# C++ Concepts Categorized from PYQs

Based on the analysis of the previous year questions (PYQs) from both the lab and theory papers, the following C++ concepts have been identified and categorized:

## Core C++ Concepts

1. **Programming Paradigms**
2. Structured Programming vs Object-Oriented Programming
3. Features and advantages/disadvantages of each paradigm
4. **Data Types**
5. Built-in data types and their sizes
6. Derived data types
7. User-defined data types
8. **Basic Input/Output**
9. Data streams
10. Stream hierarchy in C++

## Object-Oriented Programming Concepts

1. **Classes and Objects**
2. Class definition and declaration
3. Object creation and destruction
4. Member variables and functions
5. Access control specifiers (public, private, protected)
6. **Constructors and Destructors**
7. Default constructors
8. Parameterized constructors
9. Copy constructors
10. Constructor overloading
11. Destructors and their importance

12. **Encapsulation and Information Hiding**
13. Data abstraction
14. Implementation hiding
15. **Inheritance**
16. Base and derived classes
17. Types of inheritance
18. Constructor calling in inheritance
19. Method overriding
20. **Polymorphism**
21. Function overloading
22. Operator overloading
23. Virtual functions
24. Runtime polymorphism
25. **Friend Functions and Classes**
26. Declaration and usage
27. Advantages and applications

## Advanced C++ Concepts

1. **Operator Overloading**
2. Syntax and implementation
3. Operators that cannot be overloaded
4. Applications (string concatenation, complex numbers, etc.)
5. **Templates**
6. Function templates
7. Class templates
8. Template specialization
9. **Exception Handling**
10. try, catch, and throw mechanisms
11. Exception hierarchy

12. Custom exceptions

13. **File Handling**

14. File streams
15. Reading and writing to files

## Practical Applications

1. **Data Structures Implementation**
2. Arrays and matrices

3. Matrix operations

4. **Real-world Object Modeling**

5. Bank account management
6. Library management
7. Vehicle classification
8. Time and date handling

This categorization will serve as the foundation for creating a structured, progressive learning roadmap for C++ programming.