Assignments for Diploma in Mobile Application Development (Native)

Module 1 – Overview of IT Industry

What is a Program?

***LAB EXERCISE**: Write a simple "Hello World" program in two different programming languages of your choice. Compare the structure and syntax.*

***THEORY EXERCISE**: Explain in your own words what a program is and how it functions.*

What is Programming?

***THEORY EXERCISE**: What are the key steps involved in the programming process?*

Types of Programming Languages

***THEORY EXERCISE**: What are the main differences between high-level and low-level programming languages?*

World Wide Web & How Internet Works

***LAB EXERCISE**: Research and create a diagram of how data is transmitted from a client to a server over the internet.*

***THEORY EXERCISE**: Describe the roles of the client and server in web communication.*

Network Layers on Client and Server

***LAB EXERCISE**: Design a simple HTTP client-server communication in any language.*

***THEORY EXERCISE**: Explain the function of the TCP/IP model and its layers.*

Client and Servers

***THEORY EXERCISE**: Explain Client Server Communication*

Types of Internet Connections

***LAB EXERCISE**: Research different types of internet connections (e.g., broadband, fiber, satellite) and list their pros and cons.*

***THEORY EXERCISE**: How does broadband differ from fiber-optic internet?*

Protocols

***LAB EXERCISE**: Simulate HTTP and FTP requests using command line tools (e.g., curl).*

***THEORY EXERCISE**: What are the differences between HTTP and HTTPS protocols?*

Application Security

***LAB EXERCISE**: Identify and explain three common application security vulnerabilities. Suggest possible solutions.*

***THEORY EXERCISE**: What is the role of encryption in securing applications?*

Software Applications and Its Types

***LAB EXERCISE**: Identify and classify 5 applications you use daily as either system software or application software.*

***THEORY EXERCISE**: What is the difference between system software and application software?*

Software Architecture

***LAB EXERCISE**: Design a basic three-tier software architecture diagram for a web application.*

***THEORY EXERCISE**: What is the significance of modularity in software architecture?*

Layers in Software Architecture

***LAB EXERCISE**: Create a case study on the functionality of the presentation, business logic, and data access layers of a given software system.*

***THEORY EXERCISE**: Why are layers important in software architecture?*

Software Environments

***LAB EXERCISE**: Explore different types of software environments (development, testing, production). Set up a basic environment in a virtual machine.*

***THEORY EXERCISE**: Explain the importance of a development environment in software production.*

Source Code

***LAB EXERCISE**: Write and upload your first source code file to Github.*

***THEORY EXERCISE**: What is the difference between source code and machine code?*

Github and Introductions

***LAB EXERCISE**: Create a Github repository and document how to commit and push code changes.*

***THEORY EXERCISE**: Why is version control important in software development?*

Student Account in Github

***LAB EXERCISE**: Create a student account on Github and collaborate on a small project with a classmate.*

***THEORY EXERCISE**: What are the benefits of using Github for students?*

Types of Software

***LAB EXERCISE**: Create a list of software you use regularly and classify them into the following categories: system, application, and utility software.*

***THEORY EXERCISE**: What are the differences between open-source and proprietary software?*

GIT and GITHUB Training

***LAB EXERCISE**: Follow a GIT tutorial to practice cloning, branching, and merging repositories.*

***THEORY EXERCISE**: How does GIT improve collaboration in a software development team?*

Application Software

LAB EXERCISE*: Write a report on the various types of application software and how they improve productivity.*

THEORY EXERCISE*: What is the role of application software in businesses?*

Software Development Process

LAB EXERCISE*: Create a flowchart representing the Software Development Life Cycle (SDLC).*

THEORY EXERCISE*: What are the main stages of the software development process?*

Software Requirement

LAB EXERCISE*: Write a requirement specification for a simple library management system.*

THEORY EXERCISE*: Why is the requirement analysis phase critical in software development?*

Software Analysis

LAB EXERCISE*: Perform a functional analysis for an online shopping system.*

THEORY EXERCISE*: What is the role of software analysis in the development process?*

System Design

LAB EXERCISE*: Design a basic system architecture for a food delivery app.*

THEORY EXERCISE*: What are the key elements of system design?*

Software Testing

LAB EXERCISE*: Develop test cases for a simple calculator program.*

THEORY EXERCISE*: Why is software testing important?*

Maintenance

LAB EXERCISE*: Document a real-world case where a software application required critical maintenance.*

THEORY EXERCISE*: What types of software maintenance are there?*

Development

THEORY EXERCISE*: What are the key differences between web and desktop applications?*

27. Web Application

THEORY EXERCISE*: What are the advantages of using web applications over desktop applications?*

28. Designing

THEORY EXERCISE*: What role does UI/UX design play in application development?*

29. Mobile Application

THEORY EXERCISE*: What are the differences between native and hybrid mobile apps?*

30. DFD (Data Flow Diagram)

LAB EXERCISE*: Create a DFD for a hospital management system.*

THEORY EXERCISE*: What is the significance of DFDs in system analysis?*

31. Desktop Application

LAB EXERCISE*: Build a simple desktop calculator application using a GUI library.*

THEORY EXERCISE*: What are the pros and cons of desktop applications compared to web applications?*

32. Flow Chart

LAB EXERCISE*: Draw a flowchart representing the logic of a basic online registration system.*

THEORY EXERCISE*: How do flowcharts help in programming and system design?*

Module 2 – Introduction to Programming

Overview of C Programming

- **THEORY EXERCISE**:
    - Write an essay covering the history and evolution of C programming. Explain its importance and why it is still used today.
- **LAB EXERCISE**:
    - Research and provide three real-world applications where C programming is extensively used, such as in embedded systems, operating systems, or game development.

2. Setting Up Environment

- **THEORY EXERCISE**:
    - Describe the steps to install a C compiler (e.g., GCC) and set up an Integrated Development Environment (IDE) like DevC++, VS Code, or CodeBlocks.
- **LAB EXERCISE**:
    - Install a C compiler on your system and configure the IDE. Write your first program to print "Hello, World!" and run it.

3. Basic Structure of a C Program

- **THEORY EXERCISE**:
    - Explain the basic structure of a C program, including headers, main function, comments, data types, and variables. Provide examples.
- **LAB EXERCISE**:
    - Write a C program that includes variables, constants, and comments. Declare and use different data types (int, char, float) and display their values.

4. Operators in C

- **THEORY EXERCISE**:
    - Write notes explaining each type of operator in C: arithmetic, relational, logical, assignment, increment/decrement, bitwise, and conditional operators.
- **LAB EXERCISE**:
    - Write a C program that accepts two integers from the user and performs arithmetic, relational, and logical operations on them. Display the results.

    - WAP to Find Area And Circumference of Circle

    - Find Area of Square formula : a = a2 5. Find Area of Cube formula : a = 6a2 6. Find area of Triangle Formula : A = 1/2 × b × h

    - Accept number of students from user. I need to give 5 apples to each student. How many apples are required?

    - Find character value from ascii

    - Find ascii value of given number

5. Control Flow Statements in C

- **THEORY EXERCISE**:
  - Explain decision-making statements in C (if, else, nested if-else, switch). Provide examples of each.

- **LAB EXERCISE**:
  - Write a C program to check if a number is even or odd using an if-else statement. Extend the program using a switch statement to display the month name based on the user’s input (1 for January, 2 for February, etc.).

  - Write a C program to check if a number is even or odd using an if-else statement. Extend the program using a switch statement to display the month name based on the user’s input (1 for January, 2 for February, etc.).

  - WAP to find maximum number among 3 numbers using ternary operator

  - Write a C program to calculate profit and loss on a transaction

6. Looping in C

- **THEORY EXERCISE**:
  - Compare and contrast while loops, for loops, and do-while loops. Explain the scenarios in which each loop is most appropriate.
- **LAB EXERCISE**:
  - Write a C program to print numbers from 1 to 10 using all three types of loops (while, for, do-while).
  - WAP to take 10 no. Input from user find out below values a. How many Even numbers are there b. How many odd numbers are there c. Sum of even numbers d. Sum of odd numbers?

  - WAP to print number in reverse order e.g.: number = 64728 ---> reverse = 82746

7. Loop Control Statements

- **THEORY EXERCISE**:
  - Explain the use of `break`, `continue`, and `goto` statements in C. Provide examples of each.
- **LAB EXERCISE**:
  - Write a C program that uses the `break` statement to stop printing numbers when it reaches 5. Modify the program to skip printing the number 3 using the `continue` statement.

  - Calculate the Sum of Natural Numbers Using the While Loop

  - Program of Armstrong Number in C Using For Loop & While Loop

  - WAP to accept 5 numbers from user and display in reverse order using for loop and array

8. Functions in C

- **THEORY EXERCISE**:
  - What are functions in C? Explain function declaration, definition, and how to call a function. Provide examples.
- **LAB EXERCISE**:
  - Write a C program that calculates the factorial of a number using a function Include function declaration, definition, and call.

  - WAP to find factorial using recursion
  - WAP to reverse a string and check that the string is palindrome or no

9. Arrays in C

- **THEORY EXERCISE**:
  - Explain the concept of arrays in C. Differentiate between one-dimensional and multi-dimensional arrays with examples.
- **LAB EXERCISE**:
  - Write a C program that stores 5 integers in a one-dimensional array and prints

them. Extend this to handle a two-dimensional array (3x3 matrix) and calculate the sum of all elements.

  - Accept number from user store in array

  - Convert array into asce and dec order

  - Find max element from the array

10. Pointers in C

- **THEORY EXERCISE**:
  - Explain what pointers are in C and how they are declared and initialized. Why are pointers important in C?
- **LAB EXERCISE**:
  - Write a C program to demonstrate pointer usage. Use a pointer to modify the value of a variable and print the result.

11. Strings in C

- **THEORY EXERCISE**:
    - Explain string handling functions like `strlen()`, `strcpy()`, `strcat()`, `strcmp()`, and `strchr()`. Provide examples of when these functions are useful.
- **LAB EXERCISE**:
    - Write a C program that takes two strings from the user and concatenates them using `strcat()`. Display the concatenated string and its length using `strlen()`.
    - Find length of string which is entered by user without using inbuilt function.
    - Join 2 strings using of user defined function without using inbuilt function
    - Accept string from user and check it is palindrome or not

12. Structures in C

- **THEORY EXERCISE**:
    - Explain the concept of structures in C. Describe how to declare, initialize, and access structure members.
- **LAB EXERCISE**:
    - Write a C program that defines a structure to store a student's details (name, roll number, and marks). Use an array of structures to store details of 3 students and print them.

13. File Handling in C

- **THEORY EXERCISE**:
    - Explain the importance of file handling in C. Discuss how to perform file operations like opening, closing, reading, and writing files.
- **LAB EXERCISE**:
    - Write a C program to create a file, write a string into it, close the file, then open the file again to read and display its contents.

EXTRA LAB EXERCISES FOR IMPROVING PROGRAMMING LOGIC

1. Operators

LAB EXERCISE 1: Simple Calculator

- Write a C program that acts as a simple calculator. The program should take two numbers and an operator as input from the user and perform the respective operation (addition, subtraction, multiplication, division, or modulus) using operators.
- **Challenge**: Extend the program to handle invalid operator inputs.

LAB EXERCISE 2: Check Number Properties

- Write a C program that takes an integer from the user and checks the following using different operators:
    - Whether the number is even or odd.
    - Whether the number is positive, negative, or zero.

    - Whether the number is a multiple of both 3 and 5.

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2. Control Statements

LAB EXERCISE 1: Grade Calculator

- Write a C program that takes the marks of a student as input and displays the corresponding grade based on the following conditions:
    - Marks > 90: Grade A
    - Marks > 75 and <= 90: Grade B
    - Marks > 50 and <= 75: Grade C
    - Marks <= 50: Grade D
- Use *if-else* or *switch* statements for the decision-making process.

LAB EXERCISE 2: Number Comparison

- Write a C program that takes three numbers from the user and determines:
    - The largest number.
    - The smallest number.
- **Challenge**: Solve the problem using both *if-else* and *switch-case* statements.

LAB EXERCISE 3: Temperature calculation

- Write a C program to read temperature in centigrade and display a suitable message according to the temperature state below: Temp < 0 then Freezing weather Temp 0-10 then Very Cold weather Temp 10-20 then Cold weather Temp 20-30 then Normal in Temp Temp 30-40 then Its Hot Temp >=40 then Its Very Hot

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3. Loops

LAB EXERCISE 1: Prime Number Check

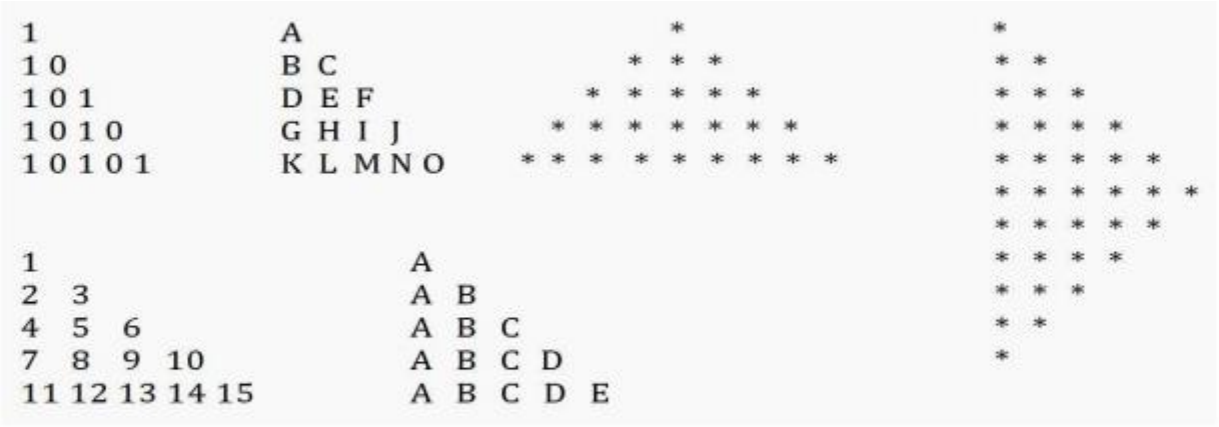
- Write a C program that checks whether a given number is a prime number or not using a *for* loop.
- **Challenge**: Modify the program to print all prime numbers between 1 and a given number.

LAB EXERCISE 2: Multiplication Table

- Write a C program that takes an integer input from the user and prints its multiplication table using a *for* loop.
- **Challenge**: Allow the user to input the range of the multiplication table (e.g., from 1 to N).

LAB EXERCISE 3: Sum of Digits

- Write a C program that takes an integer from the user and calculates the sum of its digits using a *while* loop.
- **Challenge**: Extend the program to reverse the digits of the number.
- **Patterns** :



```
1               A                     *                   *
1 0             B C                 * * *                 * *
1 0 1           D E F             * * * * *               * * *
1 0 1 0         G H I J         * * * * * * *             * * * *
1 0 1 0 1       K L M N O     * * *  * * * * * *          * * * * *
                                                          * * * * * *
                                                          * * * * *
1                      A                                  * * * *
2  3                   A  B                               * * *
4  5  6                A  B  C                            * *
7  8  9  10            A  B  C  D                         *
11 12 13 14 15         A  B  C  D  E
```

- Write a program to find out the max from given number (E.g., No: -1562 Max number is 6)

4. Arrays

LAB EXERCISE 1: Maximum and Minimum in Array

- Write a C program that accepts 10 integers from the user and stores them in an array. The program should then find and print the maximum and minimum values in the array.

- **Challenge**: Extend the program to sort the array in ascending order.

LAB EXERCISE 2: Matrix Addition

- Write a C program that accepts two 2x2 matrices from the user and adds them. Display the resultant matrix.
- **Challenge**: Extend the program to work with 3x3 matrices and matrix multiplication.

LAB EXERCISE 3: Sum of Array Elements

- Write a C program that takes N numbers from the user and stores them in an array. The program should then calculate and display the sum of all array elements.
- **Challenge**: Modify the program to also find the average of the numbers.

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5. Functions

LAB EXERCISE 1: Fibonacci Sequence

- Write a C program that generates the Fibonacci sequence up to N terms using a recursive function.
- **Challenge**: Modify the program to calculate the Nth Fibonacci number using both iterative and recursive methods. Compare their efficiency.

LAB EXERCISE 2: Factorial Calculation

- Write a C program that calculates the factorial of a given number using a function.
- **Challenge**: Implement both an iterative and a recursive version of the factorial function and compare their performance for large numbers.

LAB EXERCISE 3: Palindrome Check

- Write a C program that takes a number as input and checks whether it is a palindrome using a function.
- **Challenge**: Modify the program to check if a given string is a palindrome.

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6. Strings

LAB EXERCISE 1: String Reversal

- Write a C program that takes a string as input and reverses it using a function.
- **Challenge**: Write the program without using built-in string handling functions.

LAB EXERCISE 2: Count Vowels and Consonants

- Write a C program that takes a string from the user and counts the number of vowels and consonants in the string.
- **Challenge**: Extend the program to also count digits and special characters.

LAB EXERCISE 3: Word Count

- Write a C program that counts the number of words in a sentence entered by the user.
- **Challenge**: Modify the program to find the longest word in the sentence.

Extra Logic Building Challenges

Lab Challenge 1: Armstrong Number

- Write a C program that checks whether a given number is an Armstrong number or not (e.g., 153 = 1^3 + 5^3 + 3^3).
- **Challenge**: Write a program to find all Armstrong numbers between 1 and 1000.

Lab Challenge 2: Pascal's Triangle

- Write a C program that generates Pascal's Triangle up to N rows using loops.
- **Challenge**: Implement the same program using a recursive function.

Lab Challenge 3: Number Guessing Game

- Write a C program that implements a simple number guessing game. The program should generate a random number between 1 and 100, and the user should guess the number within a limited number of attempts.
- **Challenge**: Provide hints to the user if the guessed number is too high or too low.

Lab Challenge 4: Sum of Prime Numbers

- **Description**: Write a C program that calculates the sum of all prime numbers up to a given number N.
- **Challenge**: Extend the program to find and print all the prime numbers found.

Module #3 Introduction to OOPS Programming

1. Introduction to C++

LAB EXERCISES:

1. *First C++ Program: Hello World*
   - Write a simple C++ program to display "Hello, World!".
   - *Objective*: Understand the basic structure of a C++ program, including **#include**, **main()**, and **cout**.
2. *Basic Input/Output*
   - Write a C++ program that accepts user input for their name and age and then displays a personalized greeting.
   - *Objective*: Practice input/output operations using **cin** and **cout**.
3. *POP vs. OOP Comparison Program*
   - Write two small programs: one using Procedural Programming (POP) to calculate the area of a rectangle, and another using Object-Oriented Programming (OOP) with a class and object for the same task.
   - *Objective*: Highlight the difference between POP and OOP approaches.
4. *Setting Up Development Environment*
   - Write a program that asks for two numbers and displays their sum. Ensure this is done after setting up the IDE (like Dev C++ or CodeBlocks).
   - *Objective*: Help students understand how to install, configure, and run programs in an IDE.

THEORY EXERCISE:

1. *What are the key differences between Procedural Programming and Object-Oriented Programming (OOP)?*
2. *List and explain the main advantages of OOP over POP.*
3. *Explain the steps involved in setting up a C++ development environment.*
4. *What are the main input/output operations in C++? Provide examples.*

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2. Variables, Data Types, and Operators

LAB EXERCISES:

1. *Variables and Constants*
   - Write a C++ program that demonstrates the use of variables and constants. Create variables of different data types and perform operations on them.
   - *Objective*: Understand the difference between variables and constants.
2. *Type Conversion*
   - Write a C++ program that performs both implicit and explicit type conversions and prints the results.

   - *Objective*: Practice type casting in C++.

3. *Operator Demonstration*
   - Write a C++ program that demonstrates arithmetic, relational, logical, and bitwise operators. Perform operations using each type of operator and display the results.
   - *Objective*: Reinforce understanding of different types of operators in C++.

THEORY EXERCISE:

1. *What are the different data types available in C++? Explain with examples.*
2. *Explain the difference between implicit and explicit type conversion in C++.*
3. *What are the different types of operators in C++? Provide examples of each.*
4. *Explain the purpose and use of constants and literals in C++.*

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3. Control Flow Statements

LAB EXERCISES:

1. *Grade Calculator*
   - Write a C++ program that takes a student’s marks as input and calculates the grade based on if-else conditions.
   - *Objective*: Practice conditional statements (**if-else**).
2. *Number Guessing Game*
   - Write a C++ program that asks the user to guess a number between 1 and 100. The program should provide hints if the guess is too high or too low. Use loops to allow the user multiple attempts.
   - *Objective*: Understand **while** loops and conditional logic.
3. *Multiplication Table*
   - Write a C++ program to display the multiplication table of a given number using a **for** loop.
   - *Objective*: Practice using loops.
4. *Nested Control Structures*
   - Write a program that prints a right-angled triangle using stars (*) with a nested loop.
   - *Objective*: Learn nested control structures.

THEORY EXERCISE:

1. *What are conditional statements in C++? Explain the* if-else *and* switch *statements.*
2. *What is the difference between* for, while, *and* do-while *loops in C++?*
3. *How are* break *and* continue *statements used in loops? Provide examples.*
4. *Explain nested control structures with an example.*

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4. Functions and Scope

LAB EXERCISES:

1. *Simple Calculator Using Functions*
   - Write a C++ program that defines functions for basic arithmetic operations (add, subtract, multiply, divide). The main function should call these based on user input.
   - *Objective*: Practice defining and using functions in C++.
2. *Factorial Calculation Using Recursion*
   - Write a C++ program that calculates the factorial of a number using recursion.
   - *Objective*: Understand recursion in functions.
3. *Variable Scope*
   - Write a program that demonstrates the difference between local and global variables in C++. Use functions to show scope.
   - *Objective*: Reinforce the concept of variable scope.

THEORY EXERCISE:

1. *What is a function in C++? Explain the concept of function declaration, definition, and calling.*
2. *What is the scope of variables in C++? Differentiate between local and global scope.*
3. *Explain recursion in C++ with an example.*
4. *What are function prototypes in C++? Why are they used?*

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5. *Arrays and Strings*

LAB EXERCISES:

1. *Array Sum and Average*
   - Write a C++ program that accepts an array of integers, calculates the sum and average, and displays the results.
   - *Objective*: Understand basic array manipulation.
2. *Matrix Addition*
   - Write a C++ program to perform matrix addition on two 2x2 matrices.
   - *Objective*: Practice multi-dimensional arrays.
3. *String Palindrome Check*
   - Write a C++ program to check if a given string is a palindrome (reads the same forwards and backwards).
   - *Objective*: Practice string operations.

THEORY EXERCISE:

1. *What are arrays in C++? Explain the difference between single-dimensional and multi-dimensional arrays.*
2. *Explain string handling in C++ with examples.*
3. *How are arrays initialized in C++? Provide examples of both 1D and 2D arrays.*
4. *Explain string operations and functions in C++.*

6. *Introduction to Object-Oriented Programming*

LAB EXERCISES:

1. *Class for a Simple Calculator*
   - Write a C++ program that defines a class **Calculator** with functions for addition, subtraction, multiplication, and division. Create objects to use these functions.
   - *Objective*: Introduce basic class structure.
2. *Class for Bank Account*
   - Create a class **BankAccount** with data members like **balance** and member functions like **deposit** and **withdraw**. Implement encapsulation by keeping the data members private.
   - *Objective*: Understand encapsulation in classes.
3. *Inheritance Example*
   - Write a program that implements inheritance using a base class **Person** and derived classes **Student** and **Teacher**. Demonstrate reusability through inheritance.
   - *Objective*: Learn the concept of inheritance.

THEORY EXERCISE:

1. ***Explain the key concepts of Object-Oriented Programming (OOP).***
2. ***What are classes and objects in C++? Provide an example.***
3. ***What is inheritance in C++? Explain with an example.***
4. ***What is encapsulation in C++? How is it achieved in classes?***

Module 4 – Introduction to DBMS

Introduction to SQL

Theory Questions:

1. What is SQL, and why is it essential in database management?
2. Explain the difference between DBMS and RDBMS.
3. Describe the role of SQL in managing relational databases.
4. What are the key features of SQL?

LAB EXERCISES:

- **Lab 1**: Create a new database named `school_db` and a table called `students` with the following columns: `student_id`, `student_name`, `age`, `class`, and `address`.
- **Lab 2**: Insert five records into the `students` table and retrieve all records using the `SELECT` statement.

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2. SQL Syntax

Theory Questions:

1. What are the basic components of SQL syntax?
2. Write the general structure of an SQL `SELECT` statement.
3. Explain the role of clauses in SQL statements.

LAB EXERCISES:

- **Lab 1**: Write SQL queries to retrieve specific columns (`student_name` and `age`) from the `students` table.
- **Lab 2**: Write SQL queries to retrieve all students whose age is greater than 10.

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3. SQL Constraints

Theory Questions:

1. What are constraints in SQL? List and explain the different types of constraints.
2. How do `PRIMARY KEY` and `FOREIGN KEY` constraints differ?
3. What is the role of `NOT NULL` and `UNIQUE` constraints?

LAB EXERCISES:

- **Lab 1**: Create a table `teachers` with the following columns: `teacher_id` (Primary Key), `teacher_name` (NOT NULL), `subject` (NOT NULL), and `email` (UNIQUE).
- **Lab 2**: Implement a `FOREIGN KEY` constraint to relate the `teacher_id` from the `teachers` table with the `students` table.

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4. Main SQL Commands and Sub-commands (DDL)

Theory Questions:

1. Define the SQL Data Definition Language (DDL).
2. Explain the `CREATE` command and its syntax.
3. What is the purpose of specifying data types and constraints during table creation?

LAB EXERCISES:

- **Lab 1**: Create a table `courses` with columns: `course_id`, `course_name`, and `course_credits`. Set the `course_id` as the primary key.
- **Lab 2**: Use the `CREATE` command to create a database `university_db`.

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5. ALTER Command

Theory Questions:

1. What is the use of the `ALTER` command in SQL?
2. How can you add, modify, and drop columns from a table using `ALTER`?

LAB EXERCISES:

- **Lab 1**: Modify the `courses` table by adding a column `course_duration` using the `ALTER` command.
- **Lab 2**: Drop the `course_credits` column from the `courses` table.

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6. DROP Command

Theory Questions:

1. What is the function of the `DROP` command in SQL?
2. What are the implications of dropping a table from a database?

LAB EXERCISES:

- **Lab 1**: Drop the `teachers` table from the `school_db` database.
- **Lab 2**: Drop the `students` table from the `school_db` database and verify that the table has been removed.

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7. Data Manipulation Language (DML)

Theory Questions:

1. Define the `INSERT`, `UPDATE`, and `DELETE` commands in SQL.
2. What is the importance of the `WHERE` clause in `UPDATE` and `DELETE` operations?

LAB EXERCISES:

- **Lab 1**: Insert three records into the `courses` table using the `INSERT` command.
- **Lab 2**: Update the course duration of a specific course using the `UPDATE` command.
- **Lab 3**: Delete a course with a specific `course_id` from the `courses` table using the `DELETE` command.

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8. Data Query Language (DQL)

Theory Questions:

1. What is the `SELECT` statement, and how is it used to query data?
2. Explain the use of the `ORDER BY` and `WHERE` clauses in SQL queries.

LAB EXERCISES:

- **Lab 1**: Retrieve all courses from the `courses` table using the `SELECT` statement.
- **Lab 2**: Sort the courses based on `course_duration` in descending order using `ORDER BY`.
- **Lab 3**: Limit the results of the `SELECT` query to show only the top two courses using `LIMIT`.

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9. Data Control Language (DCL)

Theory Questions:

1. What is the purpose of `GRANT` and `REVOKE` in SQL?
2. How do you manage privileges using these commands?

LAB EXERCISES:

- **Lab 1**: Create two new users `user1` and `user2` and grant `user1` permission to `SELECT` from the `courses` table.
- **Lab 2**: Revoke the `INSERT` permission from `user1` and give it to `user2`.

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10. Transaction Control Language (TCL)

Theory Questions:

1. What is the purpose of the `COMMIT` and `ROLLBACK` commands in SQL?
2. Explain how transactions are managed in SQL databases.

LAB EXERCISES:

- **Lab 1**: Insert a few rows into the `courses` table and use `COMMIT` to save the changes.
- **Lab 2**: Insert additional rows, then use `ROLLBACK` to undo the last insert operation.
- **Lab 3**: Create a `SAVEPOINT` before updating the `courses` table, and use it to roll back specific changes.

---

11. SQL Joins

Theory Questions:

1. Explain the concept of `JOIN` in SQL. What is the difference between `INNER JOIN`, `LEFT JOIN`, `RIGHT JOIN`, and `FULL OUTER JOIN`?
2. How are joins used to combine data from multiple tables?

LAB EXERCISES:

- **Lab 1**: Create two tables: `departments` and `employees`. Perform an `INNER JOIN` to display employees along with their respective departments.
- **Lab 2**: Use a `LEFT JOIN` to show all departments, even those without employees.

---

12. SQL Group By

Theory Questions:

1. What is the `GROUP BY` clause in SQL? How is it used with aggregate functions?
2. Explain the difference between `GROUP BY` and `ORDER BY`.

LAB EXERCISES:

- **Lab 1**: Group employees by department and count the number of employees in each department using `GROUP BY`.
- **Lab 2**: Use the `AVG` aggregate function to find the average salary of employees in each department.

---

13. SQL Stored Procedure

Theory Questions:

1. What is a stored procedure in SQL, and how does it differ from a standard SQL query?
2. Explain the advantages of using stored procedures.

LAB EXERCISES:

- **Lab 1**: Write a stored procedure to retrieve all employees from the `employees` table based on department.
- **Lab 2**: Write a stored procedure that accepts `course_id` as input and returns the course details.

---

14. SQL View

Theory Questions:

1. What is a view in SQL, and how is it different from a table?
2. Explain the advantages of using views in SQL databases.

LAB EXERCISES:

- **Lab 1**: Create a view to show all employees along with their department names.
- **Lab 2**: Modify the view to exclude employees whose salaries are below $50,000.

---

15. SQL Triggers

Theory Questions:

1. What is a trigger in SQL? Describe its types and when they are used.
2. Explain the difference between `INSERT`, `UPDATE`, and `DELETE` triggers.

LAB EXERCISES:

- **Lab 1**: Create a trigger to automatically log changes to the `employees` table when a new employee is added.
- **Lab 2**: Create a trigger to update the `last_modified` timestamp whenever an employee record is updated.

---

16. Introduction to PL/SQL

Theory Questions:

1. What is PL/SQL, and how does it extend SQL's capabilities?
2. List and explain the benefits of using PL/SQL.

LAB EXERCISES:

- **Lab 1**: Write a PL/SQL block to print the total number of employees from the `employees` table.
- **Lab 2**: Create a PL/SQL block that calculates the total sales from an `orders` table.

---

17. PL/SQL Control Structures

Theory Questions:

1. What are control structures in PL/SQL? Explain the `IF-THEN` and `LOOP` control structures.
2. How do control structures in PL/SQL help in writing complex queries?

LAB EXERCISES:

- *Lab 1*: Write a PL/SQL block using an `IF-THEN` condition to check the department of an employee.
- **Lab 2**: Use a `FOR LOOP` to iterate through employee records and display their names.

---

18. SQL Cursors

Theory Questions:

1. What is a cursor in PL/SQL? Explain the difference between implicit and explicit cursors.
2. When would you use an explicit cursor over an implicit one?

LAB EXERCISES:

- **Lab 1**: Write a PL/SQL block using an explicit cursor to retrieve and display employee details.
- **Lab 2**: Create a cursor to retrieve all courses and display them one by one.

---

19. Rollback and Commit Savepoint

Theory Questions:

1. Explain the concept of `SAVEPOINT` in transaction management. How do `ROLLBACK` and `COMMIT` interact with savepoints?
2. When is it useful to use savepoints in a database transaction?

LAB EXERCISES:

- **Lab 1**: Perform a transaction where you create a savepoint, insert records, then rollback to the savepoint.
- **Lab 2**: Commit part of a transaction after using a savepoint and then rollback the remaining changes.

EXTRA LAB PRACTISE FOR DATABASE CONCEPTS

1. Introduction to SQL

LAB EXERCISES:

- **Lab 3**: Create a database called `library_db` and a table `books` with columns: `book_id`, `title`, `author`, `publisher`, `year_of_publication`, and `price`. Insert five records into the table.
- **Lab 4**: Create a table `members` in `library_db` with columns: `member_id`, `member_name`, `date_of_membership`, and `email`. Insert five records into this table.

---

2. SQL Syntax

LAB EXERCISES:

- **Lab 3**: Retrieve all `members` who joined the library before 2022. Use appropriate SQL syntax with `WHERE` and `ORDER BY`.
- **Lab 4**: Write SQL queries to display the titles of books published by a specific author. Sort the results by `year_of_publication` in descending order.

---

3. SQL Constraints

LAB EXERCISES:

- **Lab 3**: Add a `CHECK` constraint to ensure that the `price` of books in the `books` table is greater than 0.
- **Lab 4**: Modify the `members` table to add a `UNIQUE` constraint on the `email` column, ensuring that each member has a unique email address.

---

4. Main SQL Commands and Sub-commands (DDL)

LAB EXERCISES:

- **Lab 3**: Create a table `authors` with the following columns: `author_id`, `first_name`, `last_name`, and `country`. Set `author_id` as the primary key.
- **Lab 4**: Create a table `publishers` with columns: `publisher_id`, `publisher_name`, `contact_number`, and `address`. Set `publisher_id` as the primary key and `contact_number` as unique.

---

5. ALTER Command

LAB EXERCISES:

- **Lab 3**: Add a new column `genre` to the `books` table. Update the `genre` for all existing records.
- **Lab 4**: Modify the `members` table to increase the length of the `email` column to 100 characters.

---

6. DROP Command

LAB EXERCISES:

- **Lab 3**: Drop the `publishers` table from the database after verifying its structure.
- **Lab 4**: Create a backup of the `members` table and then drop the original `members` table.

---

7. Data Manipulation Language (DML)

LAB EXERCISES:

- **Lab 4**: Insert three new authors into the `authors` table, then update the last name of one of the authors.
- **Lab 5**: Delete a book from the `books` table where the `price` is higher than $100.

---

8. UPDATE Command

LAB EXERCISES:

- **Lab 3**: Update the `year_of_publication` of a book with a specific `book_id`.
- **Lab 4**: Increase the `price` of all books published before 2015 by 10%.

---

9. DELETE Command

LAB EXERCISES:

- **Lab 3**: Remove all members who joined before 2020 from the `members` table.
- **Lab 4**: Delete all books that have a `NULL` value in the `author` column.

---

10. Data Query Language (DQL)

LAB EXERCISES:

- **Lab 4**: Write a query to retrieve all `books` with `price` between $50 and $100.
- **Lab 5**: Retrieve the list of `books` sorted by `author` in ascending order and limit the results to the top 3 entries.

---

11. Data Control Language (DCL)

LAB EXERCISES:

- **Lab 3**: Grant `SELECT` permission to a user named `librarian` on the `books` table.
- **Lab 4**: Grant `INSERT` and `UPDATE` permissions to the user `admin` on the `members` table.

---

12. REVOKE Command

LAB EXERCISES:

- **Lab 3**: Revoke the `INSERT` privilege from the user `librarian` on the `books` table.
- **Lab 4**: Revoke all permissions from user `admin` on the `members` table.

---

13. Transaction Control Language (TCL)

LAB EXERCISES:

- **Lab 3**: Use `COMMIT` after inserting multiple records into the `books` table, then make another insertion and perform a `ROLLBACK`.
- **Lab 4**: Set a `SAVEPOINT` before making updates to the `members` table, perform some updates, and then roll back to the `SAVEPOINT`.

---

14. SQL Joins

LAB EXERCISES:

- **Lab 3**: Perform an `INNER JOIN` between `books` and `authors` tables to display the `title` of books and their respective authors' names.
- **Lab 4**: Use a `FULL OUTER JOIN` to retrieve all records from the `books` and `authors` tables, including those with no matching entries in the other table.

---

15. SQL Group By

LAB EXERCISES:

- **Lab 3**: Group `books` by `genre` and display the total number of books in each genre.
- **Lab 4**: Group `members` by the year they joined and find the number of members who joined each year.

---

16. SQL Stored Procedure

LAB EXERCISES:

- **Lab 3**: Write a stored procedure to retrieve all `books` by a particular `author`.
- **Lab 4**: Write a stored procedure that takes `book_id` as an argument and returns the `price` of the book.

17. SQL View

LAB EXERCISES:

- **Lab 3**: Create a view to show only the `title`, `author`, and `price` of books from the `books` table.
- **Lab 4**: Create a view to display `members` who joined before 2020.

18. SQL Trigger

LAB EXERCISES:

- **Lab 3**: Create a trigger to automatically update the `last_modified` timestamp of the `books` table whenever a record is updated.
- **Lab 4**: Create a trigger that inserts a log entry into a `log_changes` table whenever a `DELETE` operation is performed on the `books` table.

19. Introduction to PL/SQL

LAB EXERCISES:

- **Lab 3**: Write a PL/SQL block to insert a new `book` into the `books` table and display a confirmation message.
- **Lab 4**: Write a PL/SQL block to display the total number of books in the `books` table.

20. PL/SQL Syntax

LAB EXERCISES:

- **Lab 3**: Write a PL/SQL block to declare variables for `book_id` and `price`, assign values, and display the results.
- **Lab 4**: Write a PL/SQL block using `constants` and perform arithmetic operations on book prices.

21. PL/SQL Control Structures

LAB EXERCISES:

- **Lab 3**: Write a PL/SQL block using `IF-THEN-ELSE` to check if a book's price is above $100 and print a message accordingly.
- **Lab 4**: Use a `FOR LOOP` in PL/SQL to display the details of all books one by one.

---

22. SQL Cursors

LAB EXERCISES:

- **Lab 3**: Write a PL/SQL block using an explicit cursor to fetch and display all records from the `members` table.
- **Lab 4**: Create a cursor to retrieve books by a particular author and display their titles.

---

23. Rollback and Commit Savepoint

LAB EXERCISES:

- **Lab 3**: Perform a transaction that includes inserting a new `member`, setting a `SAVEPOINT`, and rolling back to the savepoint after making updates.
- **Lab 4**: Use `COMMIT` after successfully inserting multiple books into the `books` table, then use `ROLLBACK` to undo a set of changes made after a savepoint.

Module 1: Introduction to Mobile Application Development

- **Theory Assignment**:
  - Write a detailed report on the architecture of Android. Explain the key components, including Activities, Services, Broadcast Receivers, and Content Providers.
  - Compare Native, Web, and Hybrid applications. What are the advantages and disadvantages of each type?
- **Practical Assignment**:
  - Set up Android Studio and build a basic Android project that displays "Hello World" on the screen. Take a screenshot of your project in Android Studio and describe each part of the project structure.

Module 2: Kotlin Programming Basics

- **Theory Assignment**:
  - Explain the different data types available in Kotlin. How do `val` and `var` differ? What is a lambda expression in Kotlin, and where can it be used?
- **Practical Assignment**:
  - Create a Kotlin program that calculates the sum of all even numbers between 1 and 100. Use loops and control flow in your solution.

Object-Oriented Programming in Kotlin

- **Theory Assignment**:
  - Describe the principles of Object-Oriented Programming (OOP). Explain the differences between `abstract class` and `interface` in Kotlin and provide examples of when to use them.
- **Practical Assignment**:
  - Create a Kotlin program that demonstrates inheritance by defining a base class `Animal` and two derived classes `Dog` and `Cat`. The base class should have a method `makeSound()` that each subclass overrides.

Module 4: Android Studio and Android App Structure

- **Theory Assignment**:
  - Explain the Android app structure in detail, including the purpose of the `AndroidManifest.xml` file, Gradle, and various directories (e.g., `res`, `src`).
- **Practical Assignment**:
  - Create an Android app with two activities: a MainActivity and a SecondActivity. Use explicit intents to navigate between the two activities.

UI Design in Android

- **Theory Assignment**:
  - Write an essay on the different layout types in Android (LinearLayout, RelativeLayout, ConstraintLayout). Compare their usage and performance.
- **Practical Assignment**:
  - Design a user registration form using ConstraintLayout that includes fields for the user's name, email, phone number, and a submit button. Use input validation to ensure the fields are filled correctly.

Intents, Fragments, and Navigation

- **Theory Assignment**:

    - Explain the differences between `Fragment` and `Activity`. How does Android handle fragment lifecycle differently from activity lifecycle?
- **Practical Assignment**:
    - Build an Android app that uses a bottom navigation bar with three fragments: Home, Profile, and Settings. Ensure that data can be passed between fragments using Bundle.

Module 5): Data Storage and Persistence in Android

- **Theory Assignment**:
    - Discuss the differences between `SharedPreferences`, SQLite, and Room in Android. When would you choose each for data storage?
- **Practical Assignment**:
    - Create an Android app where the user can add, view, edit, and delete notes using Room database. Implement a RecyclerView to display the list of notes.

Module 6): Networking and APIs

- **Theory Assignment**:
    - Explain the structure of a REST API. What is Retrofit in Android, and how does it simplify API calls?
- **Practical Assignment**:
    - Use Retrofit to fetch data from a public API (e.g., OpenWeatherMap) and display the current weather information for a city in a RecyclerView.

Firebase Integration

- **Theory Assignment**:
    - What are the benefits of using Firebase in Android development? Explain Firebase Authentication and how it can be integrated with an Android app.
- **Practical Assignment**:
    - Integrate Firebase Authentication into an Android app. Allow users to sign up and log in using their email and password. Display a welcome message once the user is authenticated.

Advanced Android Concepts

- **Theory Assignment**:
    - Explain the concept of services in Android. What are the differences between foreground and background services, and when should each be used?
- **Practical Assignment**:

  - Implement a background service in an Android app that continuously tracks the user's location and displays it on the screen. Use the `FusedLocationProviderClient` for accessing GPS data.

Material Design and Animations

- **Theory Assignment**:
  - Describe the principles of Material Design. What are the key elements, and how do they improve the user experience?
- **Practical Assignment**:
  - Create an Android app that uses a floating action button (FAB) and a Snackbar to provide feedback to the user. Implement basic view animations (such as fade in/out or sliding) when switching between activities.

Module 7)

Kotlin Coroutines and Asynchronous Programming

- **Theory Assignment**:
  - Explain the concept of Kotlin Coroutines. How do coroutines improve performance over traditional threading mechanisms?
- **Practical Assignment**:
  - Build an Android app that makes network requests to fetch data using Kotlin Coroutines. Ensure that the app displays a loading indicator while the data is being fetched in the background.

Testing in Android

- **Theory Assignment**:
  - Discuss the importance of unit testing in Android development. What is the difference between unit testing and UI testing?
- **Practical Assignment**:
  - Write unit tests using JUnit to test the business logic of a sample Android app (e.g., a calculator app). Use Espresso to test a basic user interface in the app.

Publishing and Deployment

- **Theory Assignment**:
  - Explain the steps involved in preparing an Android app for publishing. Discuss the significance of ProGuard and app signing.
- **Practical Assignment**:

    - Prepare an APK for release by signing the APK and enabling ProGuard in Android Studio. Generate a signed APK and submit it for testing.

Capstone Project

- **Practical Assignment**:
    - Build a complete Android app (e.g., an E-commerce app or a Social Media app) that incorporates all the concepts learned throughout the course. The app should include features like user authentication, database integration, API calls, UI design using Material Design, and proper navigation between screens.