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CSE201

Enrol. No. A2305220069

[ET]

END SEMESTER EXAMINATION : NOV-DEC 2022

DATABASE MANAGEMENT SYSTEMS

Time : 3 Hrs. *Maximum Marks : 60*

Note: ***Attempt questions from all sections as directed.***

SECTION – A (24 Marks)

Attempt any **four** *questions out of* **five.**
Each question carries **06** *marks.*

1. Differentiate between logical data independence and physical data Independence. Which one is harder to achieve? Why?

2. Discuss the role of *foreign key* while specifying the most common types of meaningful join operations. Explain with the help of a suitable example.

3. Define functional dependency. What do you mean by lossless decomposition? Explain with suitable example how functional dependencies can be used to show that decompositions are lossless.

P.T.O.

4. Prove that the basic two-phase locking protocol guarantees conflict serializability of schedules.

5. Draw a diagram representing the structure of DBMS. List its major components also.

Internal, conceptual, view

SECTION – B (20 Marks)

Attempt any **two** *questions out of* **three.**
Each question carries **10** *marks.*

6. Consider a university database for the scheduling of classrooms for final exams.

This database could be modeled as the single entity set *exam*, with attributes *course-name, section-number, room-number*, and *time*. Alternatively, one or more additional entity sets could be defined, along with relationship sets to replace some of the attributes of the *exam* entity set, as

- *course* with attributes *name, department*, and *c-number*
- *section* with attributes *s-number* and *enrollment*, and dependent as a weak entity set on *course*
- *room* with attributes *r-number, capacity*, and *building*

(a) Draw an E-R diagram illustrating the use of all three additional entity sets listed. (5)

(b) Explain what application characteristics would influence a decision to include or not to include each of the additional entity sets. (5)

7. Consider the three transactions T1, T2, and T3, and the schedules S1 and S2 given below. Draw the serializability (precedence) graphs for S1 and S2, and state whether each schedule is serializable or not. If a schedule is serializable, write down the equivalent serial schedule(s).

T1: r1 (X); r1 (Z); w1 (X);

T2: r2 (Z); r2 (Y); w2 (Z); w2 (Y);

T3: r3 (X); r3 (Y); w3 (Y);

SI: r1 (X); r2 (Z); r1 (Z); r3 (X); r3 (Y); w1 (X); w3 (Y); r2 (Y); w2 (Z); w2 (Y);

S2: r1 (X); r2 (Z); r3 (X); r1 (Z); r2 (Y); r3 (Y); w1 (X); w2 (Z); w3 (Y); w2 (Y);

8. Given the following SQL query :

Student (sid, name, age, address)

Book(bid, title, author)

P.T.O.

Checkout(sid, bid, date)

```
SELECT S.name
FROM Student S, Book B, Checkout C
WHERE S.sid = C.sid
AND B.bid = C.bid
AND B.author = 'Olden Fames'
AND S.age > 12
AND S.age < 20
```

And assuming :

- There are 10,000 Student records stored on 1,000 pages.
- There are 50,000 Book records stored on 5,000 pages.
- There are 300,000 Checkout records stored on 15,000 pages.
- There are 500 different authors.
- Student ages range from 7 to 24.

(a) Show a physical query plan for this query, assuming there are no indexes and data is not sorted on any attribute. (5)

(b) Suggest two indexes and an alternate query plan for this query. (5)

SECTION – C (16 Marks)

(Compulsory)

9. (a) Consider the following schema :

Supplier (sid: integer, sname: string, address: string)

Part (pid: integer, pname: string, colour: string)

Catalog (sid: integer, pid: integer, cost: real)

The relation Supplier stores suppliers and the key of that relation is sid. The relation Part stores parts, and pid is the key of that relation. Finally, Catalog stores which supplier supplies which part at which cost. The key is the combination of the two attributes sid and pid.

Write the following queries in relational algebra and SQL :

(i) Find the names of suppliers who supply some red part.

(ii) Find the IDs of suppliers who supply some red or green part.

(iii) Find the names of suppliers who supply some red part or are based at 21 George Street.

(iv) Find the IDs of suppliers who supply some red part and some green part.

(v) Find the IDs of suppliers who supply only red parts. (10)

(b) A video library allows customers to borrow videos. Assume that there is only 1 of each video. We are told that :

video (title, director, serial)

customer (name, addr, memberno)

hire (memberno, serial, date)

title --> director, serial

serial --> title

serial --> director

name, addr --> memberno

memberno --> name, addr

serial, date --> memberno

Normalize the given relations with given dependencies to BCNF. (6)