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17CA103 DATABASE MANAGEMENT SYSTEMS				
Academic Year :	2018-2019	**Question Bank**	Programme :	MCA
Year / Semester :	I / I		Course Coordinator:	Ms.S.Visalatchy

Course Objectives	**Course Outcomes:**
1. To learn the fundamentals of data models and to conceptualize and depict a database system using ER diagram. 2. To make a study of SQL and relational database design. 3. To understand the internal storage structures using different file and indexing techniques which will help in physical DB design. 4. To know the fundamentals concepts of transaction processing – concurrency control techniques and recovery procedure. 5. To have an introductory knowledge about the Storage and Query processing Techniques.	On completion of the course, students will be able to CO1: Explain the fundamentals of data models and to conceptualize and depict a database system using ER diagram CO2: Explain relational database design. CO3: Explain the Storage and Query processing Techniques CO4: Explain transaction processing and concurrency control. CO5: Compare different types of databases.

PART – A (2 Mark Questions With Key)				
S.No	**Questions**	**Mark**	**COs**	**BTL**
UNIT I – RELATIONAL DATABASES				
1	**What do you mean by weak entity set?**		1	K1
	An entity set that does not have a primary key	1		
	An entity set that does not have sufficient attributes to form a primary key	1		
2	**List any four applications where a database is used?**			
	Sales : For customer, product, and purchase information. **Accounting** : For payments, receipts, account balances, assets and other accounting information.	1	1	K1
	Finance : For storing information about holdings, sales, and purchases of financial instruments such as stocks and bonds; also for storing real-time market data to enable online trading by customers and automated trading by the firm. **Universities** : For student information, course registrations, and grades (in addition to standard enterprise information such as human resources and accounting).	1		

3	**Define Database management system.**			
	It is system software for creating and managing databases.	1	1	K1
	DBMS provides users and programmers with a systematic way to create, retrieve, update and manage data.	1		
4	**List out the difference types of attributes in ER data model.**			
	• Simple and Composite Attribute • Single Valued and Multi Valued attribute	0.5 0.5	1	K1
	• Stored and Derived Attributes • Complex Attribute	0.5 0.5		
5	**Distinguish between super key and candidate key.**			
	Super Key is defined as a set of attributes within a table that uniquely identifies each record within a table. Super Key is a superset of Candidate key.	1	1	K2
	Candidate keys are defined as the set of fields from which primary key can be selected. It is an attribute or set of attribute that can act as a primary key for a table to uniquely identify each record in that table.	1		
6	**What is Dynamic SQL?**			
	Dynamic SQL allows the program to construct an SQL query as a character string at runtime, submit the query, and then retrieve the result into program variables a tuple at a time. The dynamic SQL component of SQL allows programs to construct and submit SQL queries at runtime.	2	1	K1
7	**Define Embedded SQL.**			
	Embedded SQL provides a means by which a program can interact with a database server. However, under embedded SQL, the SQL statements are identified at compile time using a pre-processor. The preprocessor submits the SQL statements to the database system for pre compilation and optimization; then it replaces the SQL statements in the application program with appropriate code and function calls before invoking the programming-language compiler.	2	1	K1
8	**Define Key.**			
	To specify how tuples within a given relation are distinguished. This is expressed in terms of their attributes. That is, the values of the attribute values of a tuple must be such that they can uniquely identify the tuple.	2	1	K1

9	**Define data model.**				
	Data models define how the logical structure of a database is modeled. Data Models are fundamental entities to introduce abstraction in a DBMS.		1		
	Data models define how data is connected to each other and how they are processed and stored inside the system.		1	1	K1
10	**State the difference between primary key and unique key.**				
	Primary Key	**Unique Key**			
	Can be only one in a table	Can be more than one unique key in one table.	0.5		
	It never allows null values	Unique key can have null values (only single null is allowed).	0.5	1	K2
	Primary Key is unique key identifier and cannot be null and must be unique.	It can be a candidate key	1		
11	**List the responsibilities of a DB Manager.**				
	Database administrators also control access and security aspects. For example, different people within an organization use databases in different ways.		1		
	Some employees may simply want to view the data and perform basic analysis. Other employees are actively involved in adding data to the database or updating existing data. This means that the database administrator needs to set the user permissions		1	1	K1
12	**What are the various disadvantages of file system?**				
	➢ Data redundancy and inconsistency ➢ Difficulty in accessing data ➢ Data isolation ➢ Integrity problems		1		
	➢ Atomicity problems. ➢ Concurrent-access anomalies ➢ Security problems		1	1	K1
13	**Compare Database systems with file systems.**				
	Database systems	**File systems**			
	A program to debit or credit an account	Data redundancy and inconsistency	0.5		
	A program to add a new account	Difficulty in accessing data	0.5	1	K2
	A program to find the balance of	Data isolation	0.5		

	an account				
	A program to generate monthly statements	Integrity problems	0.5		
14	**Explain domain relational calculus with syntax.**				
	A second form of relational calculus, called domain relational calculus, uses domain variables that take on values froman attributes domain, rather than values for an entire tuple. The domain relational calculus, however, is closely related to the tuple relational calculus. $\{< x1, x2, \ldots, xn > \mid P(x1, x2, \ldots, xn)\}$		2	1	K1
15	**Define Keys and distinguish between super key and candidate key.**				
	Key A key is a single or combination of multiple fields. Its purpose is to access or retrieve data rows from table according to the requirement.		1		
	Super key	**Candidate key**			
	a combination of attributes that can be uniquely used to identify a database record.	A relation can have only one primary key.	0.5		
	A table might have many super keys.	It may contain many fields or combination of fields that can be used as primary key. One field or combination of fields is used as primary key.	0.5	1	K2
UNIT II – DATABASE DESIGN					
1	**What is First normal form?**				
	A domain is atomic if elements of the domain are considered to be indivisible units. We say that a relation schema R is in first normal form (1NF) if the domains of all attributes of R are atomic.		2	2	K1
2	**What do you mean by triggers?**				
	An instance of a relation that satisfies all such real-world constraints is called a legal instance of the relation; a legal instance of a database is one where all the relation instances are legal instances.		1	2	K1
3	**What are the two ways to use functional dependencies?**				
	We shall use functional dependencies in two ways: To test instances of relations to see whether they satisfy a given set F of functional dependencies.		1		
	To specify constraints on the set of legal relations.We shall thus concern ourselves with only those relation instances that satisfy a given set of functional dependencies. If we wish to constrain ourselves to relations on schema r (R) that satisfy a set F of functional dependencies, we say that F holds on r (R).		1	2	K1

4	**Define BCNF.**			
	Arelation schema R is in BCNF with respect to a set F of functional dependencies if, for all functional dependencies in F+ of the form _ → _, where _ ⊆ R and _ ⊆ R, at least one of the following holds: • _ → _ is a trivial functional dependency (that is, _ ⊆ _). • _ is a superkey for schema R.	1	2	K1
5	**Define: Tuple Relational Calculus.**			
	A query in the tuple relational calculus is expressed as: {t| P(t)}	1	2	K1
	Example Queries Find the ID, name, dept name, salaryfor instructors whose salary is greater than $80,000: {t| t ∈ instructor ∧ t[salary] >80000}	1		
6	**Define Third Normal form.**			
	A relation schema R αis in third normal form with respect to a set F of functional dependencies if, for all functional dependencies in F+ of the form α →β, where α ⊆ R and β ⊆ R, at least one of the following holds: • α →β is a trivial functional dependency. • α is a superkey for R. • Each attribute A in β −α is contained in a candidate key for R.	2	2	K1
7	**What is meant by Armstrong's axioms?**			
	• Union rule. If α →β holds and α →λ holds, then α →β λ holds. • Decomposition rule. If α →β λ holds, then α →β holds and α →λ holds. • Pseudo transitivity rule. If α →β holds and λ β δ → _ holds, then α λ →δ holds.	2	2	K1
8	**Write the complete set of relational algebra operations.**			
	Let r (R) be a relation schema, and let F be a set of functional dependencies on r (R). Let R1 and R2 form a decomposition of R. We say that the decomposition is a lossless decomposition if there is no loss of information by replacing r (R) withtwo relation schemas r1(R1) andr2(R2).	2	2	K1
9	**Why functional dependencies are called trivial functional dependencies?**			
	A trivial functional dependency occurs when you describe a functional dependency of an attribute on a collection of attributes	1	2	K2

	that includes the original attribute.			
	This type of functional dependency is called trivial because it can be derived from common sense. It is obvious that if you already know the value of B, then the value of B can be uniquely determined by that knowledge.	1		
10	**Define Functional dependency.**			
	Functional dependency is a relationship that exists when one attribute uniquely determines another attribute. (OR) Functional dependency in a database serves as a constraint between two sets of attributes.	1		
	If R is a relation with attributes X and Y, a functional dependency between the attributes is represented as X->Y, which specifies Y is functionally dependent on X. Here X is a determinant set and Y is a dependent attribute. Each value of X is associated precisely with one Y value.	1	2	K1
11	**Write a test case for BCNF.**			
	To check if a nontrivial dependency $\alpha \rightarrow \beta$ causes a violation of BCNF, compute α + (the attribute closure of α), and verify that it includes all attributes of R; that is, it is a superkey of R.	1		
	To check if a relation schema R is in BCNF, it suffices to check only the dependencies in the given set F for violation of BCNF, rather than check all dependencies in F+.	1	2	K1
12	**What is called equality-generating dependencies?**			
	Functional dependencies rule out certain tuples from being in a relation. If $A \rightarrow B$, then we cannot have two tuples with the same A value but different B values. Multivalued dependencies, on the other hand, do not rule out the existence of certain tuples. Instead, they require that other tuples of a certain form be present in the relation. For this reason, functional dependencies sometimes are referred to as equality-generating dependencies.	2	2	K1
13	**Define Fourth normal form.**			
	A relation schema r (R) is in fourth normal form (4NF) with respect to a set D of functional and multivalued dependencies if, for all multivalued dependencies in D+ of the form $\alpha \rightarrow\rightarrow \beta$, where $\alpha \subseteq R$ and $\beta \subseteq R$, at least one of the following holds: • $\alpha \rightarrow\rightarrow \beta$ is a trivial multivalued dependency. • α is a superkey for R.	2	2	K1

14	**What is PJNF?**			
	Multivalued dependencies help us understand and eliminate some forms of repetition of information that cannot be understood in terms of functional dependencies. There are types of constraints called join dependencies that generalize multivalued dependencies, and lead to another normal form called project-join normal form (PJNF).	0.5	2	K1
15	**What is denormalization?**			
	The process of taking a normalized schema and making it nonnormalized is called denormalization, and designers use it to tune performance of systems to support time-critical operations.	2	2	K1
UNIT III – DATA STORAGE AND QUERYING				
1	**Why variable length record arises in databases? Give an example.**		3	K2
	Storage of multiple record types in a file Record types that allow variable lengths for one or more fields Record types that allow repeating fields	1		
2	**What you mean by Hashing?**			
	File organizations based on the technique of hashing allow us to avoid accessing an index structure	1	3	K2
	Hashing also p rovides a way of constructing indices.	1		
3	**List the uses of Indexing.**			
	There are two basic kinds of indices: **Ordered indices** :Based on a sorted ordering of the values.	1	3	K1
	Hash indices: Based on a uniform distribution of values across a range of buckets. The bucket to which a value is assigned is determined by a function called a hash function.	1		
4	**What is Hash Key?**			
	We want to choose a hash function that assigns search-key values to buckets in such a way that the distribution has these qualities: • **The distribution is uniform**. • **The distribution is random.**	2	3	K2
5	**Define: Sparse Indices.**			
	In a sparse index, an index entry appears for only some of the search-key values.	1	3	K1
	Sparse indices can be used only if the relation is stored in sorted			

	order of the search key, that is, if the index is a clustering index.		1		
6	**What is the difference between Dense index and Sparse Index?**				
	Dense index	**Sparse Index**			
	an index entry appears for every search-key value in the file.	an index entry appears for only some of the search-key values.	1	3	K2
	clustering index, the index record contains the search-key value and a pointer to the first data record with that search-keyvalue.	Sparse indices can be used only if the relation is stored in sorted order of the search key, that is, if the index is a clustering index.	1		
7	**What is the main advantage of using static hashing?**				
	In a hash file organization, we obtain the address of the disk block containing a desired record directly by computing a function on the search-key value of the record.		1	3	K2
	In a hash index organization we organize the search keys, with their associated pointers, into a hash file structure.		1		
8	**What are the physical storage media?**				
	➢ Cache ➢ Main memory ➢ Flash memory ➢ Magnetic-disk storage ➢ Optical storage ➢ Tape storage		2	3	K1
9	**What is MTTF?**				
	The mean time to failure (MTTF), this is a measure of the reliability of the disk. The mean time to failure of a disk (or of any other system) is the amount of time that, on average, we can expect the system to run continuously without any failure.		2	3	K1
10	**Give two main goals of parallelism in a disk system.**				
	Load-balance multiple small accesses (block accesses), so that the ..		1	3	K1
	Parallelize large accesses so that the response time of large accesses is reduced.		1		
11	**What are the factors to choose the RAID level?**				
	• Monetary cost of extra disk-storage requirements. • Performance requirements in terms of number of I/O operations. • Performance when a disk has failed. • Performance during rebuild (that is, while the data in a failed disk are being rebuilt on a new disk).		2	3	K1

12	**What are the two types of tertiary storage devices?**			
	➢ Optical disks ➢ Magnetic tapes.	2	3	K1
13	**What are the possible ways for organizing records in a file?**			
	➢ Heap files organization. ➢ Sequential file organization. ➢ Hashing file organization.	2	3	K1
14	**Explain sequential file organization.**			
	Sequential file is designed for efficient processing of records in sorted order based on some search key. A search key is any attribute or set of attributes; it need not be the primary key, or even a super key.	2	3	K1
15	**What is called journaling file systems?**			
	File systems that support log disks as above are called journaling file Systems. Journaling file systems can be implemented even without a separate log disk, keeping data and the log on the same disk. Doing so reduces the monetary cost, at the expense of lower performance.	2	3	K1
UNIT IV – TRANSACTION MANAGEMENT				
1	**Define the term ACID property.**			
	The ACID properties of a DBMS allow safe sharing of data. ACID properties are an important concept for databases. The acronym stands for Atomicity, Consistency, Isolation, and Durability.	2	4	K1
2	**What is Shadow Paging?**			
	Shadow paging is a technique for providing atomicity and durability (two of the ACID properties) in database systems. A page in this context refers to a unit of physical storage (probably on a hard disk), typically of the order of to bytes.	2	4	K1
3	**List the desirable properties of Transaction.**			
	• Atomicity • Consistency • Isolation • Durability	2	4	K1
4	**What is Concurrency control?**			
	The database system must control the interaction among the concurrent transactions to prevent them from destroying the consistency of the database. It does so through a variety of mechanisms called concurrency-control.	2	4	K1
5	**Write the modes in which a data item may be locked.**			
	A lock is a mechanism to control concurrent access to a data item . Data items can be locked in two modes : 1. exclusive (X) mode.	2	4	K1

	Data item can be both read as well as written. X-lock is requested using lock-X instruction. 2. shared (S) mode. Data item can only be read. S-lock is requested using lock-S instruction.			
6	**Why recovery scheme is essential for a database?**			
	An integral part of a database system is a recovery scheme that can restore the database to the consistent state that existed before the failure.	1	4	K2
	The recovery scheme must also provide high availability; that is, it must minimize the time for which the database is not usable after a failure.	1		
7	**Define: Two Phase Locking Protocol.**			
	One protocol that ensures serializability is the two-phase locking protocol	0.5	4	K1
	two phases: **1. Growing phase :** A transaction may obtain locks, but may not release any lock. **2. Shrinking phase :** A transaction may release locks, but may not obtain any new locks.	1.5		
8	**What is meant by transaction rollback?**			
	The log is scanned backward. With Example	1	4	K2
	Once the log record <Ti start> is found the backward scan is stopped. With Example.	1		
9	**What are the two operations said to be conflict?**			
	We are dealing with only read and write instructions.	0.5	4	K2
	Example	1.5		
10	**What are the operations of transaction?**			
	read(X), which transfers the data item X from the database to a variable, also called X, in a buffer in main memory belonging to the transaction that executed the read operation.	1	4	K2
	write(X), which transfers the value in the variable X in the main-memory buffer of the transaction that executed the write to the data item X in the database.	1		
11	**What is Deadlock?**			
	A state where neither of two transactions can ever proceed with its normal execution. This situation is called deadlock.	0.5	4	K1
	Example	1.5		

12	**What is Rolled back?**			
	Any changes that the aborted transaction made to the database must be undone. Once the changes caused by an aborted transaction have been undone, we say that the transaction has been rolled back.	2	4	K2
13	**Write the transaction states.**			
	• Active • Partially committed • Failed • Aborted • Committed	2	4	K1
14	**Consider a simple banking system to transfer the amount Rs.50/- from account A to account B.**			

	read(A);
	A := A − 50;
	write(A);
	read(B);
	B := B + 50;
	write(B).
		2	4	K2

15	**consider the following SQL query on our university database that finds all instructors who earn more than $90,000.**			
	select *ID, name* **from** *instructor* **where** *salary* > 90000;	2	4	K2
UNIT V – ADVANCED TOPICS				
1	**What are the advantages of OODBMS?**			
	To develop a database system that natively stores objects and relationships between objects. Such databases, called object-oriented databases	1	5	K2
	Object-oriented databases represent components of the design as objects, and the connections between the objects indicate how the design is structured.	1		
2	**Write a note on OO data model.**			
	The object-oriented data model supports a rich type system, including structured and collection types. While inheritance and, to some extent, complex types are also present in the E-R model, encapsulation and object-identity distinguish the object-oriented data model from the E-R model.	2	5	K1
3	**What is called Temporal databases?**			
	Time plays an important role in database systems. Databases are models of the real world. Whereas most databases model the state of	2	5	K1

	the real world at a point in time (at the current time), temporal databases model the states of the real world across time.			
4	**Define Spatial databases.**			
	Spatial databases are finding increasing use today to store computer-aided design data as well as geographic data. Design data are stored primarily as vector data; geographic data consist of a combination of vector and raster data.	1	5	K1
	Spatial-integrity constraints are important for design data.Spatial data support in databases is important for efficiently storing, indexing, and querying of data based on spatial locations.	1		
5	**Give an example for structure of XML.**			
	<account> . . . <balance> . . . </balance> . . . </account>	1	5	K1
	With small program.	1		
6	**What is Object Query Language?**			
	The object query language (OQL) is the query language proposed for the ODMG object model. It is designed to work closely with the programming languages for which an ODMG binding is defined, such as C++, SMALLTALK, and JAVA.	1.5	5	K1
	Hence, an OQL query embedded into one of these programming languages can return objects that match the type system of that language.	0.5		
7	**What is Mobile databases?**			
	We study the database requirements of the new generation of mobile computing systems, such as notebook computers and palmtop computing devices, which are connected to base stations via wireless digital communication networks. Such computers need to be able to operate while disconnected from the network, unlike the distributed database systems	2	5	K1
8	**What is tuning?**			
	Tuning the performance of a system involves adjusting various parameters and design choices to improve its performance for a specific application. Various aspects of a database-system design—ranging from high-level aspects such as the schema and transaction design, to database parameters such as buffer sizes, down to hardware issues such as number of disks—affect the performance of an application. Each of these aspects can be adjusted so that performance is improved.	2	5	K1
9	**Define XML.**			
	Extensible Markup Language (XML) was not originally conceived as a database technology.	0.5	5	K1

	XML has its roots in document management, and is derived from a language for structuring large documents known as the Standard Generalized Markup Language(SGML).	1.5		
10	**What is Xpath in XML?**			
	XPath addresses parts of an XML document by means of path expressions. A path expression in XPath is a sequence of location steps separated by "/" (instead of the "." operator that separates steps in SQL:1999). The result of a path expression is a set of values.	2	5	K1
11	**What are the two reasons for using broadcast data?**			
	First, the mobile host avoids the energy cost for transmitting data requests. Second, the broadcast data can be received by a large number of mobile hosts at once, at no extra cost. Thus, the available transmission bandwidth is utilized more effectively.	2	5	K2
12	**What are the basic architecture of a video-on-demand System?**			
	• Video server • Terminals • Network	2	5	K2
13	**Give an importance of the R-tree.**			
	A storage structure called an R-tree is useful for indexing of objects such as points, line segments, rectangles, and other polygons.	1	5	K2
	An R-tree is a balanced tree structure with the indexed objects stored in leaf nodes, much like a B+-tree.	1		
14	**Define vector data.**			
	Vector data are constructed from basic geometric objects, such as points, line segments, poly lines, triangles, and other polygons in two dimensions, and cylinders, spheres, cuboids, and other polyhedrons in three dimensions.	2	5	K1
15	**What are the two classes of database applications?**			
	Online transaction processing (OLTP) and decision support Online analytical processing (OLAP)	2	5	K1
Note : 15 Questions with answer key must be prepared in each unit				

PART – B (12 Mark Questions with Key)				
S.No	**Questions**	**Mark**	**COs**	**BTL**
UNIT I – RELATIONAL DATABASES				
1	**Explain the database system Architecture with neat diagram.**	12	1	K2
	Database Applications Database Languages Storage Manager	2 2 2		
	The Query Processor With neat Diagram Diagram	2 2 2		

2	**Discuss the various disadvantages of file system and explain how it can be overcome by DBMS.**	12		
	Keeping organizational information in a file-processing system has a number of major disadvantages: ➢ Data redundancy and inconsistency ➢ Difficulty in accessing data ➢ Data isolation ➢ Integrity problems	2 1 1 2	1	K2
	➢ Atomicity problems. ➢ Concurrent-access anomalies ➢ Security problems	2 2 2		
3	**Explain in detail about basic structure of SQL with example.**			
	Queries on a Single Relation Queries on Multiple Relations The Natural Join	4 4 4	1	K2
4	**Explain Relational algebra with example**			
	• Select • Project • Set difference • Cartesian product • Union • rename	12	1	K3
5	**Explain the different types of database languages**			
	• DDL • DML • DCL	4 4 4 4	1	K2
6	**Discuss about E-R model with an example.**			
	➢ E-R Model definition ➢ Entity Sets ➢ Relationship Sets ➢ Attributes	2 4 4 2	1	K2
UNIT II – DATABASE DESIGN				
1	**Explain the Boyce Code Normal form and 3NF with your own example. Also give how it differs from that of 3NF.**	12	2	K2
	BCNF with example 3NF with example Comparison between BCNF and 3NF	4 4 4		
2	**Explain about decomposition using Multivalued Dependencies.**	12		
	Multivalued Dependencies Fourth Normal Form 4NF Decomposition	4 4 4	2	K2
3	**Discuss in detail about Fifth Normal Form in detail.**			
	PJNF or Fifth Normal form explanation	8	2	K2

	Example	4		
4	**Explain in detail about database design process in database design.**			
	E-R Model and Normalization Naming of Attributes and Relationships Denormalization for Performance Other Design Issues	3 3 3 3	2	K2
5	**Explain in detail about functional dependency theory with suitable examples.**			
	Closure of a set of functional dependencies Closure of attribute sets Canonical cover Lossless Decomposition Dependency preservation	3 3 2 2 2	2	K2
6	**Illuminate the algorithm for decomposition.**			
	BCNF decomposition ➢ Testing for BCNF ➢ BCNF decomposition algorithm ➢ 3NF decomposition ➢ Correctness of the 3NF algorithm Comparison of BCNF and 3NF	1 2 2 2 2 3	2	K2
UNIT III – DATA STORAGE AND QUERYING				
1	**Explain how B+ tree is used for indexing with an example.**	12		
	Structure of a B+-Tree Queries on B+-Trees Updates on B+-Trees • Insertion • Deletion • Non unique Search Keys • Complexity of B+-Tree Updates	4 4 4	3	K2
2	**Distinguish between static hashing and dynamic hashing.**			
	Difference between static hashing and dynamic hashing	12	3	K2
3	**What you mean by file organization and explain B tree indexing of files?**			
	Fixed-Length Records Variable-Length Records	4 4	3	K2
	Structure of a B+-Tree Updates on B+-Trees	2 2		
4	**Explain B+ tree Index files with examples.**			
	Structure of a B+-Tree Queries on B+-Trees Updates on B+-Trees	4 4 4	3	K2
5	**Describe about Multiple Key Access.**			
	Using Multiple Single-Key Indices Indices on Multiple Keys Covering Indices	4 4 4	3	K2

6	**Explain in detail about RAID level.**			
	6 RAID Levels explained with neat diagrammatic representation. RAID Level 0 RAID Level 1 RAID Level 2 RAID Level 3 RAID Level 4 RAID Level 5 RAID Level 6	 1 2 2 2 2 2 1	3	K2
UNIT IV – TRANSACTION MANAGEMENT				
1	**Explain the different techniques of Serializability with example.**	12		
	Conflict serializability. conflict equivalent precedence graph serializability order topological sorting Illustration of topological sorting	2 2 2 2 2 2	4	K2
2	**How concurrency is performed? Explain the protocol that is used to maintain the concurrency concept.**			
	Lock-Based Protocols Locks Granting of Locks The Two-Phase Locking Protocol Implementation of Locking	3 1 2 3 3	4	K2
3	**Explain recovery with concurrent transactions.**			
	Interaction with Concurrency Control Transaction Rollback Checkpoints Restart Recovery	4 2 4 2	4	K2
4	**Explain Two Phase Locking Protocol with an example.**			
	1. Growing phase. A transaction may obtain locks, but may not release any lock. **2. Shrinking phase.** A transaction may release locks, but may not obtain any new locks. • Strict two-phase locking protocol • Rigorous two-phase locking protocol • Implementation of Locking • Graph-Based Protocols	 2 2 2 2 2 2	4	K2
5	**Draw a state diagram and discuss the typical states that a transaction goes through during execution.**			

	Transaction state ◦Active ◦Partially committed ◦Failed ◦Aborted ◦Committed ◦Terminated **Transaction** ◦Restart ◦Kill **Explain with diagram**	 4 4 4 	4	K3
6	**What is crash recovery? Discuss.**			
	Log-Record Buffering Database Buffering Operating System Role in Buffer Management Fuzzy Check pointing	4 4 2 2	4	K2
UNIT V – ADVANCED TOPICS				
1	**Explain in detail about structured types and Inheritance in SQL of Object based databases.**	12		
	Structured Types with example Type Inheritance with example	6 6	5	K2
2	**Discuss in detail about Persistent Programming Languages.**			
	Persistence of Objects Object Identity and Pointers Storage and Access of Persistent Objects Persistent C++ Systems Persistent Java Systems	2 2 2 3 3	5	K2
3	**Explain in detail about XML document schema with suitable example.**			
	Document type definition XML schema	6 6	5	K2
4	**Describe about Temporal databases with suitable examples.**			
	Motivation Time in Databases Time Specification in SQL Temporal Query Languages	3 3 3 3	5	K2
5	**Discuss in detail about Spatial Databases with example.**			
	Representation of Geometric Information Design Databases Geographic data Spatial Queries Indexing of Spatial data	2 2 3 2 3	5	K2
6	**Explain about Mobile databases with suitable examples.**			
	A Model of Mobile Computing Routing and Query processing Broadcast data Disconnectivity and Consistency	3 3 3 3	5	K2
Note : 6 Questions with answer key must be prepared in each unit and maximum two sub divisions are allowed.				

PART – C (20 Mark Questions with Key)				
S.No	**Questions**	**Mark**	**COs**	**BTL**
UNIT I – RELATIONAL DATABASES				
1	**Draw an enhanced ERD for Library Management system and explain the various notations used.**	20	1	K3
	▪ Notations with explanations ▪ ER Diagram for Library Management System	5 15		
2	**Explain in detail about advanced SQL with example.**			
	▪ SQL Data Types and Schemas ▪ Integrity Constraints ▪ Authorization ▪ Embedded SQL ▪ Dynamic SQL ▪ Functions and Procedural Constructs** ▪ Recursive Queries** ▪ Advanced SQL Features**	2 2 2 3 3 3 2 3	1	K2
UNIT II – DATABASE DESIGN				
1	**Explain in detail about Dependency Preservation with suitable example.**	20		
	Definition Explanation about dependency preservation with example.	3 17	2	K2
2	**Describe about decomposition using functional dependencies.**			
	Keys and functional dependencies Boyce-code Normal form BCNF and Dependency preservation Third normal form Higher normal forms		2	
UNIT III – DATA STORAGE AND QUERYING				
1	**Explain in detail about Selection operation, Sorting and Join operation with suitable examples.**	20		
	Selection Operation with examples Sorting with examples Join Operation with examples	7 6 7	3	K2
2	**Elaborately explain the steps involved in query processing with suitable example.**			
	• Overview • Measures of Query Cost • Selection Operation • Sorting • Join Operation • Other Operations • Evaluation of Expressions	2 3 3 3 3 3 3	3	K2
UNIT IV – TRANSACTION MANAGEMENT				
1	**Explain in detail about deadlock handling with suitable example.**	20		
	Explanation about Deadlock Deadlock Prevention	5 5	4	K2

	Deadlock Detection and Recovery with neat diagram	10		
2	**Discuss in detail about Timestamp based Protocol with examples.**			
	Timestamps The Timestamp-Ordering Protocol Thomas' Write Rule	5 7.5 7.5	4	K2
UNIT V – ADVANCED TOPICS				
1	**Explain about the XML and example for XML representation of Banking information.**	20		
	Explanation about XML XML coding for Banking system	5 15	5	K3
2	**Design a database for the student management system with the requirements like managing attendance details and the semester marks of the students. Give the complete design that includes ER diagram and complete database design.**			
	The functional requirements ER diagram Database design	5 5 10	5	K3
Note : 2 Questions with answer key must be prepared in each unit and maximum two sub divisions are allowed.				