**NATIONAL INSTITUTE OF TECHNOLOGY, KURUKSHETRA**

**THEORY EXAMINATION** **ROLL**
**NO.Question Paper**

Month and Year of the Examination: **Nov/Dec 2021**

Programme: **B.Tech. (Information technology)** … Semester… **3rd**….

Subject……..DBMS Course No…**ITPC 25**……

Maximum Marks…**50**……

Number of Questions to be attempted…**5**… Time allowed …**2 Hours**……

Total No. of Questions……**5**…… Total No. of Pages used…**2**….

**Note:** Assume suitably and state, additional data required, if any.

Q1 (a) Describe the three-schema architecture. Why do we need mappings between schema levels? How do different schema definition languages support this architecture? (5)

(b) What is meant by a recursive relationship type? Give some examples of Recursive relationship types. (5)

Q2 (a) A database is being constructed to keep track of the teams and games of a sports league. A team has a number of players, not all of whom participate in each game. It is desired to keep track of the players participating in each game for each team, the positions they played in that game, and the result of the game. Design an ER schema diagram for this application, stating any assumptions you make. Choose your favorite sport (e.g., soccer, baseball, football). Also define the mapping of conceptual schema to logical schema. (5)

(B) Comparison between Tuple relational calculus and domain relational calculus. (5)

Q3. (a) Relation R has eight attributes ABCDEFGH. Fields of R contain only atomic values. `F={CH->G, A->BC, B->CFH, E->A, F->EG}` is a set of functional dependencies (FDs) so that F + is exactly the set of FDs that hold for R.

How many candidate keys does the relation R have?
(a) 3 (b) 4 (c) 5 (d) 6

(b) Consider the relation X(P, Q, R, S, T, U) with the following set of functional dependencies

F = {
{P, R} → {S, T}
{P, S, U} → {Q, R}
}

Which of the following is the trivial functional dependency in F+ is closure of F?
(a) {P, R} → {S, T}

(b) {P, R} → {R, T}
(c) {P, S} → {S}
(d) {P, S, U} → {Q}

(c) Consider a schema R(A, B, C, D) and functional dependencies A -> B and C -> D. Then the decomposition of R into R1 (A, B) and R2(C, D) is
(a) dependency preserving and lossless join
(b) lossless join but not dependency preserving
(c) dependency preserving but not lossless join
(d) not dependency preserving and not lossless join

(d) Relation R with an associated set of functional dependencies, F, is decomposed into BCNF. The redundancy (arising out of functional dependencies) in the resulting set of relations is
(a) Zero
(b) More than zero but less than that of an equivalent 3NF decomposition
(c) Proportional to the size of F+
(d) Indeterminate

(e) Consider the following functional dependencies in a database.

```
Date_of_Birth->Age            Age->Eligibility
Name->Roll_number             Roll_number->Name
Course_number->Course_name    Course_number->Instructor
(Roll_number, Course_number)->Grade
```

The relation (Roll_number, Name, Date_of_birth, Age) is
(a) in second normal form but not in third normal form
(b) in third normal form but not in BCNF
(c) in BCNF
(d) in none of the above

Q4 (1) Consider the following partial Schedule *S* involving two transactions *T1*and *T2*. Only the *read* and the *write* operations have been shown. The read operation on data item *P* is denoted by *read* (*P*) and the write operation on data item *P* is denoted by *write* (*P*).

| Time instance | Transaction-id | |
|---|---|---|
| | *T1* | *T2* |
| 1 | *read(A)* | |
| 2 | *write(A)* | |
| 3 | | *read(C)* |
| 4 | | *write(C)* |
| 5 | | *read(B)* |
| 6 | | *write(B)* |

| | | |
|---|---|---|
| 7 | | *read(A)* |
| 8 | | *Commit* |
| 9 | *read(B)* | |
| Schedule S | | |

Suppose that the transaction $T1$ fails immediately after time instance 9. Which one of the following statements is correct?

- (A) $T2$ must be aborted and then both $T1$ and $T2$ must be re – started to ensure transaction atomicity
- (B) Schedule $S$ is non – recoverable and cannot ensure transaction atomicity
- (C) Only $T2$ must be aborted and then re – started to ensure transaction atomicity
- (D) Schedule S is recoverable and can ensure atomicity and nothing else needs to be done

Q4 (2) Consider the following schedules involving two transactions. Which one of the following statements is **TRUE**?

$S_1$: $r_1(X)$; $r_1(Y)$; $r_2(X)$; $r_2(Y)$; $w_2(Y)$; $w_1(X)$
$S_2$: $r_1(X)$; $r_2(X)$; $r_2(Y)$; $w_2(Y)$; $r_1(Y)$; $w_1(X)$

- (A) Both $S_1$ and $S_2$ are conflict serializable.
- (B) $S_1$ is conflict serializable and $S_2$ is not conflict serializable.
- (C) $S_1$ is not conflict serializable and $S_2$ is conflict serializable.

- (D) Both $S_1$ and $S_2$ are not conflict serializable.

Q4 (3) Explain concurrency control and locking protocols with example. (3,3,4)

OR

Q4 (a) Explain Serializability and Transaction Timestamp with examples. (5)
Q4 (b) Describe BCNF, Third Normal form, Fifth Normal form with examples.(5)

Q5 Write short notes on :-

(a) ACID properties
(b) Multivalued functional dependencies
(c) Embedded SQL and Dynamic SQL (3,3,4 )

RUBY CHAUHAN

Rubyyy.rana@gmail.com
8708934706