DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Rescheduled Supplementary Summer Examination – 2025

Course: B.Tech (Computer Engineering / Computer Science & Engineering / Allied) **Semester : V**

Subject Code & Name: Database Management System (BTCOC501)

Max Marks: 60 **Date: 18/08/2025** **Duration: 3 Hr.**

Instructions to the Students:

1. *Each question carries 12 marks.*
2. *Question No. 1 will be compulsory and include objective-type questions.*
3. *Candidates are required to attempt any four questions from Question No. 2 to Question No. 6.*
4. *The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.*
5. *Use of non-programmable scientific calculators is allowed.*
6. *Assume suitable data wherever necessary and mention it clearly.*

Marks

Q. 1 Objective type questions. (Compulsory Question) **12**

1 The primary purpose of a database system is to _____. 1

a) Store large text files b) Provide efficient data management

c) Generate operating systems d) Run hardware devices

2 Which of the following is a weak entity? 1

a) Student b) Employee c) Dependent d) Course

3 In ER diagrams, mapping cardinality specifies: 1

a) Attributes of entity b) Number of entities in a relationship

c) Storage size d) File format

4 Match the following: 1

1. Primary Key	A. Unique identifier
2. Candidate Key	B. Minimal super key
3. Super Key	C. Set of attributes uniquely identifying tuples
4. Foreign Key	D. Referential integrity

a) 1-A, 2-B, 3-C, 4-D b) 1-B, 2-C, 3-D, 4-A

c) 1-C, 2-D, 3-B, 4-A d) 1-D, 2-A, 3-C, 4-B

5 Tuple relational calculus is _____. 1

a) Procedural b) Non-procedural c) Data definition language d) Encryption technique

6 The SQL clause used to group tuples is: 1

a) ORDER BY b) GROUP BY c) HAVING d) DISTINCT

7 Normalization is used to _____. 1

a) Increase redundancy b) Minimize redundancy

c) Reduce concurrency d) Improve hardware speed

8 A relation in 1NF does not contain: 1

a) Atomic values b) Multi-valued attributes

c) Candidate keys d) Primary keys

9 A schedule that preserves transaction results as if executed serially is called: 1

a) Non-serializable b) Serializable c) Concurrent d) Cascading

10 Which of the following is NOT a concurrency control protocol? 1

a) Lock-based b) Timestamp-based

c) Two-phase commit d) Deadlock avoidance

11 Match the following: 1

1. Atomicity	A. All or nothing
2. Consistency	B. Preserves rules
3. Isolation	C. Executes independently
4. Durability	D. Results survive failure

a) 1-A, 2-B, 3-C, 4-D b) 1-B, 2-C, 3-D, 4-A
c) 1-C, 2-D, 3-A, 4-B d) 1-D, 2-A, 3-B, 4-C

12 A _____ is a logical unit of database processing that includes one or more operations. 1

a) Tuple b) Transaction c) Query d) Relation

Q. 2 Solve the following. **12**

A) Explain the difference between primary key, candidate key, and super key with examples. **6**

B) Define database system applications with examples. Differentiate between strong and weak entity sets in ER modeling. **6**

Q.3 Solve the following. **12**

A) List the fundamental operations in relational algebra. **6**
Write relational algebra queries for:
a) Retrieve names of employees earning more than 50,000.
b) Find all students enrolled in "Database Systems".

B) Explain schema, instance, and relation with an example. Differentiate between relational algebra and relational calculus. **6**

Q. 4 Solve Any Two of the following. **12**

A) List the different types of SQL commands with examples. Define SQL joins and explain types with syntax. **6**

B) Explain any FOUR built-in types the SQL. Explain aggregate functions in SQL with suitable **6**

examples.

Write SQL queries for the table consists of `Employee`:

a) Find names of employees working in “Sales” department.
b) List the average salary by department.

C) The following are SQL queries based on a typical "university schema," which commonly includes tables such as `course`, `department`, `instructor`, `student`, `takes`, and `section`. **6**

a) Find the titles of courses in the Comp. Sci. department that have 3 credits.
b) Find the IDs of all students who were taught by an instructor named Einstein; make sure there are no duplicates in the result.
c) Find the highest salary of any instructor.
d) Find all instructors earning the highest salary (there may be more than one with the same salary).

Q.5 Solve Any Two of the following. **12**

A) State the features of a good relational design. Define functional dependency with example. **6**

B) Why are certain functional dependencies called trivial functional dependencies? Normalize the given relation R(A, B, C, D, E) with FDs: A→B, B→C, C→D, D→E up to BCNF. **6**

C) Compute the closure of the following set F of functional dependencies for relation schema r (A, B, C, D, E). A→BC, CD→E, B→D, E→A **6**
List the candidate keys for R.

Q. 6 Solve Any Two of the following. **12**

A) Explain lock-based concurrency control with examples. State the ACID properties of a transaction. **6**

B) Show how timestamp-based protocol can avoid conflicts between two sample transactions. Differentiate between static and dynamic deadlock handling techniques. **6**

C) Draw an ER diagram for a university system with entities: Student (Student_ID [PK], Name, DOB, Email, Phone), Course (Course_ID [PK], Course_Name, Credits, Department, Semester), Instructor (Instructor_ID [PK], Name, Qualification, Department, Email) having the relations as Enrollment, Teaches, and advises. **6**

***** End *****