Question Paper

Exam Date & Time: 29-Nov-2022 (09:00 AM - 12:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

MANIPAL INSTITUTE OF TECHNOLOGY, FIFTH SEMESTER B.TECH END SEMESTER EXAMINATIONS, NOV 2022

DATABASE SYSTEMS [ICT 3157]

Marks: 50 **Duration: 180 mins.**

Answer all the questions.

Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed

1) Assume we have the following application that models soccer teams, the games they play, and the players in each team. In the design, we want to capture the following: (5)

A)

- We have a set of teams, each team has an ID (unique identifier), name, main stadium, and to which city this team belongs.
- Each team has many players, and each player belongs to one team. Each player has a number (unique identifier), name, DoB, start year, and shirt number that he uses.
- Teams play matches, in each match there is a host team and a guest team. The match takes place in the stadium of the host team.
- For each match we need to keep track of the following: The date on which the game is played, the final result of the match, the players participated in the match.
- For each player, how many goals he scored, whether or not he took yellow card, and whether or not he took red card.
- During the match, one player may substitute another player. We want to capture this substitution and the time at which it took place.
- Each match has exactly three referees. For each referee we have an ID (unique identifier), name, DoB, years of experience. One referee is the main referee and the other two are assistant referee.

Design an ER diagram with description to capture the above requirements. Make sure cardinalities and primary keys are clear

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B) For the given employee database: (3)

employee (<u>employee name</u>, street, city)

works (<u>employee name</u>, company name, salary)

company (<u>company name</u>, city)

manages (<u>employee name</u>, manager name)

Write a query to find those employees with no manager. Note that an employee may simply have no manager listed or may have a null manager. Write your query using an outer join and then write it again using no outer join at all.

C) Consider the relation scheme given below and write the SQL queries for the following. (2)

Employee (Empno, Name, Department, Salary)

i. List all the employees whose name starts with the Letter 'R'

ii. Find the second maximum salary.

2) IBIBCbank aims to automate banking transactions after the demonetization. They consulted IT sector to implement PLSQL block which performs deposit and withdraw operation. Mr.Sam created an Oracle PLSQL procedure that performs money deposits. He wants to create a withdrawal procedure in oracle pl/sql. Help him by writing the procedure which performs withdrawal for the given relation table. The procedure is taking two arguments: first argument is the account number, second argument is the amount to be withdrawn. The minimum balance to be maintained is 1000. Update the Account table, after transaction and create an entry in Transaction table, after each successful transaction. In Transaction table, TransactionType is "withdrawal" for withdrawal operation. (5)

A)

Account (AccNo, BranchName, BalanceAmount).

Transaction (AccNo, TransactionDate, TransactionType, AmountWithdrawn , BalanceAmount)

B) Consider the following Database Schema. (3)

Course (course_no, description, cost, prerequisite)

Section_Course (section_id, course_no, location, instructor_id, capacity)

Enrollment(student_id, section_id, course_no, enroll_date, grade)

Create above tables by enforcing the following constraints.

i. grade attribute in Enrollment table should be one of the following values: 'A+', 'A', 'B', 'C', 'D', 'E', 'F'.
ii. Deleting a tuple in a Course table should delete a corresponding tuple(s) in Section_Course.

C) Consider the following relations for an order processing database application in a company. (2)

CUSTOMER (cust_id, cname, city)

ORDERS (order_id, cust_id, order_date, order_amt)

SHIPMENT (order_id, warehouse_id, shipdate)

WAREHOUSE (warehouse_id, city)

Customer wants to know from which warehouse their order/s was/were shipped. Write a nested query to get this information.

3) How NoSql database is differenet from relational database. Give an example for each of the 4 different types of NoSql database. Consider a mongodb collection namely "Student" with the following fields namely regno, name, insem_mark and endsem_mark. Write a mongodb command for the following. (5)

A)

i. List all student details who scored more than 40 in endsem.

ii. For the student with regno 45, update the insem mark from 28 to 30.

iii. Find total number of students in a Student collection.

B) For what type of transactions validation based protocol is used. What are the conditions to be checked for validation of transactions? (3)

C) Let R1(A, B) and R2(B, C, D) be the decomposed relation for the relation R (A, B, C, D) with functional dependencies {A-->B, BC-->D, C-->D}. Check whether the decomposition is lossless or not. (2)

4) A) Concurrent execution of transaction improves throughput and resource utilization. However when transactions executed concurrently in uncontrolled manner, we face 3 major problems. Illustrate the 3 major problems with suitable example (5)

B) Find the candidate key and highest normal form of the following relation (3)

i. R(A, B, C, D) with dependencies A-->B, B-->C, C-->BD

ii. R(A, B, C, D, E, F, G, H) with dependencies CH-->G, A-->BC, B-->CFH, E-->A, F-->EG.

C) Consider the following schedule S1 and S2 of transactions T1, and T2. Here R and W specifies read and write operations respectively. A and B specifies data items. (Example: $R_2(A)$ specifies read operation performed on data item A by the transaction T2.) Check whether the given schedules are view equivalent or not. (2)

S1 : $R_1(A)$ $W_1(A)$ $R_2(A)$ $W_2(A)$ $R_1(B)$ $W_1(B)$ $R_2(B)$ $W_2(B)$

S2 : $R_1(A)$ $W_1(A)$ $R_1(B)$ $W_1(B)$ $R_2(A)$ $W_2(A)$ $R_2(B)$ $R_2(B)$

5) A) Which data structure is used by the lock manager for concurrent execution of transactions. Explain with suitable diagram. Also specify lock manager processes when a) lock request message arrives b) when it receives unlock message b) when transaction aborts. (5)

B) How many serial schedules are possible with 3 transactions? Consider the following schedule S of transactions T1, T2 and T3. Here R and W specifies read and write operations respectively. X, Y and Z specifies data items. (Example: $R_2(Z)$ specifies read operation performed on data item Z by the transaction T2). Check whether the given schedule is conflict serializable or not. (3)

S : $R_1(X)$ $R_2(Z)$ $R_1(Z)$ $R_3(X)$ $R_3(Y)$ $W_3(X)$ $R_2(Y)$ $W_2(Z)$ $W_3(Y)$

C) Brewer's CAP theorem says that, in distributed environment, Nosql database strongly can support either consistency or availability. Justify your answer. (2)

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