INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal, Hyderabad - 500 043

COMPUTER SCIENCE AND ENGINEERING(AI & ML)

TUTORIAL QUESTION BANK

Course Title	**DATABASE MANAGEMENT SYSTEMS**				
Course Code	AITC05				
Program	B.Tech				
Semester	IV	CSE(AI & ML)			
Course Type	Core				
Regulation	UG-20				
Course Structure	Theory			Practical	
	Lecture	Tutorials	Credits	Laboratory	Credits
	3	-	3	-	-
Course Coordinator	Ms. K. Anjali, Assistant Professor				

COURSE OBJECTIVES:

The students will try to learn:

I	Efficient ways of designing database by encapsulating data requirements for business and organizational scenarios
II	Analysing and developing sophisticated queries in database language SQL for extracting information from large datasets
III	Enhancing skills in developing and managing data efficiently in related engineering problems.

COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO 1	**Outline** the importance of database system, RDBMS and its functionalities for voluminous data storage and management..	Understand
CO 2	**Model** the real world database systems using Entity Relationship Diagrams from the requirement specification.	Apply
CO 3	**Construct** queries in Relational Algebra, Relational Calculus and SQL to retrieve desired information.	Apply
CO 4	**Identify** appropriate normalization technique using dependencies for controlling the redundancy of data in database.	Apply
CO 5	**Demonstrate** ACID properties of Transaction processing, currency control protocols and recovery to preserve the database in a consistent state.	Understand

CO 6	**Organize** data storage and file organization techniques using tree and hash indices for effective query processing..	Apply

QUESTION BANK:

Q.No	QUESTION	Taxonomy	How does this subsume the level	CO's
MODULE I				
CONCEPTUAL MODELING INTRODUCTION				
PART A-PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS				
1	Construct an E-R diagram for keeping track of the exploits of your favorite sports team. You should store the matches played, the scores in each match, the players in each match and individual player statistics for each match. Summary statistics should be modeled as derived attributes.	Apply	Recall the concept of ER-Model then relate the entities and attributes to model ER-Diagram for a keeping track of the exploits of your favorite sports team	CO 2
2	Let E1 and E2 be two entities in an E/R diagram with simple single-valued attributes. R1 and R2 are two relationships between E1 and E2, where R1 is one-to- many and R2 is many-to-many. R1 and R2 do not have any attributes of their own. Calculate the minimum number of tables required to represent this situation in the relational model	Apply	Recall the concept of ER-Model then relate the entities and attributes to model ER-Diagram and dramatize the minimum number of tables required to represent this situation in the relational model.	CO 2
3	Analyze and find whether modifications made at conceptual level makes application programs written by users at view level to be modified in a database. Analyze your answer with illustration.	Analyze	Recall the concept of abstraction levels then relate View of database and utilize the operations in database to categorize conceptual level and view level.	CO 1

4	We can convert any weak entity set to strong entity set by simply adding appropriate attributes. Analyze why, then, do we have weak entity sets?	Analyze	Recall the concept of ER model then understand the weak entity and strong entity set to identify the different entity sets in model to categorize weak entity set to strong entity set	CO 2
5	What are the responsibilities of a DBA? If we assume that the DBA is never interested in running his or her own queries; does the DBA still need to understand query optimization? Why?	Understand	Recall the concept of DBA and explain the operations done by DBA	CO 1
6	Describe the structure of a DBMS. If your operating system is upgraded to support some new functions on OS files (e.g., the ability to force some sequence of bytes to disk), which layer(s) of the DBMS would you have to rewrite to take advantage of these new functions.	Remember	—	CO 1
7	Why relational model became more popular comparing with other record based models?	Understand	Recall the concept of relational model and summarize with other record based models	CO 1
8	Describe the process to convert ER model into relation schema.	Remember	—	CO 2
9	Discuss the disadvantages of file processing system, and explain how these disadvantages are avoided in DBMS?	Understand	Recall the concept of file system and express how these disadvantages are avoided in DBMS	CO 1
10	Design a relational database for a university registrar's office the office maintain data about each class, including the instructor, the number of students enrolled, and time and place of the class Meetings. For each student - class pair, a grade is recorded.	Remember	—	CO 2

PART-B LONG ANSWER QUESTIONS				
1	Compare and Contrast file Systems with database systems.	Understand	Recall the concept of basic file system and database system and distinguish between file Systems with database systems.	CO 1
2	Define Data Abstraction and discuss levels of Abstraction.	Remember	—	CO 1
3	Discuss about different types of Data models.	Understand	Recall the concept of data models and explain the classification of different data models	CO 1
4	Describe the Structure of DBMS.	Understand	Recall the concept of DBMS and explain the structure of DBMS.	CO 1
5	Discuss additional features of the ER-Models.	Understand	Recall the concept of ER model and explain the features of the ER-Models.	CO 2
6	Discuss about the Concept Design with the ER Model.	Understand	Recall the concept of ER model and summarize the Concept Design with the ER Model.	CO 2
7	Explain in detail Different types of Data Independence with examples.	Understand	Recall the concept of Data Independence and classify the Different types of Data Independence with examples.	CO 1
8	Explain different types of database users and write the functions of DBA.	Understand	Recall the concept of database users and then discuss the functions of DBA.	CO 1
9	List out different types of integrity constraints.	Remember	—	CO 1
10	Discuss about Different keys used in data base design with examples.	Understand	Recall the concept of database design and then distinguish Different keys used in data base design with examples.	CO 1
11	Distinguish strong entity set with weak entity set?	Understand	Recall the concept of entity set and then distinguish strong entity set with weak entity set.	CO 2

12	Differentiate relation schema and relational instance?	Understand	Recall the concept of Database system and then distinguish relation schema and relational instance	CO 1
13	List and explain the design issues of entity relationship.	Remember	—	CO 2
14	Construct ER-Diagram for a hospital with a set of patients and a set of medical doctors. Associated with each patient a log of the various tests and examinations conducted.	Apply	Recall the concept of ER-Diagram then Relate the entities and attributes and Model an ER-Diagram for a hospital	CO 2
15	Describe about Basic Concepts of ER Model in DBMS	Remember		CO 2
16	Explain ER Model, with its Entity and Entity Set?	Understand	Recall the concept of ER Model and paraphrase about Entity and Entity Set	CO 2
17	Discuss about ER Model and its Relationships?	Understand	Recall the concept of ER Model and explain Relationships of ER Model	CO 2
18	Discuss about generalization with a neat diagram?	Understand	Recall the concept of database system and explain generalization with a neat diagram	CO 2
19	Explain specialization with a neat diagram?	Understand	Recall the concept of database system and explain specialization with a neat diagram	CO 2
20	Describe about aggregation with a neat diagram?	Remember		CO 2
PART-C SHORT ANSWER QUESTIONS				
1	List the advantages of DBMS.	Remember	—	CO 1
2	List the database Applications.	Remember	—	CO 1
3	Define instances and schemas of database.	Remember	—	CO 1
4	Discuss Data Independence.	Understand	Recall the concept of database and Explain Data Independence	CO 1
5	How application programs access data base?	Remember	—	CO 1
6	Define (i) Database (ii) DBMS.	Remember	—	CO 1
7	List out main components of Database storage structure?	Remember	—	CO 1

8	What are the main responsibilities of Transaction management component?	Understand	Recall the concept of transaction management and Explain responsibilities of Transaction management component	CO 3
9	Outline main functions of Query Processor.	Remember	—	CO 1
10	Define (i) Entity (ii) Attribute	Remember	—	CO 2
11	Define Relationship and Relationship set.	Remember	—	CO 2
12	Discuss about Data Definition language.	Understand	Recall the concept of SQL statements and paraphrase about Data Definition language	CO 1
13	Discuss about Data Manipulation language.	Remember	—	CO 1
14	List responsibilities of a DBA.	Remember	—	CO 1
15	Outline the History of Data base Systems.	Remember	—	CO 1
16	Discuss how you can change the data in the table.	Understand	Recall the concept of SQL statements and describe how to update data in the table.	CO 1
17	List various types of attributes.	Remember	—	CO 2
18	Discuss How can you alter and destroy tables?	Understand	Recall the concept of SQL statements and describe how to destroy and alter the data in the tables.	CO 2
19	Define a data model? List the types of data model used.	Remember	—	CO 1
20	List the levels of data abstraction.	Remember	—	CO 1
MODULE II				
RELATIONAL APPROACH				
PART-A PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS				

1	For the following relational database, give the expressions in RA. student(stuno, stuname, major,level,age) Class(Classname, meets at, Room, fid) Faculty(fid,fname,deptid) 1. Find the names of all uniors (level = JR) who are enrolled in a class taught by I.Teach. 2. Find the age of the oldest student who is either a history major or is enrolled in a course taught by I.Tech? 3. Find the names of all classes that either meet in room R128 or have five or more students enrolled	Understand	Recall the concept of relational algebra and explain the queries for student relation.	CO3
2	Illustrate the relations employee (name, salary,deptno) department (deptno, deptname, address) Solve which query cannot be expressed using the basic relational algebra operations.	Apply	Recall the concept of relational algebra then Relate the employee relations to construct the queries for employee and department relations.	CO3
3	Discuss Query in relational algebra to find second highest salary of Employee from Employee relation.	Understand	Recall the concept of relational algebra and explain the queries for employee relation..	CO3
4	Consider the following schema given. The primary keys are underlined. Sailors(sailor-id, sailor-name, sailor-rating, sailor-age) Boats(boat-id, boat-name, boat-color) Reserves(sailor-id, boat-id, day) Write queries in Relational Algebra. 1. Find the names of sailors who have reserved boat number 120 2. Find the names of sailors who have reserved a green boat 3. Find the names of sailors who have not reserved a green boat 4. Find the names of sailors with the highest rating	Apply	Recall the concept of relational algebra then Relate the sailors,reserves relations to construct the queries for sailors relation with primary key	CO3

5	Consider the following database. Employee (employee-name, street, city) Works (employee-name, company-name, salary) Company (company-name, 6city) M7anager (employee-name, manager-name) 1. Give an expression in the relational a9lgebra, the tuple relational calculus, for the following query. 2. Find the names of all employees who work for estate bank.	Understand	Recall the concept of relational algebra,calculus and summarize TRC for employee relation	CO3
6	Define the RA expression for the following Queries. Sailor Schema (sailor id, Sailor name, Rating. Age) Reserves (Sailor id, Boat id, Day) Boat Schema (Boat id, Boatname.color) 1. Find the names of sailors who have reserved boat name 103; 2. Find the sailor id of sailors who have reserved a red boat; 3. Find the colors of boats reserved by the sailor rubber. 4. Find the names of sailors who have reserved a red boat.	Understand	Recall the concept of relational algebra and explain the queries for sailors,reserves and boats relation.	CO3
7	Observe the following relational database, give the expressions in RA. student(stuno, stuname, major,level,age) Class(Classname, meets at, Room, fid) Faculty(fid,fname,deptid) 1. Find the names of all uniors (level = JR) Who are enrolled in a class taught by I.Teach. 2. Find the age of the oldest student who is either a history major or is enrolled in a course taught by I.Tech?	Understand	Recall the concept of relational algebra and explain the queries for student relation .	CO3

8	Sailor Schema (sailor id, Sailorname, Rating.Age) Reserves (Sailor id, Boat id, Day)Boat Schema (boat id, Boatname, color) 1. Find the age of the youngest sailor for each rating level? 2. Find the age of the youngest sailor who is eligible to vote for each rating level with at lead two such sailors? 3. Find the No.of reservations for each red boat? 4. Find the average age of sailor for each rating level that at least 2 sailors.	Understand	Recall the concept of SQL statements and explain the queries for sailors,reserves and boats tables.	CO3
9	How the statement "the sids of suppliers who supply some red or green part" can be represented in the form of relational algebra and tuple relational calculus from the above relations. Suppliers scheme: Suppliers(sid: INTEGER, sname: STRING, address: STRING) Parts(pid: INTEGER, pname: STRING, color: STRING) Catalog(sid: INTEGER, pid: INTEGER, cost: REAL)	Understand	Recall the concept of relational algebra,calculus and explain relational algebra ,TRC for suppliers relation	CO3
10	Given the relations Employee (name, salary, deptno) department (deptno, deptname, address) Solve which query cannot be expressed using the basic sql operations.	Understand	Recall the concept of SQL statements and explain the queries for employee and department relations.	CO3
PART-B LONG ANSWER QUESTIONS				
1	Illustrate different set operations in Relational algebra with an example.	Understand	Recall the concept of Relational algebra and explain how to perform set operations in relational algebra	CO 3
2	Define Join. Explain different types of joins in relational algebra.	Remember	-	CO 3

3	Discuss about Tuple Relational calculus in detail.	Remember	-	CO 3
4	Define the difference between Relational Algebra and Relational Calculus.	Understand	Recall the concept of relational data base summarizes Relational Algebra and Relational Calculus.	CO 3
5	Describe Extended relational operations with examples.	Remember	-	CO 3
6	Discuss about procedural language in SQL.	Remember	-	CO 3
7	Discuss structure of query in TRC with example.	Understand	Recall the concept of query explains TRC with example.	CO 3
8	Illustrate a query in TRC to find the names of sailors who have reserved both a red and green boat? Write a query in TRC to find the names of sailors who have reserved all boats?	Understand	Recall the concept of relational calculus explain TRC for example	CO 3
9	Write a query in TRC to find the names of sailors who have reserved a red boat? Write a query in TRC to find the names of sailors who have not reserved a red boat?	Remember	-	CO 3
10	Write a TRC query to find the names of sailors who have reserved boat 103?	Remember	-	CO 3
11	Let R=(ABC) and S=(DEF) let r(R) and s(S) both relations on schema R and S. Give an expression in the Tuple relational calculus that is equivalent to each of the following.ρ B=19(r) A,F,(ρC=D(r×s)) r $\bigcap$ s	Remember	-	CO 3

12	Sketch the following schema instructor (ID, name, dept name), teaches (ID, course id, sec id, semester, year), section (course id, sec id, semester, year), student (ID, name, dept name), takes (ID, course id, sec id, semester, year, grade) Write the following query in RA,TRC and DRC Find the names of the instructors not teaching any course.	Understand	Recall the concept of query explain RA, TRC ,DRC for given example	CO 3
13	Find the names of sailors who have reserved a green boat	Remember	-	CO 3
14	Describe sides of sailors who have reserved red and green boat Find sides of all sailors who have reserved red boat but not green boat.	Remember	-	CO 3
15	Describe sid s of all sailors who have a rating of 10 or reserved boat 104 find sailors whose rating is better than every sailor called Horatio.	Remember	-	CO 3
16	Find the sailors with the highest rating Find the names of all branches in the loan relation.	Remember	-	CO 3
17	Define about set operations with syntax and examples	Understand	Recall the concept of relational algebra and explain set operators with example	CO 3
18	Write about Division operation in relational algebra with example	Remember	-	CO 3
19	Write about join operations with syntax and examples	Remember	-	CO 3
20	Differentiate natural join and inner join operations with examples	Understand	Recall the concept of relational algebra and distinguish between natural join and inner join operations with examples	CO 3
PART-C SHORT ANSWER QUESTIONS				
1	Describe Create statement with example.	Remember	——-	CO 3

2	Define DML statements in SQL Give an example.	Remember	———	CO 3
3	Discuss various Aggregate functions used in SQL.	Understand	Recall the concept of SQL statements and explain Aggregate functions	CO 3
4	Define primary key.	Remember	——-	CO 3
5	State the syntax of foreign key constraint.	Remember	——-	CO 3
6	What are the data types in SQL?	Understand	Recall the concept of SQL statements and explain data type	CO 3
7	Write a SQL statement to find employees whose commission is greater than their salaries.	Understand	Recall the concept of SQL statements and illustrate the query to find employees whose commission is greaterthan salaries	CO 3
8	Write a SQL statement to find the employees who are not clerks,analysts or salesmen.	Understand	Recall the concept of SQL statements and illustrate the query to find employees who are not clerks,analysts or salesman	CO 3
9	Write a SQL statement to display the names of all the employees and position where the string AR occurs in the name.	Understand	Recall the concept of SQL statements and illustrate the query to display the names of all employees whose name contains AR	CO 3
10	List out all classes in select statement.	Remember	——	CO 3
11	Define redundancy and its problems	Remember	——	CO 3
12	Define functional dependency. Why are some functional dependencies trivial?	Remember	——	CO 3
13	Discuss normalization.	Understand	Recall the concept of normalization in database explain it.	CO 3
14	Differentiate between trivial and nontrivial dependencies.	Remember	——	CO 3
15	If relation R consists of only simple candidate keys then R should be in which normal form?	Understand	Recall the concept of keys in database explain candidate keys with example	CO 3
16	Define First Normal Form.	Remember	——	CO 3
17	Define Second Normal Form.	Remember	——	CO 3

18	Define Third Normal Form.	Remember	——	CO 3
19	Define Fourth Normal Form.	Remember	——	CO 3
20	Identify the Normal Forms of the relation R.R(ABCD) FD : {A → B, B → C}	Understand	Recall the concept of normal form to identify the normal forms for relation R.	CO 3
MODULE III				
BASIC SQL QUERY AND NORMALIZATION				
PART A-PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS				
1	Write the SQL expression for the following Queries. Sailor Schema (sailor id, Sailorname, Rating.Age) Reserves (Sailor id, Boat id, Day) Boat Schema (Boat id, Boatname.color) 1. Find the names of sailors who have reserved boat name 103; 2. Find the sailor id of sailors who have reserved a red boat; 3. Find the colors of boats reserved by the sailor rubber? 4. Find the names of sailors who have reserved a red boat?	Understand	Recall the concept of SQL statement and explain SQL queries for sailor schema	CO4
2	For the following relational database, give the expressions in SQL. student(stuno, stuname, major,level,age) Class(Classname, meets at, Room, fid) Faculty(fid,fname,deptid) 1. Find the names of all uniors (level = JR) Who are enrolled in a class taught by I.Teach? 2. Find the age of the oldest student who is either a history major or is enrolled in a course taught by I.Tech? 3. Find the names of all classes that either meet in room R128 or have five or more students enrolled?	Understand	Recall the concept of SQL statement and explain SQL queries for student schema	CO4

3	Write the SQL expressions for the following relational database. sailor schema (sailor id, Boat id, sailorname, rating, age) Recerves (Sailor id, Boat id, Day) Boat Schema (boat id, Boatname, color) 1. Find the age of the youngest sailor for each rating level? 2. Find the age of the youngest sailor who is eligible to vote for each rating level with at lead two such sailors? 3. Find the No.of reservations for each red boat?	Understand	Recall the concept of SQL statements and explain the SQL queries for sailor reserves and boats relations	CO4
4	Consider the following schema: Suppliers(sid: integer, sname: string, address: string) Parts(pid: integer, pname: string, color: string) Catalog(sid: integer, pid: integer, cost: real) The Catalog relation lists the prices charged for parts by Suppliers. Answer the following questions: Give an example of an updatable view involving one relation. 1. Give an example of an updatable view involving two relations. 2. Give an example of an insertable-into view that is updatable. 3. Give an example of an insertable-into view that is not updatable.	Understand	Recall the concept of SQL statements and explain the SQL queries for suppliers relation	CO4
5	Consider following relations in DB and solve the queries: Student (GR NO, name, gender, address, city, class) Marks (GR NO, sub1, sub2, sub3, total, per) 1. Display the student of 'FYBCA' and 'TYBCA'. (2 mark each) 2. Display the marks of student whose gr no> 100. 3. Count the no of girls in FYBCA. 4. count the no: of first class students in TYBCA.	Apply	Recall the concept of SQL statements then understand the aggregate operations to Construct the queries for student relation with certain constraints	CO 4

6	Consider a relation scheme R = (A, B, C, D, E, H) on which the following functional dependencies hold: A–> B, BC–> D, E–> C, D–> A. Write the candidate keys of R.	Understand	Recall the concept of functional dependency and understand how to find the candidate keys for relation R.	CO4
7	Consider the following relational schemes for a library database: Book (Title, Author, Catalog no, Publisher, Year, Price) Collection (Title, Author, Catalog no) the following are functional dependencies: Title Author –> Catalog no Catalog no –> Title Author Publisher Year Publisher Title Year –> Price Assume Author, Title is the key for both schemes. Apply the appropriate normal form for Book Cancellation.	Understand	Recall the concept of functional dependency ,normalforms and explain the book cancellation in library relation using appropriate normal form	CO 4
8	Consider a schema R (A, B, C, D) and functional dependencies A -> B and C ->D.Solve and find whether the decomposition of R into R1 (A, B) and R2(C, D) belongs to which one or both (dependency preserving and loss less join)?	Understand	Recall the concept of functional dependency ,normalforms and explain the book cancellation in library relation using appropriate normal form	CO4
9	Consider the relation R(A,B,C,D,E,F) and FDs A →BC, F→ A, C→ AD → E, E → D AD is the decomposition of R into R1(A,C,D) R2 (B,C,D) and R3 (E,F,D) loss less? Explain the requirement of Lossless decomposition.	Understand	Recall the concept of functional dependency ,normalforms and explain the book cancellation in library relation using appropriate normal form	CO 4
10	Suppose the schema R(A,B,C,D,E) is decomposed into (A,B,C) and (A,D,E)show that the decomposition is not a dependency preserving decomposition if the following set of FD hold A→ BC, CD→ E, B→ D, E →A	Understand	Recall the concept of functional dependency ,normalforms and explain the book cancellation in library relation using appropriate normal form	CO 4
PART-B LONG ANSWER QUESTIONS				

1	Define a View in SQL. Write about updates on views.	Remember	–	CO 4
2	Illustrate Group by and Having clauses with examples.	Understand	Recall the concept of SQL statements and explain the queries using Group by and having clause	CO 4
3	Discuss about Complex integrity constraints in SQL.	Remember	–	CO 4
4	Write a nested query to find the names of sailors who have reserved both a red and green boat. Write a nested query to find the names of sailors who have reserved all boats.	Understand	Recall the concept of SQL statements and illustrate the query to find names of sailors who have reserved both red and green boat using nested queries.	CO 4
5	Discuss various DML statements in SQL and explain with Examples.	Understand	Recall the concept of SQL statements and explain about different DML statements in SQL	CO 4
6	define referential integrity constraint, unique key. Is unique +not null is same as primary key	Remember	—-	CO 4
7	What are nested queries? What is correlation in nested queries? Explain	Understand	Recall the concept of SQL statements and explain about nested and correlation queries in SQL	CO 4
8	Consider the following schema instructor (ID, name, dept name), teaches (ID, course id, sec id, semester, year), section (course id, sec id, semester, year), student (ID, name, dept name), takes (ID, course id, sec id, semester, year, grade) Write the following queries in SQL 1. Find the names of the students not registered in any section 2. Find the total number of courses taught department wise 3. Find the total number of courses registered department wise.	Understand	Recall the concept of SQL statements then Relate the instructor ,teaches and section relations to construct the queries to find names of the students,total no of course taught and total no of course registered	CO 4

9	Define decomposition and how does it address redundancy? Discuss the problems that may be caused by the use of decompositions.	Understand	Recall the concept of redundancy and understand the problems occurs in decomposition	CO 4
10	Define functional dependencies. How are primary keys related to FDs?	Understand	Recall the concept of dependencies and explain about functional dependencies how primary keys are related to FD's.	CO 4
11	Define normalization? Explain 1NF, 2NF, 3NF Normal forms.	Remember	–	CO 4
12	Describe properties of decompositions	Remember	–	CO5
13	Explain about Schema refinement in Database design.	Understand	Recall the concept of Database design and summarize Schema refinement .	CO 4
14	Illustrate multivalued dependencies and Fourth normal form with example.	Remember	–	CO 4
15	Compute the closer of the following set of functional dependencies for a relation scheme. R(A,B,C,D,E) F= A–>BC,CD–>E,B–>D, E–> A List out the candidate keys of R.	Apply	Recall the concept of functional dependency then relate the relation scheme R(ABCD) to identify the candidate keys for relation R	CO5
16	Write a note on INSERT, DELETE, UPDATE commands in SQL.	Remember	–	CO 4
17	R(ABCD) is relation with FD set C→D, C→A, B→C. Find i. Candidate Key ii. Normal form that can be existed iii. Decompose in BCNF relations	Apply	Recall the concept of functional dependency then relate the relation R(ABCD) and find the candidate key,normal form existence for relation R	CO 4
18	Explain the key constraints Primary key and Foreign key with examples	Remember	–	CO 4
19	Find pairs of sids such that the supplier with the first sid charges more for some part than the supplier with the second sid.	Remember	–	CO 4

20	Find the sids of suppliers who supply some red part and some green part	Remember	–	CO 4
PART-C SHORT ANSWER QUESTIONS				
1	Describe Create statement with example.	Remember	——-	CO 4
2	Define DML statements in SQL Give an example.	Remember	———	CO 4
3	Discuss various Aggregate functions used in SQL.	Understand	Recall the concept of SQL statements and explain Aggregate functions	CO 4
4	Define primary key.	Remember	——-	CO 4
5	State the syntax of foreign key constraint.	Remember	——-	CO 4
6	What are the data types in SQL?	Understand	Recall the concept of SQL statements and explain data type	CO 4
7	Write a SQL statement to find employees whose commission is greater than their salaries.	Understand	Recall the concept of SQL statements and illustrate the query to find employees whose commission is greaterthan salaries	CO 4
8	Write a SQL statement to find the employees who are not clerks,analysts or salesmen.	Understand	Recall the concept of SQL statements and illustrate the query to find employees who are not clerks,analysts or salesman	CO 4
9	Write a SQL statement to display the names of all the employees and position where the string AR occurs in the name.	Understand	Recall the concept of SQL statements and illustrate the query to display the names of all employees whose name contains AR	CO 4
10	List out all classes in select statement.	Remember	——	CO 4
11	Define redundancy and its problems	Remember	——	CO 4
12	Define functional dependency. Why are some functional dependencies trivial?	Remember	——	CO 4
13	Discuss normalization.	Understand	Recall the concept of normalization in database explain it.	CO 4

14	Differentiate between trivial and nontrivial dependencies.	Remember	——	CO 4
15	If relation R consists of only simple candidate keys then R should be in which normal form?	Understand	Recall the concept of keys in database explain candidate keys with example	CO 4
16	Define First Normal Form.	Remember	——	CO 4
17	Define Second Normal Form.	Remember	——	CO 4
18	Define Third Normal Form.	Remember	——	CO 4
19	Define Fourth Normal Form.	Remember	——	CO 4
20	Identify the Normal Forms of the relation R.R(ABCD) FD : {A → B, B → C}	Understand	Recall the concept of normal form to identify the normal forms for relation R.	CO 4
MODULE IV				
TRANSACTION MANAGEMENT				
PART A- PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS				
1	Consider the following transactions with data items P and Q initialized to zero: T1: read(P); read(Q); If P=0 then Q:=Q+1; write(Q); T2: read(Q); read(P); If Q=0 then P:=P+1; write(P); Solve and find any non-serial interleaving of T1 and T2 for concurrent execution leads to a serializable schedule or non serializable schedule. Explain	Understand	Recall the concept of serializable schedule and verify the given schedule is serial or serializable	CO 5
2	Analyze which of the following concurrency control protocols ensure both conflict serializability and freedom from deadlock?	Apply	Recall the concept of concurrency control then understand the conflict serializability ,deadlock to identify which of the concurrency control ensure both conflict serializability and freedom from deadlock.	CO 5

3	Suppose that we have only two types of transactions, T1 and T2. Transactions preserve database consistency when run individually. We have defined several integrity constraints such that the DBMS never executes any SQL statement that brings the database into an inconsistent state. Assume that the DBMS does not perform any concurrency control. Give an example schedule of two transactions T 1 and T 2 that satisfies all these conditions, yet produces a database instance that is not the result of any serial execution of T 1 and T 2.	Understand	Recall the concept of serializable schedule and solve the given problem.	CO 5
4	Suppose that there is a database system that never fails. Analyze whether a recovery manager required for this system.	Understand	Recall the concept of system failure and check automatic recoverability of system	CO 5
5	Explain the Immediate database Modification technique for using the Log to Ensure transaction atomicity despite failures?	Understand	Recall the concept of data storage then explain the immediate database modification technique to ensure transaction atomicity despite failures.	CO 5
6	Consider the following actions taken by transaction T1 on database objects X and Y : R(X), W(X), R(Y), W(Y) Give an example of another transaction T 2 that, if run concurrently to transaction T without some form of concurrency control, could interfere with T 1. 1. Explain how the use of Strict 2PL would prevent interference between the two transactions. 2. Strict 2PL is used in many database systems. Give two reasons for its popularity.	Understand	Recall the concept of transaction processing and find schedule for the given problem.	CO 5

7	Suppliers(sid: integer, sname: string, address: string) Parts(pid: integer, pname: string, color: string) Catalog(sid: integer, pid: integer, cost: real) The Catalog relation lists the prices charged for parts by Suppliers. For each of the following transactions, state the SQL isolation level that you would use and explain why you chose it. 1. A transaction that adds a new part to a suppliers catalog. 2. A transaction that increases the price that a supplier charges for a part.	Understand	Recall the concept of transaction processing and find queries in SQl for the given problem.	CO 5
8	Answer each of the following questions briefly. The questions are based on the following relational schema: Emp(eid: integer, ename: string, age: integer, salary: real, did: integer) Dept(did: integer, dname: string, floor: integer) and on the following update command: replace (salary = 1.1 * EMP.salary) where EMP.ename = Santa 1. Give an example of a query that would conflict with this command (in a concurrency control sense) if both were run at the same time. 2. Explain what could go wrong, and how locking tuples would solve the problem. 3. Give an example of a query or a command that would conflict with this command, such that the conflict could not be resolved by just locking individual tuples or pages but requires index locking.	Understand	Recall the concept of Locking protocols and explain the queries in given scenario.	CO 5

9	Suppose that we have only two types of transactions, T 1 and T 2. Transactions preserve database consistency when run individually. We have defined several integrity constraints such that the DBMS never executes any SQL statement that brings the database into an inconsistent state. Assume that the DBMS does not perform any concurrency control. Give an example schedule of two transactions T 1 and T 2 that satisfies all these conditions, yet produces a database instance that is not the result of any serial execution of T 1 and T 2.	Understand	Recall the concept of transaction processing and find Schedule for the given problem.	CO 5
10	What are the roles of the Analysis, Redo, and Undo phases in ARIES?	Understand	Recall the concept of ARIES and explain the roles of each phase?	CO 5
PART-B LONG ANSWER QUESTIONS				
1	Explain ACID properties and Illustrate them through examples?	Remember	–	CO 5
2	Discuss How do you implement Atomicity and Durability?	Understand	Recall the concept of transaction properties and extend implementation of atomicity and Durability properties.	CO 5
3	Illustrate Concurrent execution of transaction with examples?	Remember	–	CO 5
4	Discuss Serializability in detail with an example?	Remember	–	CO 5
5	Discuss two phase locking protocol and strict two phase locking protocols?	Understand	Recall the concept of concurrent Transaction and explain two phase Locking Protocol	CO5
6	Describe Timestamp based locking protocols?	Remember	–	CO 5
7	Describe Validation-based locking protocols?.	Remember	–	CO 5

8	Discuss in detail Multiple Granularity?	Understand	Recall the concept of data storage and explain how data can be divided int granularity livel	CO 5
9	Explain in detail Storage structure?	Remember	–	CO 5
10	Discuss Deferred database modification and Immediate database modification?	Remember	–	CO 5
11	Discuss how you recover from Concurrent transactions?	Remember	–	CO 5
12	Explain Buffer Management with a neat diagram?	Understand	Recall the concept of data storage and explain the role of buffer in data transfer process	CO 5
13	Explain different types of Advanced Recovery Techniques	Remember	–	CO 5
14	Write in detail about Remote Backup systems?	Remember	–	CO 5
15	Explain the Check point log based recovery scheme for recovering the database.	Remember	–	CO 5
16	When a transaction is rolled back under timestamp ordering, it is assigned a new timestamp. Why can it not simply keep its old timestamp?	Remember	–	CO 5
17	Consider the following schedule S1. S1=r3(y), r3(z), r1(x), w1(x), w3(y), w3(z), r2(z), r1(y), w1(y), r2(y), w2(y), r2(x), w2(x) Check whether S1 is serializable or not. If it is serializable, write its equivalent serial schedule.	Apply	Recall the concept of serializable schedule and verify the given schedule is serial or serializable.	CO 5
18	With a neat diagram explain NO-UNDO/NO-REDO recovery mechanism in transaction processing?	Remember	–	CO 5
19	Explain the serializable and non serializable schedule?	Remember	–	CO 5

20	Suppose that there is a database system that never fails. Analyze whether a recovery manager required for this system.	Remember	–	CO 5
PART-C SHORT ANSWER QUESTIONS				
1	Define a Transaction. List the properties of transaction?	Remember	——	CO 5
2	Discuss different phases of transaction?	Remember	——	CO 5
3	Discuss recoverable schedules?	Remember	——	CO 5
4	Discuss cascade less schedules?	Understand	——	CO 5
5	Define Two Phase Commit protocol?	Remember	——	CO 5
6	Demonstrate the implementation of Isolation?	Remember	——	CO 5
7	Discuss the Procedure to test Serializability?	Understand	Recall the concept of Serializability and write the procedure to test serilizability	CO 5
8	List different types of locks and write about compatibility among them?	Remember	——	CO 5
9	Discuss about Failure Classification?	Remember	——	CO 5
10	Define a checkpoint?	Remember	——	CO 5
11	Discuss the failures that can occur with loss of Non-volatile storage?	Remember	——	CO 5
12	Demonstrate Conflict Serializability?	Understand	Recall the concept of Serializability and construct example for Conflict serilizability	CO 5
13	Discuss View Serializability?	Remember	———	CO 5
14	Explain the distinction between serial schedule and serializable schedule with examples?	Understand	Recall the concept of Serializability and indentify differences between serial and serializable	CO 5
15	How Consistency of a transaction preserved?	Understand	Recall the concept of Concurrent transactions and construct example for preservation.	CO 5

16	When two instructions are conflict to each other?	Understand	Recall the concept of conflicting and write example for Conflict instructions	CO 5
17	Indicate the importance of Isolation property of a Transaction?	Understand	Recall the concept of transaction properties and extend isolation importance with example	CO 5
18	State the property atomicity of a Transaction?	Remember	Recall the concept of Serializability and write example for Conflict serilizability	CO 5
19	Explain about transaction states with a neat diagram?	Understand	Recall the concept of Transaction and draw state diagram for transaction life cycle.	CO 5
20	Discuss about Schedule and Recoverability?	Understand	Recall the concept of Schedule and explain how transaction can be recovered from failure.	CO 5
MODULE V				
DATA STORAGE AND QUERY PROCESSING				
PART A-PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS)				
1	Consider a B+-tree in which the maximum number of keys in a node is 5 Calculate the minimum number of keys in any non-root node.	Understand	Recall the concept of B+ trees and calculate the minimum number of keys in any non root node with a max no of keys in anode is 5	CO 6
2	In the index allocation scheme of blocks to a file, Calculate on what maximum possible size of the file depends.	Understand	Recall the concept of indexing in file then calculate the maximum possible size of file	CO 6
3	A clustering index is defined on the fields of which type? Analyze them.	Understand	Recall the concept of indexing then identify which type of fields are defined in clustering index.	CO 6
4	Calculate the minimum space utilization for a B+ tree index?	Understand	Recall the concept of B+ trees then calculate th minimum space utilization in B+tree index.	CO 6
5	Explain about the B - tree and the structure of B + tree in detail with an example.	Understand	Recall the concept of B+ trees and B- trees then explain the B+ trees and B-trees with example.	CO 6

6	Explain the distinction between closed and open hashing. Discuss the relative merits of each technique in database applications	Understand	Recall the concept of hashing and explain merits and demerits hashing techniques	CO 6
7	Suppose that we are using extendable hashing on a file that contains records with the following search-key values: 2,3,5,7,11,17,19,23,29,31 Show the extendable hash structure for this file if the hash function is h(x) = x mod 8 and buckets can hold three records.	Apply	Recall the concept of extendible hashing in files then understand the no of records and search key values to identify that hash function holds three records	CO 6
8	Explain various steps in Query Processing and write any two techniques to optimize query.	Understand	Recall the concept of query processing then explain the steps involved in query processing and write two techniques to optimize the query	CO 6
9	Construct a B +- tree for the following set of key values. (2,3,5,7,11,17,19,23,29,31) Assume that the tree is initially empty and values are added in ascending order. Construct B+- tree for the cases where the number of pointers that will fit in one node is as follows. (a) four (b) six (c) eight	Apply	Recall the concept of B+ trees then understand the problem and construct B+ trees for the for the three cases.	CO 6

10	Consider the B+ tree index of order d = 2 shown in Figure 10.1. 1. Show the tree that would result from inserting a data entry with key 9 into this tree. 2. Show the B+ tree that would result from inserting a data entry with key 3 into the original tree. How many page reads and page writes does the insertion require? 3. Show the B+ tree that would result from deleting the data entry with key 8 from the original tree, assuming that the left sibling is checked for possible distribution. 4. Show the B+ tree that would result from deleting the data entry with key 8 from the original tree, assuming that the right sibling is checked for possible redistribution. 5. Show the B+ tree that would result from starting with the original tree, inserting a data entry with key 46 and then deleting the data entry with key 52. 6. Show the B+ tree that would result from deleting the data entry with key 91 from the original tree.	Apply	Recall the concept of B+ trees then understand the problem and construct the B+ trees to perform operations like insertion and deletion	CO 6
PART-B LONG ANSWER QUESTIONS				
1	Write in detail about Hash based Indexing and Tree based Indexing.	Understand	Recall the concept of indexing and explain about hash based indexing and tree based indexing	CO 6
2	Compare I/O costs for all File Organizations.	Understand	Recall the concept of file organizations then compare the Input/output cost for different file organizations.	CO 6
3	Explain in detail about ISAM.	Understand	Recall the concept of file organizations then explain about ISAM.	CO 6

4	Explain B+ trees? Discuss about this Dynamic Index Structure.	Understand	Recall the concept of storage then explain the B+ trees and dynamic index structure	CO 6
5	Demonstrate searching a given element in B+ trees. Explain with example.	Understand	Recall the concept of B+ trees in data storage then demonstrate the searching of given element in B+ trees.	CO 6
6	Compare and Contrast Extendible Hashing with Linear Hashing.	Understand	Recall the concept of hashing then compare the extendible and linear hashing	CO 6
7	How does Extendable hashing use a directory of buckets? How does it handles insert and delete operations?	Understand	Recall the concept of hashing then explain how does extendable hashing use a directory of buckets and how does it handle insertion and deletion operations.	CO 6
8	Explain how insert and delete operations are handled in a static hash index.	Understand	Recall the concept of hashing then explain how insertion and deletion operations are handled in a static hash index.	CO 6
9	Explain the organization of records in files in detail	Understand	Recall the concept of file organization and explain the organization of records in files.	CO 6
10	Explain about sequential file and heap file organizations.	Understand	Recall the concept of file organization and explain the sequential file and heap file organization	CO 6
11	Explain the hash file organization?	Remember	—	CO 6
12	Illustrate insertion of an element in B+ trees with example.	Understand	Recall the concept of B+ trees the illustrate the insertion of an element in B+ trees with example.	CO 6
13	Illustrate deletion of an element in B+ trees with example.	Understand	Recall the concept of B+ trees the illustrate the deletion of an element in B+ trees with example.	CO 6

14	Write in detail about Static Hashing.	Understand	Recall the concept of hashing and explain about static hashing in detail.	CO 6
15	Explain in detail about Extendible Hashing.	Understand	Recall the concept of hashing and explain about extendible hashing in detail	CO 6
16	Explain in detail about Linear Hashing.	Understand	Recall the concept of hashing and explain about Linear hashing in detail	CO 6
17	Explain about storage devices and memory hierarchy.	Understand	Recall the concept of recoverability and explain the recovery facilities with example.	CO 6
18	Explain different RAID levels in disks	Understand	Recall the concept of magnetic disks and explain the different raid levels	CO 6
19	Compare Tree indices and Hash Indices	Understand	Recall the concept of indexing and compare the hash and tree indices	CO 6
20	Explain the steps in query processing and write about measures of query cost.	Understand	Recall the concept of query processing then explain steps involved in query processing and measures of query cost	CO 6
PART-C SHORT ANSWER QUESTIONS				
1	Write about data on External storage.	Remember	—	CO 6
2	Illustrate Clustered Indexes.	Remember	—	CO 6
3	Discuss the Primary and Secondary indexes.	Remember	—	CO 6
4	Define Tree Indexing.	Remember	—	CO 6
5	Describe Storage Hierarchy.	Remember	—	CO 6
6	Discuss the intuition for Tree Indexes.	Remember	—	CO 6
7	Define Indexed Sequential Access Method.	Remember	—	CO 6
8	Discuss about Overflow pages and Locking considerations of ISAM.	Understand	—	CO 6
9	Describe structure of B+ tree node.	Understand	—	CO 6
10	Compare dynamic and static hash techniques.	Remember	—	CO 6

11	What is timestamp?	Remember	—	CO 6
12	List the different file organization	Remember	—	CO 6
13	What is log?	Remember	—	CO 6
14	Lists the steps in Query processing	Understand	—	CO 6
15	What is blind write?	Remember	—	CO 6
16	Describe immediate database modification?	Remember	—	CO 6
17	Discuss the advantages of heap file organization	Remember	—	CO 6
18	What is transaction failure?	Remember	—	CO 6
19	Identify when a Transaction system is in dead lock state?	Remember	—	CO 6
20	What is locking protocol?	Remember	—	CO 6

Course Coordinator: **HOD, CSE(AI & ML)**
Ms. K. Anjali, Assistant Professor