BACHELOR OF COMPUTER APPLICATIONS (BCA_NEW/BCAOL)

ASSIGNMENTS OF BCA_NEW/BCAOL PROGRAMME SEMESTER-III

(July 2026 & January 2027 Session)

MCS-208, MCSL-209, MCS-207, BCS-131, BCSL-135, BCS-040

SCHOOLOFCOMPUTERANDINFORMATIONSCIENCES
INDIRA GANDHI NATIONAL OPEN UNIVERSITY
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Important Notes

1. BCA_NEW Student need to submit the assignments to the Coordinator of your Study Centre on or before the due date.
2. BCAOL Student need to submit the assignments on LMS Portal on or before the due date.
3. Assignment submission before due dates is compulsory to become eligible for appearing in corresponding Term End Examinations. For further details, please refer to Programme Guide.
4. 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 Programme Guide.
5. The viva voce is compulsory for the assignments. For any course, if a student submitted the assignment and not attended the viva-voce, then the assignment is treated as not successfully completed and would be marked as ZERO.

Course Code	**:**	**BCSL-135**
Course Title	**:**	**DBMS and C++ Lab**
Assignment Number	**:**	**BCA_NEW/BCAOL(III)L-135/Assign/2026-27**
Maximum Marks	**:**	**50**
Last Date of Submission	**:**	**31st October, 2026 (For July 2026 Session)**
	:	**30th April, 2027 (For January 2027 Session)**

Note: This assignment has one question with two sections for a total of 40 marks. The remaining 10 marks are for Viva Voce. You must complete both sections. For Section A, provide the database design and SQL queries. For Section B, write the C++ program and attach its output printout.

Q1: Project: Vehicle Service Management System

You are required to design and develop a Vehicle Service Management System for an automobile service centre. This project will be completed in two parts. In Section A, you will design the database schema and write SQL queries. In Section B, you will develop a C++ console application to manage vehicle service records.

Section A:

Design a database schema in Third Normal Form (3NF) for the Vehicle Service Management System.

(a) Database Schema: (10 Marks)

Create the necessary tables to store the following information:

- A unique Contact_ID for each contact.
- Customer Name, Address, Mobile Number, and Email Address.
- A unique Vehicle_ID for each vehicle.
- Vehicle Registration Number, Model, Manufacturer, Year of Manufacture, and Fuel Type.
- Each customer may own multiple vehicles.
- A unique Mechanic_ID for each mechanic.
- Mechanic Name, Specialization, Experience, and Contact Number.
- A unique Service_ID for each service transaction.
- Service Date, Service Type (Periodic Service, General Repair, Engine Repair, Electrical Repair, Washing, etc.), Labour Charges, Spare Parts Cost, and Total Bill Amount.
- Each service transaction must be assigned to one mechanic.
- Multiple spare parts may be used during a service. Store the Part_ID, Part Name, Quantity, and Unit Price for each spare part.

Your design should include:

- An ER Diagram for the Vehicle Service Management System.
- The final set of tables with all columns clearly defined.

- Underline the Primary Key and specify all Foreign Keys.
- Ensure that the database schema satisfies Third Normal Form (3NF).

(b) SQL Queries: **(10 Marks)**

Write SQL queries for the following operations on the database you designed:

1. Display the customer name, vehicle registration number, service date, and service type for all vehicles serviced during a specified month.
2. List the names of customers who own more than one vehicle.
3. Display the mechanic name along with the total number of vehicles serviced by each mechanic.
4. Find the registration numbers and owner names of vehicles that have never undergone servicing.
5. Display the service history of a specified vehicle in chronological order.
6. Calculate the total service expenditure incurred by each customer.
7. Retrieve the details of vehicles whose total service cost exceeds ₹50,000.
8. Display the average labour charges for each service type.
9. List the names of spare parts replaced during a specified service transaction.
10. Display the top five customers based on the highest expenditure on vehicle servicing.

Section B: C++ Application Development **(20 Marks)**

Write a menu-driven C++ program that acts as a console-based interface for the Vehicle Service Management System. Since this is a standalone C++ application, all records should be managed using classes and file handling.

Your program must implement the following:

1. Customer Class

Create a class named Customer with private data members to store:

- Customer ID, Customer Name, Address, Mobile Number, Email Address Include:
- Constructors, Getter and Setter member functions, Function to display customer information

2. Vehicle Class

Create a class named Vehicle with private data members to store:

- Vehicle ID, Registration Number, Model, Manufacturer, Year of Manufacture, Fuel Type

Include appropriate constructors and member functions.

3. Service Class

Create a class named Service with private data members to store:

- Service ID, Customer ID, Vehicle ID, Mechanic ID, Service Date, Service Type, Labour Charges, Spare Parts Cost, Total Bill Amount

The class should include:

- Constructors, Member functions to calculate the total bill, Functions to add, modify, search, and display service records

4. File Handling

On starting the application, it should load all existing records from the following files:

- customers.dat, vehicles.dat, services.dat,
- When the user chooses to exit, all newly added and modified records must be saved back to their respective files.

5. Menu-Driven Interface

The program should display a menu with the following options:

1. Register New Customer, Register New Vehicle, Record Vehicle Service, Search Vehicle by Registration Number, Search Customer by Customer ID, Update Vehicle Service Details, Delete a Service Record, Display All Customers, Display All Vehicles, Display Complete Service History of a Vehicle, Generate Vehicle Service Bill
2. Exit

6. Input Validation

The program should validate the following conditions:

- Vehicle Registration Number must be unique.
- Mobile Number must contain exactly 10 digits.
- Labour Charges and Spare Parts Cost should not be negative.
- Total Bill Amount should be calculated automatically.
- A service record cannot be created unless both the customer and vehicle are already registered.
- Display appropriate error messages whenever invalid input is entered.

The program should be robust and handle user input errors gracefully.