VIT

Vellore Institute of Technology

## SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

## CAT –II

### CSE 2004 – Database Management Systems

**Max. Marks: 50** **Slot: D2** **Duration: 90 Minutes**

**Answer ALL Questions (5 * 10 = 50)**

1. a. Consider the following transactions that get executed concurrently.
Let the value of $bal_x$ be 50 and $bal_y$ be 100. What are the values of $bal_x$ and $bal_y$ after the concurrent execution of both the transactions. (5)

| Time | T1 | T2 |
|---|---|---|
| t1 | Begin_Transaction | |
| t2 | Read ($bal_x$) | |
| t3 | $bal_x = bal_x + 100$ | |
| t4 | Write ($bal_x$) | Begin_Transaction |
| t5 | | Read ($bal_x$) |
| t6 | | $bal_x = bal_x * 1.1$ |
| t7 | | Write ($bal_x$) |
| t8 | | Read ($bal_y$) |
| t9 | | $bal_y = bal_y * 1.1$ |
| t10 | | Write ($bal_y$) |
| t11 | | Commit |
| t12 | Read($bal_y$) | |
| t13 | $bal_y = bal_y - 100$ | |
| t14 | Write ($bal_y$) | |
| t15 | Commit | |

b. Consider a relation R(A, B, C, D) having two FD sets. FD1 = {A->B, B->C, A->C} and FD2 = {A->B, B->C, A->D}. Check whether these sets of FDs are equivalent or not. (5)

2. Given a relation R(A, B, C, D, E, G) with the following eight functional dependencies F: AB→C, D→EG, C→A, BE→C, BC→D, CG→BD, ACD→B, CE→AG.

For the following statements, decide whether they are true or false. For false statements, explain why you think that they are wrong. (10)

| Id | Statement | True / False | Explanation |
|---|---|---|---|
| 1 | The closure of BC is {A, D, E, G} | | |
| 2 | All attributes of R are in the closure of BC | | |
| 3 | The closure of AC is {A, C} | | |
| 4 | ABC is a super key of R | | |
| 5 | ABC is a candidate key of R | | |

3. a. Consider the schema R = ABCD, subjected to FDs F = {A→B, C → D}, and the Non-binary partitions D1 = {AB, AC, AD} and D2 = {AB, AC, CD}. Whether D1 and D2 partitions are lossless decomposition? (5)

b. Let the relation R be R (A, B, C, D, E) and the given set of FDs be F: {A→D, BC→AD, C→B, E→A, E→D}. Find the minimal cover of F. (5)

4. Consider the following relation: (10)

Shipping (ShipName, ShipType, VoyageID, Cargo, Port, Date)

**Hint:** Date is the date the ship arrives in the given Port

With the functional dependencies

ShipName -> ShipType

VoyageID -> ShipName, Cargo

ShipName, Date -> VoyageID, Port

(a) Identify the candidate keys (b) Normalize to 2NF

(c) Normalize to 3NF (d) Normalize to BCNF

5. Consider the following schema

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

Parts (pid: integer, pname: string, color: string)

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

The key fields are underlined, and the domain of each field is listed after the field name. The Catalog relation lists the prices charged for parts by Suppliers. Write the following queries in relational algebra.

a. Find the sids of suppliers who supply some red or green part. (2.5)

b. Find the sids of suppliers who supply some red part or are at 22, Packer Street. (2.5)

c. Find the pids of parts supplied by every supplier at less than $200. (2.5)

d. Find the pids of parts supplied by at least two different suppliers. (2.5)

AB, D1 -> C D