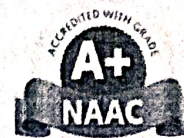


SHRI GNANAMBICA DEGREE COLLEGE: MADANAPALLE



(AUTONOMOUS)
COURSE 4: DATABASE MANAGEMENT SYSTEMS
SEMESTER II
(W.E.F.2025-26)

Program: BCA (General)



Hours per week: 4

Credits: 3

Course Objectives:

1. To understand the fundamentals of data, information, and the evolution from file-based systems to modern database management systems.
2. To develop the ability to design conceptual data models using Entity-Relationship (ER) and Enhanced ER diagrams.
3. To explore relational model principles, such as keys, integrity constraints, relational algebra and calculus, and normalization.
4. To perform data definition and manipulation using SQL commands including queries, joins, subqueries, views, and set operations.
5. To apply procedural logic using PL/SQL, incorporating control structures, functions, procedures, and database triggers.

Course Outcomes:

1. Describe the fundamentals of data, database systems, and the differences between file-based and database approaches. Compare and classify various DBMS architectures, data models, and their components, including the three-schema architecture.
2. Design conceptual data models using Entity-Relationship and Enhanced ER diagrams, applying generalization, specialization, and constraints.
3. Apply relational model concepts, including CODD rules, relational algebra, relational calculus, and normalization techniques.
4. Construct and execute SQL queries for data definition, manipulation, aggregation, joining, and subqueries, including views and set operations.
5. Develop PL/SQL programs incorporating control structures, procedures, functions, and triggers to manage database behavior effectively.

Unit I

Overview of Database Management System:

Introduction to data, information, database, database management systems, file-based system, Drawbacks of file-Based System, database approach, Classification of Database Management Systems, advantages of database approach, Various Data Models, Components of Database Management System, three schema architecture of data base, costs and risks of database approach.



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Unit II

Entity-Relationship Model:

Introduction, the building blocks of an entity relationship diagram, classification of entity sets, attribute classification, relationship degree, relationship classification, reducing ER diagram to tables, enhanced entity-relationship model (EER model), generalization and specialization, IS A relationship and attribute inheritance, multiple inheritance, constraints on specialization and generalization, advantages of ER modeling.

Unit III

Relational Model:

Introduction, CODD Rules, relational data model, concept of key, relational integrity, relational algebra, relational algebra operations, advantages of relational algebra, limitations of relational algebra, Functional dependencies and normal forms(1NF,2NF and 3NF)

Unit IV

Structured Query Language:

Introduction, Commands in SQL, Data Types in SQL, Data Definition Language, Selection Operation, Projection Operation, Aggregate functions, Data Manipulation Language, Table Modification Commands, Join Operation, Set Operations, View, Sub Query.

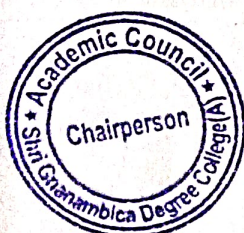
Unit V

PL/SQL:

Introduction, Shortcomings of SQL, Structure of PL/SQL, PL/SQL Language Elements, Data Types, Operators Precedence, Control Structures, Steps to Create a PL/SQL, Program, Iterative Control, Procedures, Functions.

References:

1. Database System Concepts, Avi Silberschatz, Henry F. Korth, S. Sudarshan, Seventh Edition, McGraw-Hill
2. Database Management Systems by Ragu Ramakrishnan, McGrawhill
3. Fundamentals of Database Systems, Elmasri Navathe Pearson Education
4. An Introduction to Database systems, C.J. Date, A.Kannan, S.Swami Nadhan, Pearson



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(AUTONOMOUS)
COURSE 4: DATABASE MANAGEMENT SYSTEMS-
PRACTICALS
SEMESTER II
(W.E.F.2025-26)



Program: BCA (General)

Hours per week: 2

Credits: 1

List of Experiments

Experiment 1 — Inventory Management (InventoryDB)

Table 1 — Products (Structure)

Column Name	Data Type	Constraints
product_id	INT	PRIMARY KEY
product_name	VARCHAR(50)	NOT NULL
price	DECIMAL(10,2)	CHECK(price > 0)
stock_qty	INT	CHECK(stock_qty >= 0)

Sample Data (Products)

product_id	product_name	price	stock_qty
1	Pen	10.00	100
2	Notebook	50.00	200
3	Stapler	120.00	50
4	Marker	25.00	80
5	FileFolder	60.00	150

Table 2 — Suppliers (Structure)

Column Name	Data Type	Constraints
supplier_id	INT	PRIMARY KEY
supplier_name	VARCHAR(50)	NOT NULL
contact_no	VARCHAR(20)	UNIQUE
product_id	INT	FOREIGN KEY REFERENCES Products(product_id)

Sample Data (Suppliers)

supplier_id	supplier_name	contact_no	product_id
101	StationeryMart	9876543210	1
102	PaperWorld	9876500000	2



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103	OfficeSupplies	9876512345	3
104	MarkerHub	9876522222	4
105	FileDepot	9876533333	5

Section A — DDL (Data Definition Language)

1. Create a database called InventoryDB.
2. Create tables Products and Suppliers with the specified columns and constraints.

Section B — DML (Data Manipulation Language)

3. Insert at least 5 rows into Products.
4. Insert at least 5 rows into Suppliers.
5. Update the stock quantity of the product Pen to 120.
6. Delete a supplier with a specific supplier_id.
7. Write a query to rename Notebook to NoteBook A4.

Section C — DQL (SELECT Queries)

8. Display all records from Products.
9. Display only product_name and price of all products.
10. List all products with stock_qty < 100.
11. Show all products with price between 20 and 100.
12. Find all suppliers whose contact_no starts with 98765.
13. Find the average price of products.
14. Display the total number of products in inventory.
15. Show the maximum and minimum stock quantities.
16. Count how many suppliers supply each product.
17. Show all products where price > 50 AND stock_qty > 100.
18. Show all products where price < 20 OR stock_qty < 80.
19. Display suppliers whose supplier_name contains Mart.
20. List all suppliers along with the product they supply (use INNER JOIN).
21. Display suppliers whose name starts with S.
22. Find products whose name has exactly 5 characters.
23. Find suppliers who supply products costing more than 100.

Experiment 2 — Online Bookstore (BOOKSTOREDB)

Table — Authors

Column Name	Data Type	Constraints
author_id	INTEGER	PRIMARY KEY
first_name	VARCHAR	NOT NULL
last_name	VARCHAR	NOT NULL
nationality	VARCHAR	NULL allowed



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Sample (Authors)

author_id	first_name	last_name	nationality
1	Jane	Austen	British
2	George	Orwell	British
3	Gabriel	Garcia Marquez	Colombian
4	Toni	Morrison	American
5	Mark	Twain	American
6	Harper	Lee	American
7	Fyodor	Dostoevsky	Russian

Table — Books

Column Name	Data Type	Constraints
book_id	INTEGER	PRIMARY KEY
title	VARCHAR	NOT NULL
author_id	INTEGER	FOREIGN KEY REFERENCES Authors
publication_year	INTEGER	
price	DECIMAL	

Sample (Books)

book_id	Title	author_id	publication_year	price
101	Prideand Prejudice	1	1813	12.99
102	1984	2	1949	9.50
103	OneHundred Years of Solitude	3	1967	15.00
104	Beloved	4	1987	11.25
105	AnimalFarm	2	1945	8.75
106	Adventuresof Huckleberry Finn	5	1884	10.50
107	ToKill a Mockingbird	6	1960	14.00

Table — Customers

Column Name	Data Type	Constraints
customer_id	INTEGER	PRIMARY KEY
first_name	VARCHAR	NOT NULL
last_name	VARCHAR	NOT NULL
email	VARCHAR	UNIQUE, NOT NULL
address	VARCHAR	NOT NULL

Sample (Customers)



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customer_id	first_name	last_name	Email	address
201	Alice	Smith	<u>alice.s@example.com</u>	12OakSt, London
202	Bob	Johnson	<u>bob.j@example.com</u>	45PineAve, Oxford
203	Charlie	Brown	<u>charlie.b@example.com</u>	78Maple Rd, Bristol
204	Diana	Prince	<u>diana.p@example.com</u>	34QueenSt, York
205	Edward	Norton	<u>edward.n@example.com</u>	22RiverLn, Leeds
206	Fiona	Hall	<u>fiona.h@example.com</u>	56LakeDr, Bath
207	Greg	Miller	<u>greg.m@example.com</u>	89ParkAve, Glasgow

Table — Orders

Column Name	Data Type	Constraints
order_id	INTEGER	PRIMARY KEY
customer_id	INTEGER	FOREIGN KEY REFERENCES Customers
book_id	INTEGER	FOREIGN KEY REFERENCES Books
order_date	DATE	NOT NULL
quantity	INTEGER	NOT NULL

Sample (Orders)

order_id	customer_id	book_id	order_date	quantity
301	201	101	2025-07-20	1
302	202	102	2025-07-21	2
303	201	105	2025-07-22	1
304	203	103	2025-07-23	1
305	204	106	2025-07-24	1
306	205	107	2025-07-25	3
307	206	104	2025-07-26	2

Section A — DDL (Schema Design & Constraints)

1. Write SQL to create Authors, Books, Customers, Orders with PKs, FKs, types, and NOT NULLs.
2. Alter Books table to add constraint: price > 0.



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3. Add column phone_number VARCHAR(15) to Customers and make it UNIQUE.

4. Drop the phone_number column from Customers.

Section B — DML (Data Manipulation)

5. Insert at least 7 records into each table (use sample dataset).

6. Update AnimalFarm price by increasing 10%.

7. Delete all orders before 2025-07-21.

8. Change nationality of Gabriel Garcia Marquez to Latino-American.

Section C — SELECT Queries (Data Querying)

9. List all books published between 1900 and 2000.

10. Find customers whose email contains example.com.

11. Retrieve books priced between 10 and 15 and published before 1950.

12. Show authors who are British or American.

13. Find books with price < 10 OR published after 1980.

14. Display orders placed after 2025-07-22.

15. List books by author_id = 2.

16. Find customers whose last name starts with B.

17. Show all books with price NOT between 9 and 13.

18. Display books with publication_year in (1813, 1945, 1987).

19. Find authors whose nationality is NOT British.

20. List customers whose address contains Park.

21. Show all books sorted by price desc.

22. List authors alphabetically by last_name.

23. Display orders sorted by order_date (latest first).

Use of Date Functions

24. Show all orders placed in July 2025.

25. Show orders with estimated delivery date (order_date + 5 days).

26. Show customers who placed an order on a weekend.

27. Calculate days passed since the last order.

Aggregate Functions

28. Count total books.

29. Average price of books.

30. Highest-priced book.

31. Count orders per customer.

32. Total sales (price × quantity) per customer.

GROUP BY / HAVING

33. Count books per author

34. Group orders by customer_id and show total quantity.

35. Customers who ordered more than 2 books (HAVING).



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36. Total books sold per author.

Experiment 3 — Employee DB

Table — Departments

Column	Type	Constraints
dept_id	INT	PRIMARY KEY
dept_name	VARCHAR	UNIQUE, NOT NULL
location	VARCHAR	NOT NULL

Sample (Departments)

dept_id	dept_name	location
1	HR	NewYork
2	IT	SanFrancisco
3	Finance	Chicago
4	Marketing	Boston
5	Operations	Seattle
6	Legal	Washington D.C.
7	Sales	Dallas
8	R&D	Austin
9	Procurement	Denver
10	CustomerCare	Miami

Table — Employees

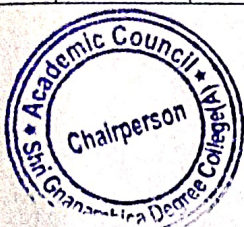
Column	Type	Constraints
emp_id	INT	PRIMARY KEY
first_name	VARCHAR	NOT NULL
last_name	VARCHAR	NOT NULL
email	VARCHAR	UNIQUE, NOT NULL
phone	VARCHAR	CHECK(phone LIKE '...') (pattern to be defined)
hire_date	DATE	NOT NULL
job_title	VARCHAR	NOT NULL
salary	DECIMAL	CHECK(salary > 0)
dept_id	INT	FOREIGN KEY REFERENCES Departments(dept_id)
manager_id	INT	FOREIGN KEY REFERENCES Employees(emp_id) (self-ref)



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Sample (Employees)

emp_id	first_name	last_name	email	phone	hire_date	job_title	Salary	dept_id	manager_id
101	Alice	Johnson	alice.j@corp.com	123-456-7890	2020-03-15	HR Manager	75000	1	NULL
102	Bob	Smith	bob.s@corp.com	234-567-8901	2019-05-20	IT Analyst	65000	2	104
103	Charlie	Brown	charlie.b@corp.com	345-678-9012	2021-01-10	Finance Executive	58000	3	106
104	Diana	Prince	diana.p@corp.com	456-789-0123	2018-07-12	IT Manager	90000	2	NULL
105	Ethan	Hunt	ethan.h@corp.com	567-890-1234	2022-02-25	Marketing Lead	62000	4	NULL
106	Fiona	Hall	fiona.h@corp.com	678-901-2345	2017-11-01	Finance Manager	85000	3	NULL



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107	Greg	Miles	<u>greg.miles@corp.com</u>	789 - 012 - 345 6	2023- 04-15	IT Support	450 00	2	104
108	Hannah	White	<u>hannah.w@corp.com</u>	890 - 123 - 456 7	2021- 09-05	HR Executive	500 00	1	101
109	Ian	Scott	<u>ian.s@corp.com</u>	901 - 234 - 567 8	2020- 11-20	Operations Analyst	560 00	5	NULL
110	Julia	Adams	<u>julia.a@corp.com</u>	012 - 345 - 678 9	2019- 12-18	Legal Advisor	700 00	6	NULL

Table — Projects

Column	Type	Constraints
project_id	INT	PRIMARY KEY
project_name	VARCHAR	NOT NULL
start_date	DATE	NOT NULL
end_date	DATE	NULL
dept_id	INT	FOREIGN KEY REFERENCES Departments

Sample (Projects)

project_id	project_name	start_date	end_date	dept_id
201	PayrollSystem	2023-01-01	NULL	3
202	WebsiteUpgrade	2023-02-10	NULL	2
203	RecruitmentDrive	2023-03-05	NULL	1



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204	Ad Campaign	2023-05-20	NULL	4
205	NewCRMTool	2023-04-15	NULL	7
206	CompliancePortal	2023-06-10	NULL	6
207	InventorySystem	2023-07-01	NULL	5
208	AIResearch	2023-08-05	NULL	8
209	CustomerFeedback	2023-09-10	NULL	10
210	ProcurementSystem	2023-10-01	NULL	9

Table — Employee_Project (Many-to-Many)

Column	Type	Constraints
emp_id	INT	FOREIGN KEY REFERENCES Employees(emp_id)
project_id	INT	FOREIGN KEY REFERENCES Projects(project_id)
hours_allocated	INT	CHECK(hours_allocated > 0)
(emp_id, project_id) is PRIMARY KEY		

Sample (Employee_Project)

emp_id	project_id	hours_allocated
102	202	120
104	202	80
103	201	100
106	201	150
101	203	50
105	204	70
107	202	60
109	207	90
110	206	110
108	203	40

Section A — DDL (Schema Creation & Modification)

1. Write SQL statements to create the tables with constraints.
2. Alter Employees to add column bonus DECIMAL(8,2) default 0.
3. Drop column bonus from Employees.

Section B — DML (Insert, Update, Delete)



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4. Insert at least 10 rows into Departments, Employees, Projects, Employee_Project (use dataset).
5. Try inserting an employee with negative salary (should fail due to CHECK).
6. Update salary of employee with emp_id = 103 by 15%.
7. Delete an employee record who resigned (choose any emp_id).
8. Increase all employees' salaries in IT department by 5%.
9. Change department of an employee to "Research" (should fail if FK doesn't allow).

Section C — DQL (Select Queries)

10. List all employees and their details.
11. Show employees in HR.
12. Find employees with salary between 50,000 and 80,000.
13. Retrieve employees hired after 2020.
14. Show employees in IT or Finance.
15. Find employees whose email ends with @corp.com.
16. List employees with salary > 60,000 AND located in New York.
17. Display employees in descending order of salary.
18. Count employees in each department.
19. Show average salary department-wise.
20. Display departments where average salary > 70,000.
21. Find number of employees in each project.
22. Display departments with more than 3 employees.
23. Show sum of all salaries department-wise.
24. List all distinct dept_id from Employees.
25. Show employee names with the year they were hired.
26. Show employees grouped by year of hire.
27. List employees hired in last 90 days.
28. List number of years of experience for all employees.

Section D — JOINS

29. List all employees with their department names (INNER JOIN).
30. Display all departments with employees, including departments without employees (LEFT JOIN).
31. Show employees and projects they work on (Employees ↔ Employee_Project ↔ Projects).
32. List projects along with total hours allocated.
33. Find employees working on more than one project.
34. Show all projects handled by Finance department.



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Section E — PL/SQL Programming

1. Procedure GetEmpInfo(emp_id) — display name, salary, department.
2. PL/SQL block to check if salary > 50,000: print High Salary else Standard Salary.
3. PL/SQL program to display top 10 rows in Emp based on job and salary.
4. Stored procedure GiveBonus(dept_id, designation, bonus_amt) — add bonus to salary of employees matching dept & designation.
5. Trigger to prevent inserting employees with salary < 30,000.
6. Trigger to prevent any transactions on EMP table on Saturday & Sunday.



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SHRI GNANAMBICA DEGREE COLLEGE: MADANAPALLE

(AUTONOMOUS)

Course 4: DATABASE MANAGEMENT SYSTEMS

SEMESTER II

(W.E.F.2025-26)

Program: BCA (General)

Question Paper – Blue Print

Time: 3 Hrs

Marks: 70

PART – A

Answer any 4 of the 8. Each Question Carries 5 marks.

(4 x 5 =20)

1. Question
2. Question
3. Question
4. Question
5. Question
6. Question
7. Question
8. Question

PART-B

Answer one from each unit. Each Question Carries 10 marks.

(5X10=50)

9. Question

UNIT 1

OR

10. Question

UNIT 2

OR

11. Question

12. Question

UNIT 3

OR

13. Question

14. Question

UNIT 4

OR

15. Question

16. Question

UNIT 5

OR

17. Question

18. Question



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