

# **BACHELOR OF COMPUTER APPLICATIONS (BCA)**

## **(Revised Syllabus)**

BCA(Revised Syllabus)/ASSIGN/SEMESTER-III

### **ASSIGNMENTS**

**(July-2025 & January-2026 sessions)**

**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.

<b>Course Code</b>	:	<b>MCS-023</b>
<b>Course Title</b>	:	<b>Introduction to Database Management Systems</b>
<b>Assignment Number</b>	:	<b>BCA(III)/023/Assignment/2025-26</b>
<b>Maximum Marks</b>	:	<b>100</b>
<b>Weightage</b>	:	<b>25%</b>
<b>Last Date of Submission</b>	:	<b>31<sup>st</sup>October,2025(For July Session) 30<sup>th</sup>April,2026(For January Session)</b>

**Note: This assignment has four questions for a total of 80 marks. Answer all the questions. Rest 20 marks are for viva voce. You may use illustrations and diagrams to enhance explanations. Answer to each part of the question should be confined to about 300 words.**

**Q1. Answer the following questions:**

- (a) Differentiate between a File Processing System and a Database Management System (DBMS) based on four key aspects. **(4 Marks)**
- (b) Explain the three-level architecture of a DBMS (External, Conceptual, and Internal). How does this architecture support Logical and Physical Data Independence? **(4 Marks)**
- (c) What are the ACID properties of a transaction? Explain each property with a suitable example of an airline ticket booking. **(4 Marks)**
- (d) Differentiate between DDL (Data Definition Language) and DML (Data Manipulation Language) statements in SQL. Provide two examples for each category. **(4 Marks)**
- (e) Explain the difference between 3NF (Third Normal Form) and BCNF (Boyce-Codd Normal Form). Provide an example of a relation that is in 3NF but not in BCNF. **(4 Marks)**

**Q2. An online learning platform, "EduSphere," needs a database to manage its operations. The requirements are as follows:**

- The platform has many **Students**. Each student is identified by a unique StudentID and has a Name, Email, and RegistrationDate.
  - The platform features several **Instructors**. Each instructor has a unique InstructorID, Name, and a short Bio.
  - There are multiple **Courses** on offer. Each course has a unique CourseID, a Title, Duration (in hours), and a Fee.
  - An instructor can teach multiple courses, but each course is taught by only one instructor.
  - A student can enroll in multiple courses, and a course can have many students. When a student enrolls, the EnrollmentDate and the final Grade obtained are recorded.
- (a) Design a complete ER (Entity-Relationship) diagram for the "EduSphere" platform. Clearly show all entities, attributes (including primary keys), relationships, and their cardinality constraints. **(12 Marks)**

- (b) Convert the ER diagram from part (a) into a set of relational schemas (tables). You must underline the primary key for each table and clearly indicate all foreign keys and the tables they reference. (8 Marks)

**Q3. Consider the following relational schemas for a company database:**

- **Employees** (EmpID, EmpName, Salary, DeptID)
- **Departments** (DeptID, DeptName)
- **Projects** (ProjID, ProjName, Lead\_EmpID)

Write and execute SQL queries for the following tasks. Make suitable assumptions where necessary.

- (a) Create the Employees table with EmpID as the primary key and DeptID as a foreign key referencing the Departments table. The Salary should not be negative. (4 Marks)
- (b) List the names and salaries of all employees working in the 'Technology' department, sorted in descending order of their salary. (4 Marks)
- (c) Find the name of each department and the number of employees working in it. Display only those departments that have more than 10 employees. (4 Marks)
- (d) Find the names of all employees whose salary is greater than the average salary of all employees in the company. (4 Marks)
- (e) List the names of all projects along with the name of the employee who is leading the project. (4 Marks)

**Q4. (a) Consider the relation R(A, B, C, D, E, F) with the following set of Functional Dependencies (FDs): (10 Marks)**

$$F = \{ A \rightarrow BC, CD \rightarrow E, B \rightarrow D, E \rightarrow A \}$$

- (i) Find all the candidate keys for the relation R.  
(ii) Is the relation R in 3NF? Justify your answer.  
(iii) Decompose the relation R into a set of relations that are in BCNF.
- (b) **Consider the following schedule S with two transactions T1 and T2: (10 Marks)**
- S: R1(X); W1(X); R2(X); W2(X); R1(Y); W1(Y); Commit1; R2(Y); W2(Y); Commit2;
- (i) Draw the precedence (serializability) graph for the schedule S.  
(ii) Is the schedule S serializable? If yes, provide the equivalent serial schedule(s). If no, explain why.  
(iii) Identify any concurrency problems (e.g., Lost Update, Dirty Read) present in this schedule. Explain how the problem occurs.