Roll Number												

Narula Institute of Technology

An Autonomous Institute under MAKAUT

2023

END SEMESTER EXAMINATION - ODD 2023

CS502 - Database Management Systems

TIME ALLOTTED: 3Hours **FULL MARKS: 70**

Instructions to the candidate:

Figures to the right indicate full marks.
Draw neat sketches and diagram wherever is necessary.
Candidates are required to give their answers in their own words as far as practicable

Group A
(Multiple Choice Type Questions)
Answer any ten from the following, choosing the correct alternative of each question: 10×1=10

1. In the relational modes, cardinality is termed as: (1) CO1 BL1
a) Number of tuples
b) Number of tables
c) Number of attributes
d) Number of constraints

2. Which one of the following is used to define the structure of the relation ? (1) CO2 BL1
a) DML(Data Manipulation Language)
b) DDL(Data Definition Language)
c) Query
d) Relational Schema

3. ___ is used to permanently save the work. (1) CO2 BL2
a) Read
b) Write
c) Commit
d) Rollback

4. If the state of the database no longer reflects a real state of the world that the database is supposed to capture, then such a state is called (1) CO3 BL1
a) Consistent state
b) Parallel state
c) Atomic state
d) Inconsistent state

5. Consider the relation R(A, B, C, D, E, F, G) with following functional dependencies: {A—>BC, B—>DG, E—>F}. Identify the Candidate Key. (1) CO5 BL1
a) A

b) AE
c) AD
d) AB

6. In 2-phase locking a transaction must (1) CO5 BL4
a) release all it locks at the same time
b) NOT obtain any new locks once it has started releasing locks
c) only obtain locks on items not used by any other transactions
d) ensure that deadlocks will never occur.

7. Which of the following is true? (1) CO4 BL3
a) A super key is always a candidate key
b) Every BCNF schema is also in 3NF
c) Generalization is a bottom-up design approach
d) None of these.

8. What is ACID in the context of database transactions? (1) CO4 BL2
a) A programming language
b) A security protocol
c) A set of properties ensuring reliable processing of database transactions
d) A data type

9. What is the purpose of the COMMIT statement in SQL? (1) CO3 BL2
a) To undo changes made in a transaction
b) To save the changes made in a transaction
c) To roll back a transaction
d) To delete records from a table

10. Which of the following command is a type of Data Definition language command? (1) CO1 BL2
a) Create
b) Update
c) Delete
d) Merge

11. Serializability of concurrent transactions are ensured by (1) CO5 BL3
a) locking
b) time-stamping
c) occuring deadlock
d) serial in nature

12. DML is provided for (1) CO1 BL1
a) Description of logical structure of database
b) Addition of new structures in the database system
c) Manipulation & processing of database
d) Definition of physical structure of database system

Group B
(Short Answer Type Questions)
(Answer any three of the following) 3x5=15

13. Consider the following two schedules. Check whether both of these schedule are conflict-serializable? Explain why or why not. S1: R1(X) R1(Y) R2(X) R2(Y) W2(Y) W1(X) S2: R1(X) R2(X) R2(Y) W2(Y) R1(Y) W1(X)	(5)	CO4	BL4
14. Check the highest normal form for the relation R(A, B, C, D, E, F) where the following FDs hold: {AB —> C, C —>DE, E —>F, F —>A}.	(5)	CO3	BL3
15. Explain three schema architecture.	(5)	CO1	BL2
16. What is a multi-valued dependency? Explain with example.	(5)	CO4	BL2
17. write the answer in details.	(5)		
a) Describe different data users.	(2)	CO1	BL1
b) Explain duties of Database Administrator.	(3)	CO1	BL2

Group C
(Long Answer Type Questions)
(Answer any three of the following) 3x15=45

18. Answer All	(15)		
a) Explain the ACID property of transaction.	(5)	CO5	BL3
b) Explain the 2 Phase locking protocol. What benefit does strict two-phase locking provide? What is the disadvantage of it?	(5)	CO5	BL4
c) What is deadlock in transaction? How to detect deadlock in a system? Explain with diagram.	(5)	CO5	BL4
19. write answer in details.	(15)		
a) Define the following terms with proper example: i) Trivial and non-trivial functional dependency ii) Prime and Non-prime attribute	(4)	CO2	BL1
b) Given a set of FDs for the relation schema R (A, B, C, D, E). The FDs are {BC—>D, AC—>BE, B—>A, A—>D}. Explain and find out the highest normal form of R.	(5)	CO3	BL3
c) Consider a schema R(A,B,C,D, E) and functional dependencies AB—>CD,A —>E and C—>D. Check whether the decomposition of R into R1(ABC), R2(BCD) and R3(CDE) is lossless and/or dependency preserving or not.	(6)	CO3	BL3
20. Answer All	(15)		
a) Consider the following relations: HOTEL (hotelno, name, address) ROOM (roomno, hotelno, type, price_pn)	(6)	CO3	BL5

BOOKING (hotelno, guestno, dateform, dateto, roomno)

GUEST (guestno, name, address)

Where the underlined column names are primary keys

Write down expressions in relational algebra for the following queries:

i) list all the hotels which are situated in Kolkata.

ii) list all single rooms with a charge below Rs. 1000 per night.

iii) list the names of all guests who are going to stay at ITC Hotel from 25th December to 1st January.

iv) list the price per night and type of all rooms at Grand Hotel.

v) list all guests currently staying at Taj Hotel.

b) What are the different types of outer join?	(6)	CO3	BL2
c) What is safe expression in tuple relational calculus?	(3)	CO3	BL2
21. Answer All	(15)		
a) What is normalization? Describe the different types of anomalies in a relation.	(6)	CO5	BL2
b) Explain different normal forms with example.	(9)	CO5	BL3
22a. Design an ER diagram on database for a library system that needs to manage information about books, authors, and library members. Identify and list the main entities in this library system. Define the relationships between these entities, indicating the cardinality and participation constraints. Specify attributes for each entity, taking into consideration key attributes. Draw an Entity-Relationship (ER) diagram that accurately represents the database design based on your analysis in steps 1-3. Consider entities such as Book, Author, Member, and relationships such as Authorship, Borrow, etc. Include attributes like ISBN for books, AuthorID for authors, and MemberID for library members. Ensure that your ER diagram is clear, and relationships are appropriately represented.	(8)	CO2	BL6
22b. Explain different states of transaction in RDBMS in breaf.	(4)	CO2	BL2
22c. What is shadow paging?	(3)	CO4	BL4