BMS COLLEGE OF ENGINEERING, BANGALORE-19

(Autonomous College under VTU Belagavi)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Semester:	**3**		
Course Title:	**Database Management Systems**		
Course Code:	**23CS3PCDBM**	**Total Contact Hours:**	**40**
L-T-P:	**3-0-1**	**Total Credits:**	**4**

Unit No.	Topics	Hours
1	**Introduction to Databases**: Introduction, An Example, Characteristics of Database approach, Advantages of using DBMS approach, When not to use a DBMS. **Database System Concepts and Architecture:** Data models, Schemas and instances, Three schema architecture. **SQL**: SQL Data Definition and Data Types specifying basic constraints in SQL, Schema Change Statement in SQL, Basic retrieval queries in SQL, Insert, Delete and Update statements in SQL, Additional features of SQL, More complex SQL Queries, Views (Virtual Tables) in SQL, Triggers and Stored Procedures.	8
2	**Data Modelling using the Entity-Relationship(ER) model**: Using High-Level conceptual Data Models for Database Design, A sample Database Application, Entity types, Entity Sets, Attributes and Keys, Relationship Types, Relationship Sets, Roles and Structural Constraints, Weak Entity types, Refining the ER Design, ER Diagrams, Relationship Types of Degree Higher than two, Relational Database Design using ER-to-Relational Mapping. **Relational Algebra**: Unary Relational Operations, SELECT and PROJECT, Relational Algebra Operations from Set Theory, Binary Relational Operations: JOIN and DIVISION, Aggregate functions and Grouping	8
3	**Database Design Theory and Normalization:** Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form, Multi-valued Dependencies and a Fourth Normal Form, Join Dependencies, Fifth Normal Form.	8
4	**Transaction Processing, Concurrency Control:** Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties of Transactions, Characterizing Schedules Based on Recoverability, Characterizing Schedules Based on Serializability, Two-Phase Locking Techniques for Concurrency Control. ARIES Recovery Algorithm	8

5	**NoSQL**: An overview of NoSQL, Characteristics of NoSQL, NoSQL storage types, Advantages and Drawbacks of NoSQL, Case Study: Application definition, Requirement Analysis, Implementation using MongoDB, Database Queries, Writing Queries. **Vector database:** Introduction, Vector Index, Working of Vector database.	8

Prescribed Text Books:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Fundamentals of Database Systems	Ramez Elmasri, Shamkant B Navathe	6th	Pearson	2017
2.	Getting Started with NoSQL	Gaurav Vaish	1st	Packt	2013
3.	Vector Database	Roie Schwaber-Cohen	1st	Pinecone	2023

Reference Text Books:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Database Management Systems	Ramakrishnan, Gehrke	3rd	McGraw Hill	2014
2.	Database Systems: The Complete Book	Hector Garcia-Molina, Jeffrey D.Ullman, Jennifer Widom	2nd	Pearson Education	2001
3.	Database System Concepts	Abraham Silberschatz, Henry F. Korth, S. Sudarshan	6th	Tata McGraw-Hill	2010

E-Book:

Sl. No.	Book Title	Authors	Edition	Publisher	Year	URL
1.	An Introduction to Relational Database Theory	Hugh Darwen	1st	Ventus Publishing	2012	https://dvikan.no/ntnu-studentserver/kompendier/an-introduction-to-relational-database-theory.pdf

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MOOC Course:

Sl. No.	Course name	Course Offered By	Year	URL
1.	Data Base Management System	NPTEL	2022	https://onlinecourses.nptel.ac.in/noc22_cs91/preview

Course Outcomes (COs):

CO1	Apply the concepts of database management system for various applications.
CO2	Analyse database concepts for a given problem.
CO3	Design SQL queries and conceptual data models for database applications.
CO4	Demonstrate SQL commands to create, manipulate and query data in a database.

CO-PO-PSO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO 3
CO1	3														
CO2		3													
CO3			3										2		
CO4			3		3									2	

Assessment Plan for CIE:

Tool	Remarks	Marks
Internals	**Best 2 of 3**	**20**
Quiz	**One**	**5**
Lab Component	**CIE + Lab Test**	**25**
Alternate Assessment Tool (AAT)	**---**	**---**
Total		**50**

Laboratory Plan:

1. Every lab, the student will be evaluated for 10 marks
   a. If the student successfully finishes the assigned task of the lab and on spot task, in the stipulated lab hours, 10 marks will be given to the student
   b. If the student could finish only assigned task in the stipulated lab hours, then the student will get 8 marks.
   c. If the student could not complete the assigned task of that day lab, the student can show the completion on the same day or next day. The student will get 7 marks

d. If the student could not complete as like Case 'c', then partial mark will be given based on the completion status.
e. If the student is absent for the lab, and he /she finishes the assigned task and shows the execution before the next lab, the student will get 4 marks (Attendance will not be given)

Note: Case 'e' is allowed only twice [Only if the student is absent because of illness]

RUBRICS / MARKS EVALUATION (50) – These 50 marks will be converted to 10 marks

TITLE	MARKS
ER DIAGRAM	15
SCHEMA DIAGRAM	5
IMPLEMENTATION	15
SQL QUERY	15

Instructions for the lab test:

1. Test will be conducted in two days. First-day students will be given the questions to write ER diagram, schema diagram and start the implementation in the Lab. (**Group Task - 4 members**)
2. On the second day, students will be given an SQL query to write the answer and demonstrate the same on the implemented database. (**Individual task**)

Final CIE marks (50) will be allotted as follows:
Regular lab (10 marks) + Record (5 marks) + Test (10 marks)

Writing SQL Queries for the following database systems:

Experiment #	Name of Experiment
1	Insurance Database
2	More Queries Insurance Database
3	Bank Database
4	More Queries on Bank Database
5	Employee Database
6	More Queries on Employee Database
7	Supplier Database
8	No SQL - Student Database
9	No SQL - Customer Database
10	No SQL - Restaurant Database

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PROGRAM 1: INSURANCE DATABASE

Consider the Insurance database given below.
PERSON (driver_id: String, name: String, address: String)
CAR (reg_num: String, model: String, year: int)
ACCIDENT (report_num: int, accident_date: date, location: String)
OWNS (driver_id: String, reg_num: String)
PARTICIPATED (driver_id: String,reg_num: String, report_num: int, damage_amount: int)

i. Create the above tables by properly specifying the primary keys and the foreign keys.
ii. Enter at least five tuples for each relation
iii. Display Accident date and location
iv. Update the damage amount to 25000 for the car with a specific reg_num (example 'K A053408') for which the accident report number was 12.
v. Add a new accident to the database.
vi. Display Accident date and location
vii. Display driver id who did accident with damage amount greater than or equal to Rs.25000

PROGRAM 2. More Queries on Insurance Database

PERSON (driver_id: String, name: String, address: String)
CAR (reg_num: String, model: String, year: int)
ACCIDENT (report_num: int, accident_date: date, location: String)
OWNS (driver_id: String, reg_num: String)
PARTICIPATED (driver_id: String,reg_num: String, report_num: int, damage_amount: int)
Create the above tables by properly specifying the primary keys and the foreign keys as done in "Program-1"week's lab and Enter at least five tuples for each relation.
i. Display the entire CAR relation in the ascending order of manufacturing year.
ii. Find the number of accidents in which cars belonging to a specific model (example 'Lancer') were involved.
iii. Find the total number of people who owned cars that involved in accidents in 2008.
iv. List the entire participated relation in the Descending Order of Damage Amount.
v. Find the Average Damage Amount.
vi. Delete the tuple whose Damage Amount is below the Average Damage Amount
vii. List the name of drivers whose Damage is Greater than the Average Damage Amount.
viii. Find Maximum Damage Amount.

PROGRAM 3: Bank Database

Branch (branch-name: String, branch-city: String, assets: real)
BankAccount(accno: int, branch-name: String, balance: real)
BankCustomer (customer-name: String, customer-street: String,
customer-city: String)
Depositer(customer-name: String, accno: int)

LOAN (loan-number: int, branch-name: String, amount: real)

i. Create the above tables by properly specifying the primary keys and the foreign keys.

ii. Enter at least five tuples for each relation.

iii. Display the branch name and assets from all branches in lakhs of rupees and rename the assets column to 'assets in lakhs'.

iv. Find all the customers who have at least two accounts at the *same* branch (ex. SBI_ResidencyRoad).

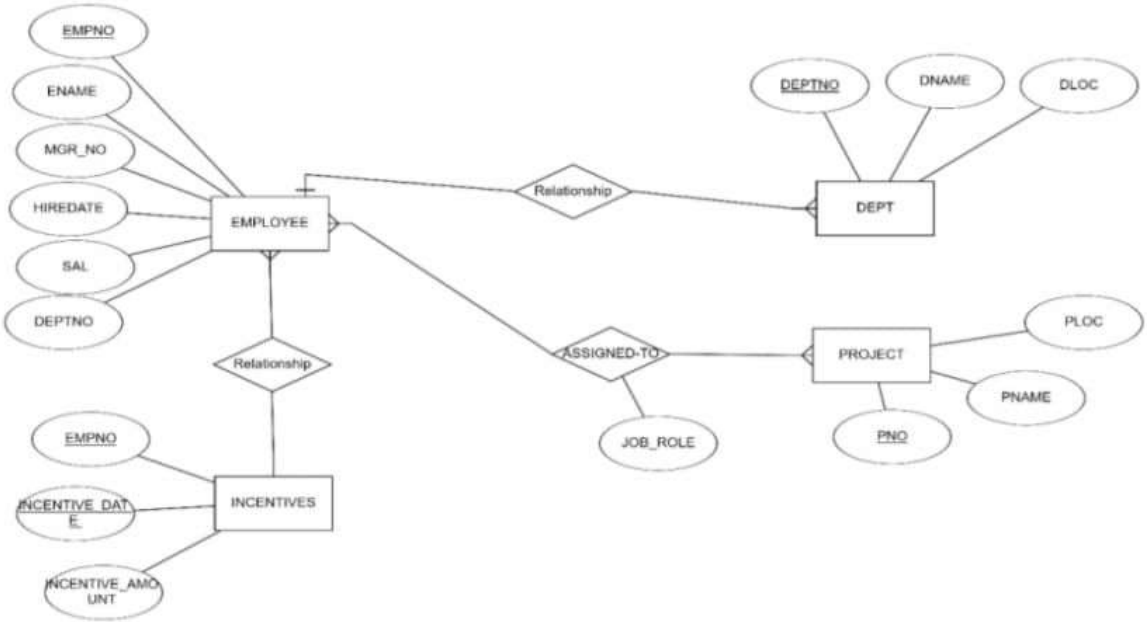
v. Create a view which gives each branch the sum of the amount of all the loans at the branch.

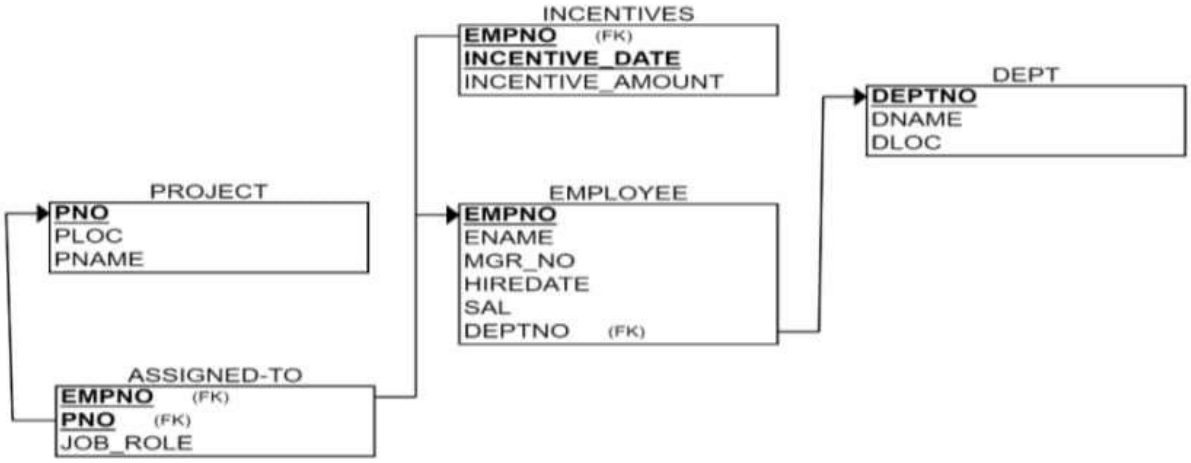
PROGRAM 4: More Queries on Bank Database

Branch (branch-name: String, branch-city: String, assets: real)
BankAccount(accno: int, branch-name: String, balance: real)
BankCustomer (customer-name: String, customer-street: String,
customer-city: String)
Depositer(customer-name: String, accno: int)
LOAN (loan-number: int, branch-name: String, amount: real)

i. Find all the customers who have an account at all the branches located in a specific city (Ex. Delhi).
ii. Find all customers who have a loan at the bank but do not have an account.
iii. Find all customers who have both an account and a loan at the Bangalore branch
iv. Find the names of all branches that have greater assets than all branches located in Bangalore.
v. Demonstrate how you delete all account tuples at every branch located in a specific city (Ex. Bombay).
vi. Update the Balance of all accounts by 5%

PROGRAM 5: Employee Database



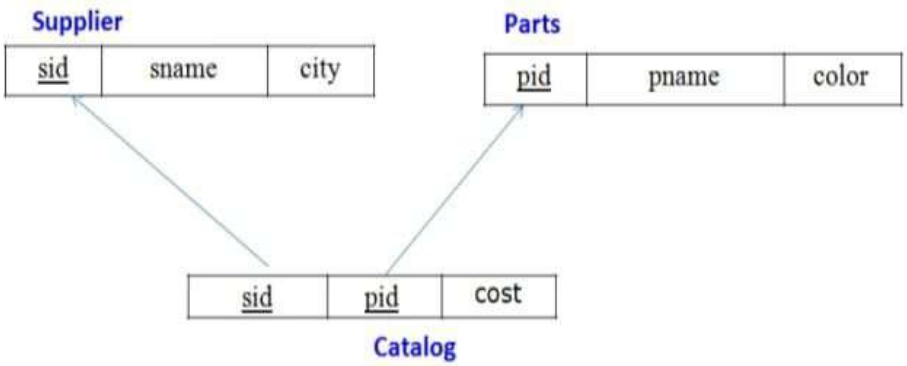


i. Using Scheme diagram, create tables by properly specifying the primary keys and the foreign keys.
ii. Enter greater than five tuples for each table.
iii. Retrieve the employee numbers of all employees who work on project located in Bengaluru, Hyderabad, or Mysuru
iv. Get Employee ID's of those employees who didn't receive incentives
v. Write a SQL query to find the employees name, number, dept, job_role, department location and project location who are working for a project location same as his/her department location.

PROGRAM 6: More Queries on Employee Database

i. Using Scheme diagram (under Program-5), Create tables by properly specifying the primary keys and the foreign keys.
ii. Enter greater than five tuples for each table.
iii. List the name of the managers with the maximum employees
iv. Display those managers name whose salary is more than average salary of his employee.
v. Find the name of the second top level managers of each department.
vi. Find the employee details who got second maximum incentive in January 2019.
vii. Display those employees who are working in the same department where his manager is working.

PROGRAM 7: Supplier Database



i. Using Scheme diagram, Create tables by properly specifying the primary keys and the foreign keys.
ii. Insert appropriate records in each table.
iii. Find the pnames of parts for which there is some supplier.
iv. Find the snames of suppliers who supply every part.
v. Find the snames of suppliers who supply every red part.
vi. Find the pnames of parts supplied by Acme Widget Suppliers and by no one else.
vii. Find the sids of suppliers who charge more for some part than the average cost of that part (averaged over all the suppliers who supply that part).
viii. For each part, find the sname of the supplier who charges the most for that part.

PROGRAM 8: NoSQL Student Database

Perform the following DB operations using MongoDB.

i. Create a database "Student" with the following attributesRollno, Age, ContactNo, Email-Id.
ii. Insert appropriate values
iii. Write query to update Email-Id of a student with rollno 10.
iv. Replace the student name from "ABC" to "FEM" of rollno 11.
v. Export the created table into local file system
vi. Drop the table.
vii. Import a given csv dataset from local file system into mongodb collection.

PROGRAM 9: NoSQL Customer Database

Perform the following DB operations using MongoDB.

i. Create a collection by name Customers with the following attributes.
Cust_id, Acc_Bal, Acc_Type
ii. Insert at least 5 values into the table.
iii. Write a query to display those records whose total account balance is greater than 1200 of account type 'Z' for each customer_id.
iv. Determine Minimum and Maximum account balance for each customer_id.
v. Export the created collection into local file system.
vi. Drop the table.
vii. Import a given csv dataset from local file system into mongodb collection.

PROGRAM 10: NoSQL Restaurant Database

Perform the following DB operations using MongoDB.

i. Write NoSQL Queries on "Restaurant" collection.
ii. Write a MongoDB query to display all the documents in the collection restaurants.
iii. Write a MongoDB query to arrange the name of the restaurants in descending along with all the columns.
iv. Write a MongoDB query to find the restaurant Id, name, town and cuisine for those restaurants which achieved a score which is not more than 10.
v. Write a MongoDB query to find the average score for each restaurant.

v. Export the created collection into local file system.
vi. Drop the table.
vii. Import a given csv dataset from local file system into mongodb collection.

PROGRAM 10: NoSQL Restaurant Database

Perform the following DB operations using MongoDB.

i. Write NoSQL Queries on "Restaurant" collection.
ii. Write a MongoDB query to display all the documents in the collection restaurants.
iii. Write a MongoDB query to arrange the name of the restaurants in descending along with all the columns.
iv. Write a MongoDB query to find the restaurant Id, name, town and cuisine for those restaurants which achieved a score which is not more than 10.
v. Write a MongoDB query to find the average score for each restaurant.

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vi. Write a MongoDB query to find the name and address of the restaurants that have a zipcode that starts with '10'.

SEE Exam Question Paper Format:

Unit-1	Internal Choice	Two Questions to be asked for 20 Marks each
Unit-2	Internal Choice	Two Questions to be asked for 20 Marks each
Unit-3	Mandatory	One Question to be asked for 20 Marks
Unit-4	Mandatory	One Question to be asked for 20 Marks
Unit-5	Mandatory	One Question to be asked for 20 Marks

Bloom's Level	Percentage of Questions to be Covered
Remember / Understand	35%
Apply / Analyze	40%
Create / Evaluate	25%