

(c) What is closure of a functional dependency?

4 + 6 + 2 = 12

**Group - E**

8. (a) What are the ACID properties of a transaction? Explain.  
 (b) Indicate the difference between conflict equivalence and view equivalence.  
 (c) Explain wait-die and wound-wait protocols for deadlock prevention.

4 + 4 + 4 = 12

9. (a) Briefly describe the properties of B-tree.  
 (b) Consider the following two transactions:

T1: read(A);  
 read(B);  
 If A:=0, then B:=B+1;  
 write(B)  
 T2: read(B);  
 read(A);  
 if B:=0, then A:=A+1;  
 write(A)

Add lock and unlock instructions to T1 and T2, so that they observe two phase locking protocol. Can the execution of these transactions result in a deadlock?

(c) What is cascading rollback?

3 + 6 + 3 = 12

**FUNDAMENTALS OF RDBMS  
 (CSEN 4281)**

Time Allotted : 3 hrs

Full Marks : 70

*Figures out of the right margin indicate full marks.*

*Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.*

*Candidates are required to give answer in their own words as far as practicable.*

**Group – A  
 (Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) Cardinality ratio means  
 (a) number of attributes associated with an entity  
 (b) number of entities related with other entities via a relationship  
 (c) number of entities in an entity set  
 (d) ratio of number of columns and rows in a table.
- (ii) DML is provided for  
 (a) description of logical structure of database  
 (b) addition of new structure in the database system  
 (c) manipulation and processing of database  
 (d) definition of physical structure of database system.
- (iii) In an E-R diagram an entity set is represented by  
 (a) rectangle (b) ellipse  
 (c) a diamond box (d) circle.
- (iv) Which of the following operations is used if we are interested in only certain columns of table?  
 (a) PROJECTION (b) UNION  
 (c) SELECTION (d) JOIN.
- (v) Which of the following is a comparison operator in SQL?  
 (a) = (b) LIKE  
 (c) BETWEEN (d) all of these.
- (vi) Which of the following is not a DDL statement?  
 (a) ALTER (b) DROP (c) SELECT (d) CREATE.

- (vii) Serializability of concurrent transactions are ensured by  
 (a) locking (b) time stamping  
 (c) both of these (d) none of these.
- (viii) Cartesian product in relational algebra is  
 (a) a unary operation (b) a binary operation  
 (c) a ternary operation (d) not defined.
- (ix) Which of the following is the way to undo the effects of an aborted transaction?  
 (a) Compensation transaction (b) Roll back  
 (c) Recovery (d) Error control.
- (x) In 2-phase locking a transaction must  
 (a) release all it locks at the same time  
 (b) not obtaining 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 .

**Group - B**

2. (a) By using a single illustrative example define and explain the terms: primary key, candidate key, foreign key, alternate key, and super key. Also, highlight the difference between a primary key and a unique key.  
 (b) Explain what DDL, DML, DCL are. Give an example of each.  
 (c) Discuss the different types of constraints that should be present in a good database design.  
 (d) By using a single illustrative example bring out the difference between left outer join, right outer join, and full outer join.  
 $3 + 3 + 3 + 3 = 12$
3. (a) Define the concept of generalization and specialization with a suitable example.  
 (b) Draw an E-R diagram for a travel agency consisting of the following: customers, buses, drivers, conductors, guides, tickets, booking, agents, reservations, conducted tours and hotels. Clearly describe entities, attributes, primary key and relations.  
 $4 + 8 = 12$

**Group - C**

4. Consider the following relations:  
 HOTEL ( hotelno, name, city)  
 ROOM ( roomno, hotelno, type, tariff)  
 BOOKING ( hotelno, guestno, datefrom, dateto, roomno)  
 GUEST ( guestno, name, city)  
 Write down the expressions in relational algebra for the following queries:  
 (i) List all the hotels which are situated in KOLKATA.  
 (ii) List all single rooms with charge below 1000.  
 (iii) List all guests currently staying at TAJ hotel.  
 (iv) List the price per night and type of all rooms at GRAND hotel.  
 $4 \times 3 = 12$
5. Consider the following tables:  
 DEPT ( DCODE, DNAME )  
 EMP ( ECODE, ENAME, BASIC, DCODE, DT\_JN)  
 Write down the SQL statements for the following:  
 (i) For each department, show DNAME and total basic of the employees in the department.  
 (ii) Find out the name of the departments where no person is working.  
 (iii) Find out the name of the employees who are working in the department named as "PQR".  
 (iv) Find out the maximum basic among the employees who has joined after the year 2000.  
 $4 + 4 + 2 + 2 = 12$

**Group - D**

6. (a) When do we call a relation is in 3NF? How does it differ from BCNF?  
 (b) What is lossless decomposition?  
 (c) Discuss the terms insertion anomalies , deletion anomalies and update anomalies.  
 $(2 + 2) + 2 + 6 = 12$
7. (a) Explain the terms 'partial functional dependency' and 'transitive dependency'.  
 (b) Given a relational schema Supply(sno, city, status, pno, qty) with FD set  $F = \{ sno \rightarrow city, city \rightarrow status, \{sno, pno\} \rightarrow qty \}$   
 Reduce it into 3NF.