ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.Tech. Arrear END SEMESTER EXAMINATIONS, Apr / May 2024

INFORMATION TECHNOLOGY
Semester 3
IT5351 Database Management Systems
(Regulation 2019)

Time: 3hrs   Max. Marks: 100

CO 1	Model an application's data requirements using conceptual modeling and design database schemas based on the conceptual model.
CO 2	Formulate solutions to a broad range of query problems using relational algebra/SQL.
CO 3	Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
CO 4	Run transactions and estimate the procedures for controlling the consequences of concurrent data access.
CO 5	Explain basic database storage structures, access techniques and query processing.
CO 6	Describe distributed, semi-structured and unstructured database systems.

BL – Bloom's Taxonomy Levels
(L1 - Remembering, L2 - Understanding, L3 - Applying, L4 - Analysing, L5 - Evaluating, L6 - Creating)

PART- A (10 x 2 = 20 Marks)
(Answer all Questions)

Q. No	Questions	Marks	CO	BL
1	Define the term logical and physical data independence.	2	CO1	L1
2	What do you mean by Referential Integrity constraint? Give an example.	2	CO2	L2
3	Differentiate Partial and Full functional dependency.	2	CO3	L2
4	Consider the relational schema Purchase and FDs as mentioned below. Discuss the different types of anomalies that are likely to arise. `Purchase(ItemID, ItemName, CustomerID, Price)` $ItemID \rightarrow ItemName$ $ItemID, CustomerID \rightarrow Price$	2	CO3	L3
5	List the ACID properties and write down its significance in a transaction.	2	CO4	L2
6	What is lock granularity? List the different types of possible locks that occur in concurrent transactions.	2	CO4	L1
7	How a dense index differs from a sparse index in databases? Give an example.	2	CO5	L2
8	Why Query optimization techniques are required for databases? Provide suitable answers.	2	CO5	L2
9	Brief the usage of XSL and DOM in a XML database.	2	CO6	L1
10	Write down the significance of CAP theorem in NoSQL databases.	2	CO6	L2

PART- B (5 x 13 = 65 Marks)

Q. No	Questions	Marks	CO	BL
11 (a) (i)	Explain the architecture of a database management system with a neat sketch by detailing each component in the architecture.	8	CO1	L2
(ii)	Consider a relational schema given below and Write queries in Relational Algebra to retrieve the required information: *STUDENT (SID, Sname, marks, CGPA, gender, branch)* *BRANCH_DETAILS (Branch, Location, strength)* 1. Display the name of the branches that have more than 100 students. 2. List the girls' students' names and location whose branch is IT. 3. Display the total marks of the students whose branch strength is greater than 100. 4. List all students whose location belongs to 'Chennai'.	5	CO2	L3
	OR			
11. (b)	Consider the following relational database. Write suitable SQL to express each of the following queries: Person (Person_ID, Person_Name, City, Salary, Dept_ID) Manager(Manager_ID, Name, Dept_Name) Department(Dept_ID, Dept_Name, Location) Works_for(Person_ID, Manager_ID, Dept_ID) i) Create tables with primary key and foreign key constraints. (2) ii) Display the name of the person who are working for the same department. (2) iii) Find the names of the employees who are working under the same manager. (2) iv) Count the total number of employee location wise. (1) v) Create a view to display the name of the employee whose salary is greater than the average salary of the employees working in the same department. (3) vi) Create a Trigger to increase the salary of the employee by 10% if the employee changes his location from Delhi to Bombay. (3)	13	CO1 CO2	L3
12 (a) (i)	Consider the following relation schema, CD (Company, Date, CatalogNum, Composer, Track, Group, Artist, Title, Instrument, Duration) together with the following functional dependencies: {Artist} → {Instrument, Group} {Composer, Title, Company} → {CatalogNum, Track, Duration} {CatalogNum} → {Company, Date} {CatalogNum, Title} → {Composer} Use Armstrong's axioms to prove formally that this set of functional dependencies implies that {CatalogNum, Title} → {Track}. Justify each step of your proof with reason.	8	CO3	L3
(ii)	Assume a bank has various types of customers who can hold different types of bank accounts. Account can be SavingsBank	5	CO3	L3

		ID, Name, Age, Account details, Money transacted. Customer can either deposit the money in the account or get a loan. Realize the above scenario into relational schema.					
		OR						
12 (b) (i)		Consider the following Movie Renting relational table: 	Member Name	Address	Movie Rented	Gender	8	CO3	L3

Member Name	Address	Movie Rented	Gender
John	4th street	ABC, CDE	Male
John	5th Avenue	EFG	Male
Mary	12th Street	HLG, VGH	Female
Janes	10th Street	CDE	Male
Mary	11th Street	FXV XYZ	Female
Anitha	17th Avenue	BCD	Female

Normalize the above relational schema until it satisfies 3NF.

			Marks	CO	L
	(ii)	Write short notes on Multivalued dependencies and its Normal form in detail with a suitable example.	5	CO3	L3
13 (a) (i)		Explain about the importance of Crash Recovery algorithm in databases. With a suitable example, explain any one recovery algorithm to redo/undo the transactions modified in database.	8	CO4	L2
	(ii)	How deadlocks can be detected and recovered? Illustrate it with an appropriate example.	5	CO4	L3
		OR			
13 (b) (i)		Explain about the Two Phase Locking protocol used to enforce concurrency control in transactions in detail.	8	CO4	L2
	(ii)	Check whether the following schedules are conflict serializable or not: S1: R(A) R(B) W(A) S2: R(A) R(B) W(B)	5	CO4	L3
14 (a) (i)		Explain the cost estimation for executing a selection query (which uses binary search) based on a primary key with a suitable example.	8	CO5	L2
	(ii)	Differentiate Static Hashing with Dynamic Hashing Strategies.	5	CO5	L3
		OR			
14 (b) (i)		Explain the various levels of RAID used for file organization and highlight their features.	8	CO5	L2
	(ii)	Construct a B+ tree of order 4 containing the following elements. 16,24,42,15,22,101,22,44,88,87,25,78,45	5	CO5	L3
15 (a) (i)		Discuss the characteristics of NoSQL databases and their uses. Also, illustrate how is it different from SQL with the help of an example.	5	CO6	L3
	(ii)	How a distributed database differs from a centralized database? Explain the different types of transparencies and fragmentations supported by Distributed databases.	8	CO6	L3
		OR			
15 (b) (i)		List the different types of NoSQL Data stores with an example for each. Create a column oriented data store for a movie database.	5	CO6	L3
	(ii)	Create a XML DTD for the following structure and store at least three records in a XML file. BookDetails(BookID,Book Name, Author Name, Publisher Name, ISSN), Customer_ID, , Customer_email, Transaction details(BookID, Customer ID, Borrow Date).	8	CO6	L3

Q. No	Questions	Marks	CO	BL
16.	A park provides services such as walking tracks, badminton, volleyball, tennis courts, open gym, yoga, and martial arts (karate, silambam). For effective utilization of these services, the management and administrator want to build a Fitness Information System. All the registered users can select the service(s) they are interested in and the time slots (1 hour). The coaches associated with each service can train selected number of users. A user can avail one or more services with different time slots. A maintenance and training fee will be collected by the administrators based on the games.			
	a) Draw an ER diagram to design the above database application with appropriate entities, relationship and cardinalities. (7) b) Realize the ER diagram to appropriate relational tables with proper keys and constraints. (4) c) Normalize the database design (till 3NF) if necessary. (4)	15	CO3	L6