CMR Institute of Technology
Department of Computer Science & Engineering

Internal Assessment Test 2: IV/July 2024

Sub:	Database Management System				Sub Code:	BCS403	Branch:	CSE	
Date:	9.7.2024	90 mins	Max Marks:	50	Sem/Sec:	IV/A, B, C		OBE	

	Answer any FIVE FULL Questions	MARKS	CO	RBT
1	Explain various types of Functional dependencies with suitable examples.	10	CO4	L2
2	Explain 3NF, BCNF, 4NF & 5NF with suitable examples.	10	CO4	L2
3	Consider the tables: Students (StudentID, StudentName, Major), Enrollments EnrollmentID, StudentID, CourseID, Semester). Write relational algebraic expressions for the following questions: 1. Find all students who are enrolled in at least one course. 2. Find all distinct student records and enrollment details across both the Students and Enrollments tables. 3. Identify all students who are not currently enrolled in any course. 4. retrieve a list of all students along with their enrolled courses and majors.	10	CO1	L3
4	1. Explain the purpose of various schema change statements. Justify your answer with suitable examples. 2. Write the algorithm for finding closure of a set of FDs. Suppose we have a set of attributes as S: {W, X, Y, Z} and functional dependencies are: Z -> W,Y -> XZ, XW -> Y. Find candidate key for the given relation S.	5+5	CO3, CO4	L3

5	1. Explain the Armstrong Axioms with relevant example 1. Differentiate between lossy and lossless join dependency	[5+5]	CO2, CO4	L2
6	Consider the relations: Employee (Emp_ID, Emp_Name, Salary, Role, Dno) & Awards (Emp_ID, Award-date) . In the Employee table for Role attribute values can be considered as “developer”, “manager”, etc. Write SQL statements for the following questions: i. Retrieve details of all the employees who won an award. ii. Retrieve the names of the developers who earn more than all the managers. iii. Retrieve the list of employees whose name ends with “Mishra”. iv. Retrieve the list of employees who works in Dept nos. 1, 2, or 3 v. Update the Emp_Name as 'XYZ' in the Table whose Emp_ID is 301.	10	CO3	L3

Answer Scheme and Solution

Answer 1

1. Trivial Functional Dependency
2. Multivalued Functional Dependency
3. Transitive Functional Dependency
4. Fully Functional Dependency
5. Partial Functional Dependency

Answer 2

3NF- No transitive dependency and for every non trivial dependency

X—> Y , either X is Candidate key or Y is prime attribute

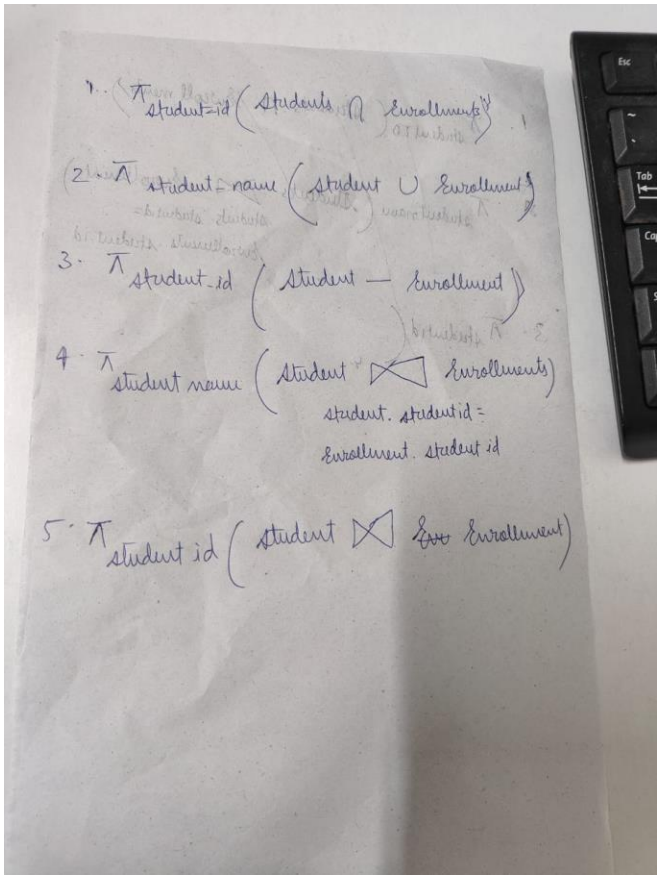
BCNF- For for every non trivial dependency

X—> Y , either X is SK.

4NF- A relation schema *R* is in 4NF with respect to a set of dependencies *F* (that includes functional dependencies and multivalued dependencies) if, for every *nontrivial* multivalued dependency $X \rightarrow\rightarrow Y$ in F+ *X* is a superkey for *R*

5NF- A relation schema *R* is in fifth normal form (5NF) (or project-join normal form (PJNF)) with respect to a set *F* of functional, multivalued, and join dependencies if, for every nontrivial join dependency JD(*R*1, *R*2, ..., *Rn*) in *F*+ every *Ri* is a superkey of *R*.

Answer 3

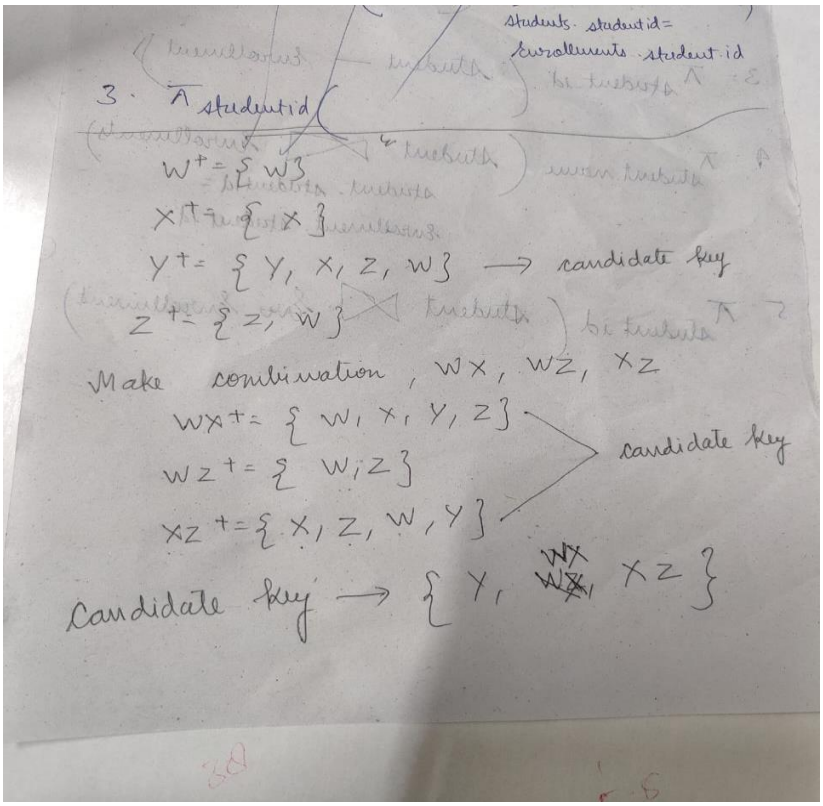


Answer 4-a

Schema change statements in databases are used to modify the structure (schema) of tables or relations.

SQL Commands are: DROP, ALTER.

Answer 4-b



Answer 5-a

1. Reflexivity-
2. Augmentation-
3. Transitivity-
4. Union or Additive:
5. Composition-
6. Decomposition or Projectivity -
7. Pseudo Transitivity-.
8. Self-Determination:
9. Extensively -

Answer 5-b

Lossy Join Dependency

1. **Definition**: A join dependency is considered lossy if, after decomposing a relation into two or more sub-relations and then joining them back together, the original relation cannot be perfectly reconstructed. In other words, some information might be lost or additional spurious tuples might be introduced during the join operation.
2. **Outcome**: The result of joining the decomposed relations may contain extra tuples that were not present in the original relation or might miss some tuples that were originally present.
3. **Implications**: Lossy join indicates potential redundancy or inconsistency in the data, making it problematic for database integrity. It generally signifies that the decomposition is not done correctly.
4. **Example**: Consider a relation R(A, B, C) decomposed into R1(A, B) and R2(B, C). If the join of R1 and R2 results in tuples that are not present in the original relation R, then the join is lossy.

Lossless Join Dependency

1. **Definition**: A join dependency is considered lossless if, after decomposing a relation into two or more sub-relations and then joining them back together, the original relation can be perfectly reconstructed without any loss of information or introduction of spurious tuples.
2. **Outcome**: The result of joining the decomposed relations exactly matches the original relation, ensuring that all original data is preserved without any inconsistencies.
3. **Implications**: Lossless join is desirable in database design as it guarantees that the decomposition does not introduce redundancy or inconsistency. It ensures data integrity and consistency.
4. **Example**: Consider a relation R(A, B, C) decomposed into R1(A, B) and R2(A, C). If the join of R1 and R2 perfectly reconstructs the original relation R without any extra or missing tuples, then the join is lossless.

Answer 6

I. SELECT e.* FROM Employee e JOIN Awards a ON e.Emp_ID = a.Emp_ID;

ii SELECT e1.Emp_Name FROM Employee e1 WHERE e1.Role = 'developer' AND e1.Salary > ALL (SELECT e2.Salary FROM Employee e2 WHERE e2.Role = 'manager');

iii. SELECT Emp_Name FROM Employee WHERE Emp_Name LIKE '%Mishra';

iv SELECT * FROM Employee WHERE Dno IN (1, 2, 3);

v. UPDATE Employee SET Emp_Name = 'XYZ' WHERE Emp_ID = 301;