

SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

QUESTION BANK



III SEMESTER

AD3362-DATABASE DESIGN AND MANAGEMENT

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SUBJECT : DATABASE DESIGN AND MANAGEMENT

SEM / YEAR: III Sem / II Year

UNIT I – CONCEPTUAL DATA MODELING

Database environment-Database system development lifecycle-Requirements collection -Database design-Entity-Relationship model-Enhanced-ER Model-UML class diagram

PART – A

Q.No	Questions	BT Level	Competence
1.	List out the application of DBMS.	BTL 1	Remembering
2.	Mention the steps in database development life cycle	BTL 1	Remembering
3.	What is Database Design and Management (DDM)?	BTL 1	Remembering
4.	List the characters of conceptual data model?	BTL 1	Remembering
5.	Define Entity-Relationship model, applications and Components?	BTL 1	Remembering
6.	What is an attribute?	BTL 1	Remembering
7.	Describe the importance of the maintenance phase in DB development?	BTL 2	Understanding
8.	Define Entity? Differentiate between strong entity and Weak entity sets?	BTL 2	Understanding
9.	What is database environment?	BTL 2	Understanding
10.	What is Enhanced ERModel (EER)?	BTL 1	Remembering
11.	Mention the purpose of class diagram?	BTL 2	Understanding
12.	Define the term "database."?	BTL 1	Remembering
13.	What is requirements collection in database design? Name two techniques used for requirements gathering?	BTL 1	Remembering
14.	Differentiate between data and metadata?	BTL 2	Understanding
15.	Recall the meaning of derived attribute with example.	BTL 2	Understanding
16.	What is a Data Definiton language.Give Example.	BTL 1	Remembering
17.	Explain the role of a DBMS in the database environment?	BTL 2	Understanding
18.	What is a UML class diagram? Name the three main elements of a class in UML?	BTL 1	Remembering
19.	What is database design? Name the three levels of database design?	BTL 1	Remembering
20.	What is a primary key Give example?	BTL 1	Remembering
21.	Compare association and aggregation in UML diagrams?	BTL 2	Understanding
22.	Mention the purpose of the Class diagram and its compartments?	BTL 2	Understanding
23.	Give the limitations of ER model? How do you overcome this?	BTL 2	Understanding
24.	What is data model? Explain various data models with example?	BTL 2	Understanding

PART-B

1.	(i) Analyze the basic architecture of Database management system with a suitable diagram? (10) (ii) Design a simple database environment for an online bookstore. Explain the roles of DBMS, users, and hardware? (6)	BTL 4	Analyzing
2.	Demonstrate short notes on (i) Notation for ER Diagram? (6) (ii) Draw the components of ER models? (10).	BTL 4	Analyzing
3.	Investigate in detail about Conceptual Database Design? (7) Analyze the advantages and disadvantages of a centralized vs. distributed database environment. Justify your answer with examples? (9)	BTL 4	Analyzing
4.	Implement Relationship Types with example? (6) Collect and document the database requirements for a hotel reservation system. Draw use case and data flow diagrams? (10)	BTL 3	Applying
5.	(i) Why would you choose a database system instead of simply storing data in operating system files? What would it make sense not to use a database system? (9) (ii) Analyze the difference between logical and physical data independence? (7)	BTL 4	Analyzing
6.	(i) What is an Entity? Demonstrate different type of Entities? (9) (ii) What is an Attribute? Demonstrate different types of Attributes? (7)	BTL 3	Applying
7.	Apply the three phases of database design to develop a database for a library management system? (16)	BTL 4	Applying
8.	Compute in detail about Enhanced ER Model with example, Apply generalization, specialization, and aggregation to design an EER diagram for an employee payroll system? (16)	BTL 4	Applying
9.	Modify in detail about class hierarchies with an example (16)	BTL 4	Applying
10.	Analyze each phase of the database development lifecycle and explain its significance with a real-world application? (16)	BTL 4	Analyzing
11.	Design the Class diagram for the Hospital management system? Find and draw conceptual classes for the same?(16)	BTL 3	Applying
12.	Compute in detail about UML diagrams. Construct a UML class diagram for an online shopping system. Show associations, multiplicities, and attributes? (16)	BTL 4	Applying
13.	A university database contains information about professors (identified by social security number, or SSN) and courses (identified by courseid). Professors teach courses; each of the following situations concerns the Teaches relationship set. For each situation, draw an ER diagram that describes it (assuming that no further constraints hold). 1. Professors can teach the same course in several semesters, and each ordering must be recorded. 2. Professors can teach the same course in several semesters, and only the most recent such offering needs to be recorded. (Assume this condition applies in all subsequent questions.) 3. Every professor must teach some course. 4. Every professor teaches exactly one course (no more, no less).(16)	BTL 4	Analyzing
14.	Demonstrate in detail the components of DB system environment? (16)	BTL 3	Applying

15.	Justify in detail about Requirement collection.? (16)	BTL 5	Applying
16.	Draw and Explain an E-R diagram for a small marketing company database and assuming your own data requirements.(16)	BTL 4	Evaluating
17.	A car-rental company maintains a database for all vehicles in its current fleet. For all vehicles, it includes the vehicle identification number, license number, manufacturer, model, date of purchase, and color. Special data are included for certain types of vehicles: <ul style="list-style-type: none"> • Trucks: cargo capacity. • Sports cars: horsepower, renter age requirement. • Vans: number of passengers. • Off-road vehicles: ground clearance, drive train (four- or two-wheel drive). Construct an E- R model for all operations.(16) 	BTL 6	Creating

UNIT II - RELATIONAL MODEL AND SQL

Relational model concepts - Integrity constraints - SQL Data manipulation – SQL Data definition – Views - SQL programming.

PART – A

Q.No	Questions	BT Level	Competence
1.	What is a relation in a relational database?	BTL 1	Remembering
2.	Define Domain Constraints	BTL 1	Remembering
3.	Differentiate between a candidate key and a primary key.	BTL 1	Remembering
4.	What is the role of foreign keys and super keys in relational databases?	BTL 1	Remembering
5.	Disadvantages of Relational Model?	BTL 2	Understanding
6.	Define a tuple and an attribute?	BTL 1	Remembering
7.	What is the function of a primary key constraint in a table?	BTL 2	Understanding
8.	Define Key Constraints.	BTL 2	Understanding
9.	Define Integrity Constraints? Explain how constraints help in preserving data quality?	BTL 2	Understanding
10.	Differentiate between relation and relational schema?	BTL 2	Understanding
11.	How is the WHERE clause used in SQL queries? How does UPDATE modify existing records?	BTL 2	Understanding
12.	Define SELECT statement with an example?	BTL 1	Remembering
13.	What does the CREATE TABLE statement do in SQL?	BTL 2	Understanding
14.	What is relational model? What are the operations in Relational Model?	BTL 2	Understanding
15.	Explain the difference between DELETE and TRUNCATE?	BTL 2	Understanding
16.	Differentiate between VARCHAR and CHAR data types in SQL	BTL 1	Remembering
17.	What is a view in SQL? How is view different from table?	BTL 2	Understanding
18.	Explain how views improve security in SQL. Differentiate between simple and complex views.?	BTL 2	Understanding
19.	Distinguish between CREATE and ALTER statements?	BTL 2	Understanding
20.	Describe the use of cursors in SQL programming?	BTL 2	Understanding
21.	What are stored procedures in SQL?	BTL 2	Understanding

22.	What is the basic structure and purpose of triggers in SQL?	BTL 1	Remembering
23	What is SQL DDL? List two DDL commands with their functions?	BTL 1	Remembering
24.	What does the COMMIT command do? Explain the purpose of the ROLLBACK command?	BTL 2	Understanding
PART – B			
1.	Apply the concepts of DDL, DML, DCL, DQL with example query. (16)	BTL 3	Applying
2.	(i) Demonstrate in detail about integrity constraints over relations? (7) (ii) Analyze the role of constraints in maintaining consistency and accuracy in relational databases? (9)	BTL 4	Analyzing
3.	Discuss the role of primary keys in maintaining data integrity. (16)	BTL 3	Applying
4.	Demonstrate in detail about Domain Constraints over relations? (7) Explain the concepts of Key constraints over relations. (9)	BTL 4	Analyzing
5.	Design a relational schema for a hospital management system. Identify suitable primary and foreign keys and represent it using a set of relations? (16)	BTL 4	Analyzing
6.	(i) Analyze SQL Data Types with example. (6) (ii) Analyze SQL Operators with example? (10)	BTL 4	Analyzing
7.	Justify a query for create, select, insert, update, delete, drop, truncate of your own example. (16)	BTL 5	Evaluating
8.	Create SQL queries for an online food delivery database to insert, update, delete, and retrieve order data. Include aggregate and join operations? (16)	BTL 3	Applying
9.	Create a table with table name employee with attributes of name, id, age, department, salary and date of joining with exact data types. Make id as primary key. Insert 5 records with values. Change any employee department to other department. Delete any one record. Finally drop the table. Write the queries for all. (16)	BTL 4	Analyzing
10.	Examine the concept of views. Analyze how views affect query performance and data security. Provide examples to support your analysis? (16)	BTL 4	Analyzing
11.	(i) Identify a trigger program for age is less than or equal to 0 for the table?(8). ii. Write a PL/SQL program for finding the factorial of number?(8)	BTL 4	Analyzing
12.	Examine in detail about SQL Data Manipulation. (16)	BTL 4	Analyzing
13.	Strengths and weaknesses of the trigger mechanism. Contrast triggers with other integrity constraints supported by SQL.	BTL 4	Applying
14.	Create a table Sales with attributes saleid, productid, quantitysold, saledate, totalprice and insert the values for each attributes. Write the queries for following (16) i. Retrieve all columns from the sales table ii. Retrieve the saleid and saledate from the sales table. iii. filter the sales table to show only with a total price greater than 100.	BTL 5	Evaluating

	(iv) Retrieve the saleid and totalprice from the sales table for sales made on January. (v) Calculate the total revenue generated from all sales in the Sales table.		
15.	(i) Recommend a PL/SQL program for finding the GCD number? (10) (ii) Recommend a PL/SQL program for finding the greatest three number? (6)	BTL 5	Evaluating
16.	Consider the following relations Employee (<u>Eno</u> , name, DOB, Gender, Date of join, Designation, BasicPay, Dno) Department (Dno, Dname) The primary key is underlined. Write sql queries to perform the following? (i) Display the employee number, name, department number, and department name of all employees. (ii) List the details of employee who earn less than basic pay of all employees (iii) List the department number and number of employees in each department, (iv) List the details of employees who work for Dno='CSE'	BTL 5	Evaluating
17.	(i) Justify a PL/SQL Program to generate the Fibonacci series (ii) Justify a PL/SQL program to handle divide by zero exception	BTL 5	Evaluating

UNIT III – RELATIONAL DATABASE DESIGN AND NORMALIZATION

ER and EER-to-Relational mapping – Update anomalies – Functional dependencies – Inference rules – Minimal cover – Properties of relational decomposition – Normalization (upto BCNF).

PART – A

Q. No	Questions	BT Level	Competence
1.	Define a weak entity? Differentiate between total and partial participation?	BTL 1	Remembering
2.	What is deletion anomaly? List the types of anomalies in unnormalized relations?	BTL 1	Remembering
3.	What is transitive dependency and Partial functional dependency?	BTL 1	Remembering
4.	What is a multivalued dependency?	BTL 2	Understanding
5.	Define the concept of a super key in terms of functional dependencies?	BTL 1	Remembering
6.	What is meant by trivial functional dependency?	BTL 1	Remembering
7.	Define the transitivity rule in Armstrong's axioms?	BTL 1	Remembering
8.	What is the union rule in the context of functional dependencies?	BTL 2	Understanding
9.	State the decomposition rule for functional dependencies.	BTL 1	Remembering
10.	What is the pseudo transitivity rule?	BTL 2	Understanding
11.	What is the purpose of finding a minimal cover?	BTL 1	Remembering
12.	Why 4NF in Normal Form is more desirable than BCNF?	BTL 2	Understanding
13.	How are inference rules useful in deriving additional FDs?	BTL 1	Remembering
14.	What is the significance of a minimal cover in normalization?	BTL 2	Understanding
15.	Define the difference between minimal cover and closure of	BTL 2	Understanding

	functional dependencies?		
16.	Define Functional Dependency?	BTL 1	Remembering
17.	Define entity relationship model?	BTL 1	Remembering
18.	Explain how minimal cover is used in database design?	BTL 1	Remembering
19.	Describe the process of finding minimal cover?	BTL 2	Understanding
20.	What is normalization?	BTL 1	Remembering
21.	Define the first normal form (1NF).	BTL 2	Understanding
22.	What is the second normal form (2NF)?	BTL 1	Remembering
23.	Define the third normal form (3NF).	BTL 1	Remembering
24.	Define Boyce codd normal form? How does BCNF differ from 3NF?	BTL 2	Understanding
PART – B			
1.	(i) Apply the process of mapping an ER diagram to a relational schema. Include detailed steps and examples? (10) (ii) Design an ER diagram for a university database with entities: Student, Course, Instructor. Show how to map this ER model into a relational schema? (6)	BTL 3	Applying
2.	Compute the mapping of extended ER (EER) constructs such as specialization, generalization, and aggregation to relational schemas. Provide examples for each construct. (16)	BTL 3	Applying
3.	Analyze the process of normalization and explain how each normal form (1NF to BCNF) contributes to improving the quality of a database schema? (16)	BTL 4	Analyzing
4.	Apply the concept of anomalies by identifying and explaining insertion, deletion, and update anomalies in an unnormalized employee database? (16)	BTL 3	Applying
5.	Analyze how normalization can help prevent update anomalies. Use examples to show how different normal forms address various update anomalies. (16)	BTL 4	Analyzing
6.	Implement in detail about Functional Dependencies? Briefly discuss about the Functional Dependency Concepts? (16)	BTL 3	Applying
7.	Analyze the significance of functional dependencies in normalization. How do they help in determining the normal forms of a relationship? (16)	BTL 4	Analyzing
8.	Identify Armstrong's axioms and their use in deriving all possible functional dependencies from a given set of functional dependencies. Provide examples to illustrate the use of each axiom? (16)	BTL 4	Analyzing
9.	Apply functional dependencies and explain their role in database design. Provide examples to illustrate different types of functional dependencies? (16)	BTL 3	Applying
10.	Analyze minimal cover (canonical cover) and explain the steps involved in computing a minimal cover for a set of functional dependencies. Provide a detailed example? (16)	BTL 4	Analyzing
11.	Discuss the importance of minimal cover in database design. How does it contribute to achieving a normalized database schema? (16)	BTL 4	Analyzing
12.	Explain the properties of relational decomposition? (16)	BTL 3	Applying

13.	Apply the lossless join and dependency preservation test to check the validity of a given decomposition? (16)	BTL 3	Applying
14.	Apply the normalization process to a sample unnormalized relation and demonstrate how it improves database design by removing redundancy and anomalies? (16)	BTL 3	Applying
15.	Define Boyce-Codd normal form (BCNF) and analyze how it differs from the third normal form (3NF). Provide examples to illustrate the differences and the process of achieving BCNF? (16)	BTL 4	Analyzing
16.	Discuss the first normal form (1NF), second normal form (2NF), and third normal form (3NF) with examples.	BTL 4	Analyzing
17.	Analyze how inference rules help in deriving new functional dependencies from a given set. Explain with example? (16)	BTL 4	Analyzing

UNIT-IV – TRANSACTION MANAGEMENT

Transaction Concepts - properties - Schedules - Serializability - Concurrency Control - Two-phase locking techniques.

PART – A

Q. No	Questions	BT Level	Competence
1.	Define transaction. Give the states of transaction?	BTL 1	Remembering
2.	What are the properties of a transaction?	BTL 1	Remembering
3.	Define a schedule in the context of database transactions.	BTL 1	Remembering
4.	Give the reasons for allowing concurrency.	BTL 2	Understanding
5.	Discuss the term aborted state.	BTL 2	Understanding
6.	Explain the difference between a transaction and a query.	BTL 2	Understanding
7.	List the types of serializability.	BTL 1	Remembering
8.	What is serializability in database transactions?	BTL 1	Remembering
9.	List the phases of two-phase locking protocol	BTL 1	Remembering
10.	What is the purpose of concurrency control in databases.	BTL 2	Understanding
11.	Define strict two-phase locking.	BTL 1	Remembering
12.	What does a conflict serializable schedule ensure?	BTL 1	Remembering
13.	Why is atomicity important in transactions?	BTL 2	Understanding
14.	Define upgrade and downgrade.	BTL 1	Remembering
15.	How does a recoverable schedule differ from a non-recoverable schedule?	BTL 2	Understanding
16.	Define deadlock.	BTL 1	Remembering
17.	List the different modes of locks in database systems.	BTL 1	Remembering
18.	Describe the significance of serializability in transaction management.	BTL 2	Understanding
19.	Define the concept of deadlock in concurrency control.	BTL 2	Understanding
20.	What is the primary objective of two-phase locking?	BTL 2	Understanding
21.	What are the timestamps associated with each data item in a database transaction?	BTL 1	Remembering
22.	Distinguish between serial and concurrent schedules?	BTL 2	Understanding

23	Give an example of a transaction state.	BTL 1	Remembering
24.	What is the role of a lock in concurrency control?	BTL 2	Understanding
PART – B			
1.	Illustrate the conflict serializability and view serializability with an example. (16)	BTL 3	Applying
2.	Evaluate about the two-phase locking with suitable examples. (16)	BTL 5	Evaluating
3.	(i) When is a transaction said to be deadlocked?(7) (ii) Explain the deadlock prevention methods with an example? (9)	BTL 4	Analyzing
4.	Analyze Two Phase Commit and Three-Phase Commit Protocols. (16)	BTL 4	Analyzing
5.	(i) What is a deadlock? How does it occur? (7) (ii) How transactions are to be written to Avoid deadlock and guarantee correct execution. Illustrate a suitable example. (9)	BTL 3	Applying
6.	(i) Analyze the ACID properties of a transaction. Discuss how each property contributes to the overall reliability and integrity of a transaction. (9) (ii) Analyze the benefits of rigorous two-phase locking. Compare it with other forms of two-phase locking by examining their effects on concurrency, deadlock prevention, and system performance. (7)	BTL 4	Analyzing
7.	(i) Evaluate the effectiveness of concurrency control methods in a DBMS. What are the strengths and weaknesses of these methods? (7) (ii) Evaluate concurrency control with an example. Compare different methods used in the example and decide which one is most effective. (9)	BTL 5	Evaluating
8.	Analyze the mechanisms for handling deadlocks in a DBMS. How does each mechanism work, and when is it most effective? (16)	BTL 4	Analyzing
9.	Evaluate the implications of dirty reads, non-repeatable reads, and phantoms in database transactions. Provide examples to illustrate how each violation can affect data integrity and system reliability. (16)	BTL 5	Evaluating
10.	(i) Analyze the concept of a transaction. Break down the components and steps involved in a transaction, and explain how each part contributes to maintaining data consistency and integrity. (7) (ii) Analyze the concept of deadlock. Identify the conditions that lead to deadlock, and discuss the various strategies used to detect, prevent, and resolve deadlocks in database systems. (9)	BTL 4	Analyzing
11.	(i) Analyze the process of deadlock detection in database systems. Explain the techniques used, their advantages, and limitations in ensuring system stability. (9) (ii) Analyze the concepts of recoverable schedules and cascadeless schedules. Compare their implications on transaction management and database reliability. (7)	BTL 4	Analyzing
12.	Analyze the concept of a schedule in database transactions. Discuss different types of schedules and their impact on database performance and concurrency. (16)	BTL 4	Analyzing
13.	Evaluate the effectiveness of deadlock prevention schemes in	BTL 5	Evaluating

	database systems. Discuss various prevention strategies, their advantages, limitations, and suitability for different types of applications. (16)		
14.	Discuss the role of concurrency control mechanisms in managing simultaneous transactions. Analyze different techniques such as locking, timestamps, and optimistic concurrency control. (16)	BTL 4	Analyzing
15.	Construct different types of schedules (serial, non-serial, concurrent) and analyze their impact on data consistency? (16)	BTL 5	Evaluating
16.	Evaluate the effectiveness of two-phase locking techniques in ensuring transaction isolation and database consistency. Compare strict two-phase locking with rigorous two-phase locking, highlighting their advantages and limitations. (16)	BTL 5	Evaluating
17.	Evaluate the importance of serializability in database transactions. Discuss how serializability ensures transaction consistency and discuss methods to test for serializability.(16)	BTL 5	Evaluating

UNIT V - OBJECT RELATIONAL AND NO-SQL DATABASES

Mapping EER to ODB schema – Object identifier – reference types – rowtypes – UDTs – Subtypes and supertypes – user-defined routines – Collection types – Object Query Language; No-SQL: CAP theorem – Document-based: MongoDB data model and CRUD operations; Column-based: Hbase data model and CRUD operations.

PART – A

Q. No	Questions	BT Level	Competence
1.	What is Object Identifier (OID)?	BTL 1	Remembering
2.	Draw the structure of object?	BTL 1	Remembering
3.	What is reference type?	BTL 2	Understanding
4.	What is row type?	BTL 2	Understanding
5.	What is supertype and subtype?	BTL 1	Remembering
6.	What is NoSQL and its types ?	BTL 2	Understanding
7.	What is CAP theorem?	BTL 1	Remembering
8.	Enlist features of MongoDB	BTL 2	Understanding
9.	Enlist the features of NoSQL.	BTL 1	Remembering
10.	Why is scheduling necessary in multi-user database systems?	BTL 1	Remembering
11.	What is NoSQL vs SQL?	BTL 2	Understanding
12.	What is mongoDB? Why it is needed?	BTL 1	Remembering
13.	How the terms in MongoDB are different from SQL?	BTL 2	Understanding
14.	Define collections in MongoDB.	BTL 1	Remembering
15.	Define the term document in MongoDB.	BTL 1	Remembering
16.	What is CAP in Brewer's CAP theorem?	BTL 2	Understanding
17.	What is CRUD function?	BTL 1	Remembering
18.	What is HBase data model?	BTL 1	Remembering
19.	What are the key components of HBase?	BTL 2	Understanding
20.	Give the syntax for insert the document. The document is analogous to rows in database.	BTL 1	Remembering
21.	How to delete Documents in MongoDB?	BTL 1	Remembering
22.	What are MongoDB CRUD operations?	BTL 2	Understanding

23	What is column-oriented database model? Give example of it.	BTL 1	Remembering
24.	Enlist the features of HBase data model.	BTL 2	Understanding
PART – B			
1.	Explain about Object Database Concept and Mapping EER and ODB Schema? (16)	BTL 4	Analyzing
2.	Evaluate Reference types in detail? (16)	BTL 5	Evaluating
3.	Examine Row Types in detail? (16)	BTL 4	Analyzing
4.	Explain about User Defined Types in detail? (16)	BTL 4	Analyzing
5.	Differentiate a short note on Subtypes and Supertypes? (16)	BTL 4	Analyzing
6.	Examine about User-Defined Routines in detail? (16)	BTL 4	Analyzing
7.	Investigate about the collection types in detail? (16)	BTL 4	Analyzing
8.	Give the detail about Object Query Language (OQL) in Detail.	BTL 4	Analyzing
9.	What is NoSQL? What is the need for it. Enlist various feature of NoSQL? (16)	BTL 5	Evaluating
10.	Evaluate the suitability of different types of NoSQL databases for various application scenarios and justify your choice? (16)	BTL 5	Evaluating
11.	Differentiate between RDBMS and NoSQL? (16)	BTL 4	Analyzing
12.	Write a short note on CAP Theorem? (16)	BTL 4	Analyzing
13.	Assess the advantages and limitations of MongoDB compared to other NoSQL databases in handling big data applications? (16)	BTL 5	Evaluating
14.	Examine the data types used in MongoDB? Explain in detail? (16)	BTL 4	Analyzing
15.	Write the MongoDB command to create and drop the database? (16)	BTL 5	Evaluating
16.	Explain with suitable examples, CRUD operations in MongoDB? (16)	BTL 4	Analyzing
17.	Write about Introduction to Hbase Data Model in detail? (16)	BTL 5	Evaluating

