a file system.

i) Observe the given scenario and list out the issues in existing system. Extend database approach for the given scenario and explain why it is a better approach.
(5 marks)

ii) In the above given scenario of extending DBMS approach, present the role of various actors involved. **(5 marks)**

02. Consider the following schedule S of Transactions T1, T2, T3 and T4. **[10]**
T2:R(Y); T2:R(X); T3:R(X); T3:commit; T1:W(X); T2:W(Y); T2:R(Z); T2:Commit; T4:R(X); T4:R(Y); T2:W(Z); T1:commit; T4:Commit

i. Find out whether the given schedule is conflict serializable, recoverable and cascade less or not. **(7marks)**

ii. If it is conflict serializable, give order of the serial schedule.
(3marks)

03. Consider the following Vellore International School (VIS) database. The school maintains **[10]** information about students and the teachers. It also gives information of the subject taught by the teacher.

Student (Snum, Sname, Sclass, Saddress)
Teacher (TID, Tname, Tqualification, Texperience)
Stu_Teacher(Snum,TID,Subject)

Provide SQL queries for the following: **[5 × 2 =10 Marks]**

i. Find the minimum experienced teacher.

ii. Find the number of teachers having qualification "Ph.D.".

iii. List the names of the students to whom "Dr. Ravi" is teaching along with the subjects he is teaching to them.

iv. Find the subjects taught by each teacher.

v. List the names of the teachers who are teaching to a student named "Vivek".

04. An institute would like to implement a Car-pooling system, where faculty members can register **[10]** their car to share it with others or avail the service, those who need. They share the Fuel cost based on Mileage of the car. There are 5 Main routes to reach the institute and 10 pickup points [1 to 10] in each route. The system stores the required information in a NoSQL Database.

(i) Create the following collections **[3 marks]**

a. "Share" to store car owners' details like FacultyId, Name, Phone number, RouteNumber, StartingPoint [1 to 10], CarModel, CarNumber, Petrol/Diesel, Mileage.

b. "Avail" to store those who wants to avail the pooling system with necessary details like FacultyId, Name, PhoneNumber, RouteNumber, PickUpPoint.

c. "Routes" to store documents with RouteNumber [1 to 5] and 10 PickUpPoints in the respective route.

(ii) Store multiple documents of two new employees each in "Share" and "Avail" collections with data of your choice, two who owns a car, respectively and other two who wants to avail this service. **[2 marks]**

(iii) Providing Route number as 1 and pick up point as 5, display all Faculty members' name and phone number from whom the service can be availed. **[2 marks]**

(iv) Remove an employee with FacultyId "10005" who bought a car recently from "Avail" collection and insert the details in to "Share" collection with additional information. **[2 marks]**

(v) A member whose FacultyId is "10001" wants to update StartingPoint from 2 to 5 in "Share" collection. **[1 mark]**

PART-B (4 X 15 Marks)
Answer All questions

05. Assume person X is planning to starting a online trading system to provide information about stock. He has identified some the following entities & attributes and some information. Consider stock will have a unique ID, company and exchange name are also unique and investor will have unique email ID. Here, the stock is issued by one company, stock is traded on one exchange, investor holds one or more stock(s) and company is listed on one or more exchange(s). Investors may have more than one email_id and phone number. Based on the given information **[15]**

(i) Design an ER diagram with appropriate cardinality ratios
(7 marks)

(ii) Map the designed ER model to a relational schema
(8 marks)

Entities & Attributes:
Stock: ticker, name, price, date
Company: name, sector, country
Exchange: name, location, currency
Investor: name, email, phone

06. a) A relational schema R has the attributes R(A,B,X,Y,Z) with the functional dependencies F=(Z->A, B->Y, XY->Z, A->BX). Identify whether the given decomposition of relation R are loss-less join decomposition and give suitable explanation. **(2x3.5=7 marks)** **[15]**
i) R1(A,B,X), R2(A,Y,Z)
ii) R1(A,B,X), R2(X,Y,Z)

b) Consider a relational schema with attributes (P,Q,R,S) and functional dependencies (Q->R, S->P) **(2x4=8 marks)**
i) Identify the candidate key(s)
ii) Check whether the relation is confirming BCNF norms, if not decompose R in to BCNF relations that preserve the functional dependencies.

07. a. Consider the given relation schema: [15]

EMPLOYEE (FNAME, LNAME, EMPID, DOB, ADDRESS, GENDER, SALARY, SUPERMPID, DNO)

DEPARTMENT (DNAME, DNUMBER, MGREMPID, MGRSTARTD)

PROJECT (PNAME, PNUMBER, PLOCATION, DNUM)

Draw the query evaluation plan/tree using the heuristic optimization technique for the following query. "For every project located in 'Stafford', retrieve the project number, the controlling department number and the department manager's last name, address and birthdate".
(8marks)

b. Consider the following relation table:

Student	Course	Instructor
Narayan	Database	Mark
Smith	Database	Navathe
Smith	Operating Systems	Ammar
Smith	Theory	Schulman
Wallace	Database	Mark
Wallace	Operating Systems	Ahamad
Wong	Database	Omiecinski
Zelaya	Database	Navathe
Narayan	Operating Systems	Ammar

Describe about the clustering indexing technique to access the records in the above table (search key=course).

For the above table, Justify whether sparse or dense indexing technique is more suitable.
(7marks)

08. Consider the following sequences of actions (given in schedule S1 and S2) listed in the order in which they are submitted to the database system for execution: [15]

Schedule S1: T1: R(X), T2: W(X), T2: W(Y), T3: W(Y), T1: W(Y), T1: Commit, T2: Commit, T3: Commit.

Schedule S2: T1: R(X), T2: W(Y), T2: W(X), T3: W(Y), T1: W(Y), T1: Commit, T2: Commit, T3: Commit

For each sequence and for each of the following concurrency control mechanisms, describe how the concurrency control mechanism handles the schedule sequence.
[7 + 8 Marks]

a. Strict 2PL with timestamps used for deadlock prevention.

b. Strict 2PL with deadlock detection. Show the waits-for graph if a deadlock cycle develops

Note: Assume that the timestamp value of transaction Ti is i. For lock-based concurrency control mechanism, add lock and unlock requests to the above sequence of actions as per the locking protocol. If a transaction is blocked, assume that all of its actions are queued until it is resumed; the DBMS continues with the next action (according to the listed sequence) of an unblocked transaction.

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