

BACHELOR OF COMPUTER APPLICATIONS (BCA)

(Revised Syllabus)

BCA(Revised Syllabus)/ASSIGN/SEMESTER-III

ASSIGNMENTS

(July – 2026 & January - 2027)

MCS-021, MCS-023, MCS-014, BCS-031, BCSL-032, BCSL-033, BCSL-034,



**SCHOOL OF COMPUTER AND INFORMATION SCIENCES
INDIRA GANDHI NATIONAL OPEN UNIVERSITY
MAIDAN GARHI, NEW DELHI – 110 068**

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Important Notes

1. Submit your assignments to the Coordinator of your Study Centre on or before the due date.
2. Assignment submission before due dates is compulsory to become eligible for appearing in corresponding Term End Examinations. For further details, please refer to BCA Programme Guide.
3. To become eligible for appearing the Term End Practical Examination for the lab courses, it is essential to fulfill the minimum attendance requirements as well as submission of assignments (on or before the due date). For further details, please refer to the BCA Programme Guide.

Course Code	:	MCS-023
Course Title	:	Introduction to Database Management Systems
Assignment Number	:	BCA(III)/023/Assignment/2026-27
Maximum Marks	:	100
Weightage	:	25%
Last Date of Submission	:	31st October, 2026 (For July 2026 Session)
	:	30th April, 2027 (For January 2027 Session)

Note: This assignment has four questions carrying 80 marks in total. Answer all the questions. The remaining 20 marks are for Viva Voce. You may use suitable illustrations, diagrams, and examples wherever necessary.

Q1:

- a. Differentiate between the Hierarchical Database Model, Network Database Model, and Relational Database Model. Discuss the advantages and limitations of each with suitable examples. **(4 Marks)**
- b. Explain the concepts of Data Independence and Data Abstraction in DBMS. How do these concepts improve database application development? **(4 Marks)**
- c. What are Keys in a relational database? Differentiate among the following with suitable examples. **(4 Marks)**
 - Candidate Key
 - Super Key
 - Primary Key
 - Alternate Key
- d. Explain Conflict Serializability. Construct a precedence graph for a suitable schedule involving two transactions and determine whether the schedule is conflict serializable. **(4 Marks)**
- e. Explain the process of Normalization. Illustrate the conversion of a relation from First Normal Form (1NF) to Third Normal Form (3NF) using a suitable example. **(4 Marks)**
- f. Describe the Shadow Paging Recovery Technique. Compare it with Log-Based Recovery highlighting their advantages and disadvantages. **(4 Marks)**
- g. Discuss the objectives of Database Security. Explain any four database security mechanisms used to protect organizational databases. **(4 Marks)**
- h. Differentiate between Centralized, Distributed, and Parallel Database Systems. Discuss one application area for each. **(4 Marks)**
- i. Write SQL commands with suitable examples for the following. **(2 Marks each = 8 Marks)**
 - i. ALTER TABLE
 - ii. CHECK Constraint
 - iii. GROUP BY with HAVING Clause
 - iv. CREATE INDEX

Q2:

A Smart Hospital Information System is to be developed for a multi-specialty hospital.

The hospital maintains information regarding:

- Patients
- Doctors
- Departments
- Appointments
- Medical Tests
- Prescriptions
- Rooms
- Bills

Each patient may consult multiple doctors. A doctor belongs to one department. Each appointment generates one prescription. Patients may undergo multiple laboratory tests. Bills are generated for consultations, tests and room charges.

- Identify all the entities, attributes, relationships, participation constraints and cardinalities involved in the above system. **(10 Marks)**
- Draw a complete Entity Relationship Diagram (ER Diagram) for the Smart Hospital Information System. **(10 Marks)**

Clearly indicate:

- Primary Keys
- Relationship Names
- Cardinality
- Participation Constraints

State suitable assumptions wherever necessary.

Q3:

Consider the following database schema.

CUSTOMER(CustomerID, CustomerName, City)

ACCOUNT(AccountNo, CustomerID, BranchID, Balance)

BRANCH(BranchID, BranchName, Location)

LOAN(LoanID, CustomerID, Amount)

Write SQL queries for the following.

(2 Marks each = 10 Marks)

- Display the names of customers having an account balance greater than ₹5,00,000.
- Display the total number of customers in each branch.
- Display customer names who have taken loans but do not have any bank account.
- Find the branch having the highest total deposits.
- Display customer names who maintain accounts in more than one branch.

Q4:

(a) Consider the relation

(6 Marks)

$R(A, B, C, D, E, F)$

with the following functional dependencies

$A \rightarrow BC$

$B \rightarrow D$

$CD \rightarrow EF$

$F \rightarrow A$

- i. Find all candidate keys.
- ii. Determine whether the relation satisfies BCNF.
- iii. If not, decompose the relation into BCNF.

(b) Consider the following schedule.

(4 Marks)

T1: R(A), W(A), R(B), W(B), Commit

T2: R(B), W(B), R(A), W(A), Commit

- i. Draw the precedence graph.
- ii. Determine whether the schedule is serializable.
- iii. Identify the concurrency problem, if any.