R V College of Engineering
Department of Computer Science and Engineering
CIE - III(Improvement): Scheme

Subject : (Code)	**Database Management Systems (CD252IA)**	**Semester : 5TH BE**

S.N	PART-A	M	BT	Co
1.	What is the difference between lossless and lossy decomposition in DBMS? **Lossless** / **Lossy** The decompositions R1, R2, R2…Rn for a relation schema R are said to be Lossless if there natural join results the original relation R. / The decompositions R1, R2, R2…Rn for a relation schema R are said to be Lossy if there natural join results into addition of extraneous tuples with the original relation R. Formally, Let R be a relation and R1, R2, R3 … Rn be it's decomposition, the decomposition is lossless if – R1 ⋈ R2 ⋈ R3 …. ⋈ Rn = R / Formally, Let R be a relation and R1, R2, R3 … Rn be its decomposition, the decomposition is lossy if – R ⊂ R1 ⋈ R2 ⋈ R3 …. ⋈ Rn	2	L2	3
2.	List the two conditions for checking the Binary decomposition? ▪ The FD ((R1 ∩ R2) → (R1 – R2)) is in F+, ▪ The FD ((R1 ∩ R2) → (R2 – R1)) is in F+	2	L1	2
3.	Define the Condition of 3NF? Third normal form (3NF) is based on the concept of transitive dependency. A functional dependency X → Y in a relation schema R is a transitive dependency if there exists a set of attributes Z in R that is neither a candidate key nor a subset of any key of R, and both X → Z and Z → Y hold.	2	L1	2
4.	Define a Transaction with example. A transaction is an executing program that forms a logical unit of database processing. A transaction includes one or more database access operations—these caninclude insertion, deletion, modification, or retrieval operations. Ex: airline reservation systems	2	L1	1
5.	Elaborate and Define ACID properties: Atomicity, Consistency,Isolation, Durability----0.5m each	2	L1	1
	PART-B			
1a	Discuss the condition for two functional dependencies to be equivalent? Check whether relation R(A,B,C,D) having two FD sets FD1 = {A->B, B->C, AB->D} and FD2 = {A->B, B->C, A->C, A->D} are equivalent or not ? Condition: Two sets of functional dependencies E and F are equivalent if E+ = F+. Therefore, equivalence means that every FD in E can be inferred from F, and every FD in F can be inferred from E; that is, E is equivalent to F if both the conditions—E covers F and F covers E—hold---1m Step 1: Checking whether all FDs of FD1 are present in FD2 ● A->B in set FD1 is present in set FD2. ● B->C in set FD1 is also present in set FD2.	5	L3	2

	● AB->D is present in set FD1 but not directly in FD2 but we will check whether we can derive it or not. For set FD2, (AB)+ = {A, B, C, D}. It means that AB can functionally determine A, B, C, and D. So AB->D will also hold in set FD2. As all FDs in set FD1 also hold in set FD2, FD2 ⊃ FD1 is true. Step 2: Checking whether all FDs of FD2 are present in FD1 ● A->B in set FD2 is present in set FD1. ● B->C in set FD2 is also present in set FD1. ● A->C is present in FD2 but not directly in FD1 but we will check whether we can derive it or not. For set FD1, (A)+ = {A, B, C, D}. It means that A can functionally determine A, B, C, and D. SO A->C will also hold in set FD1. ● A->D is present in FD2 but not directly in FD1 but we will check whether we can derive it or not. For set FD1, (A)+ = {A, B, C, D}. It means that A can functionally determine A, B, C, and D. SO A->D will also hold in set FD1. As all FDs in set FD2 also hold in set FD1, FD1 ⊃ FD2 is true. As FD2 ⊃ FD1 and FD1 ⊃ FD2 both are true **FD2 =FD1** is true. These two FD sets are semantically equivalent. -----4m			
1b	Explain any 5 reasons for failure of transaction. A transaction or system error Local errors or exception conditions detected by the transaction, A computer failure (system crash). Concurrency control enforcement. Disk failure. Physical problems and catastrophes.-----any 5 from above -----1m each	5	L2	
2a	Explain the steps for finding Minimal Cover for Functional Dependencies. For the given set of FDs {A->C, AC->D, E->H, E->AD} find the minimal cover. ● Steps: we define a set of functional dependencies F to be minimal if it satisfies the following conditions: ● 1. Split the right-hand attributes of all FDs:Every dependency in F has a single attribute for its right-hand side. ● 2. Remove all redundant FDs. ● 3. Find the Extraneous attribute and remove it.. ● Example: Minimize {A->C, AC->D, E->H, E->AD} ● **Step 1**: {A->C, AC->D, E->H, E->A, E->D} ● **Step2**:{A->C,AC->D,E->H,E->A} Here Redundant FD : {E->D} ● **Step3**:{AC->D}{A}+={A,C} Therefore C is extraneous and is removed. {A->D} ● Minimal Cover = {A->C, A->D, E->H, E->A}	7	L3	2
2b	Write the algorithm for Testing whether a schedule is serializable or not.	3		

Algorithm 21.1. Testing Conflict Serializability of a Schedule S

1. For each transaction T_i participating in schedule S, create a node labeled T_i in the precedence graph.
2. For each case in S where T_j executes a read_item(X) after T_i executes a write_item(X), create an edge $(T_i \rightarrow T_j)$ in the precedence graph.
3. For each case in S where T_j executes a write_item(X) after T_i executes a read_item(X), create an edge $(T_i \rightarrow T_j)$ in the precedence graph.
4. For each case in S where T_j executes a write_item(X) after T_i executes a write_item(X), create an edge $(T_i \rightarrow T_j)$ in the precedence graph.
5. The schedule S is serializable if and only if the precedence graph has no cycles.

3a	Explain the properties of Attribute preservation and dependency preservation? Attribute preservation---2.5m Dependency preservation-2.5m	5	L2	3
3b	Given a relational schema R = { SSN, ENAME, PNUMBER, PNAME, PLOCATION, HOURS } and the decomposed table R1 = { ENAME, PLOCATION } and R2 = { SSN, PNUMBER, HOURS, PNAME, PLOCATION } and FD = { SSN → ENAME, PNUMBER → { PNAME, PLOCATION}, { SSN, PNUMBER } → HOURS }. Identify whether the given decomposition of R, R1 and R2 is lossless or lossy decomposition ? Matrix:	5	L3	
4a	Given a relation R(A, B, C, D) and Functional Dependency set FD = { AB → CD, B → C }, determine whether the given R is in 2NF? If not convert it into 2 NF. Solution: No non-prime attribute should be partially dependent on Candidate Key Since R has 4 attributes: - A, B, C, D, and Candidate Key is AB, Therefore, prime attributes (part of candidate key) are A and B while a non-prime attribute are C and D a) FD: **AB → CD** satisfies the definition of 2NF, that non-prime attribute(C and D) are fully dependent on candidate key AB b) FD: **B → C** does not satisfy the definition of 2NF, as a non-prime attribute(C) is partially dependent on candidate key AB(i.e. key should not be broken at any cost) **As FD B → C, the above table R(A, B, C, D) is not in 2NF---3M** **Conversion to 2NF:** a) R1(B, C) b) R2(A, B, D)-----2M	5	L3	1

	SSN	ENAME	PNUMBER	PNAME	PLOCATION	HOURS
R1		a			a	
R2	a		a	a	a	a

Final matrix

	SSN	ENAME	PNUMBER	PNAME	PLOCATION	HOURS
R1	b	a	b	b	a	b
R2	a	b	a	a	a	a

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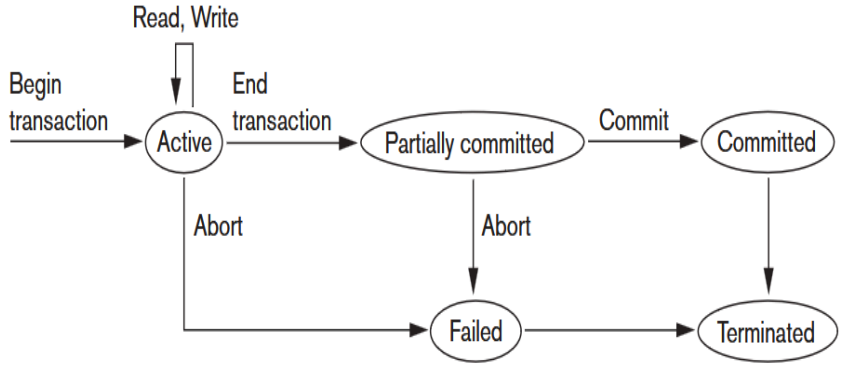
It's a lossy decomposition

b	With a transition diagram explain the states for transaction execution  Diag-2m Expl-3m	5	L2	2
5.	List and explain with examples the types of problems that can be encountered if two transactions are executing concurrently. ● The Lost Update Problem. ● The Temporary Update (or Dirty Read) Problem. ● The Incorrect Summary Problem. ● The Unrepeatable Read Problem. List -2m Explanation- 8m	10	L2	1