

**Duration: 3 hours**

**Total Marks: 70**

| Unit No. | Unit Name                              | Periods    |           |            | Marks     |           |            |
|----------|--|------------|-----------|------------|-----------|-----------|------------|
|          |  | Th         | P         | Tot        | Th        | P         | Total      |
| 1.       | OBJECT ORIENTED PROGRAMMING<br>IN C++  | 50         | 35        | 85         | 30        | 13        | 43         |
| 2.       | DATA STRUCTURE                         | 30         | 20        | 50         | 14        | 10        | 24         |
| 3.       | DATABASE MANAGEMENT SYSTEM<br>AND SQL  | 10         | 15        | 25         | 8         | 7         | 15         |
| 4.       | BOOLEAN ALGEBRA                        | 10         | 0         | 10         | 8         | 0         | 8          |
| 5.       | NETWORKING AND OPEN<br>SOURCE SOFTWARE | 10         | 0         | 10         | 10        | 0         | 10         |
|          |  | <b>110</b> | <b>70</b> | <b>180</b> | <b>70</b> | <b>30</b> | <b>100</b> |

**UNIT 1: OBJECT ORIENTED PROGRAMMING IN C++**

REVIEW: C++ covered In Class -XI,

**Object Oriented Programming:**

Concept of Object Oriented Programming - Data hiding, Data encapsulation, Class and Object, Abstract class and Concrete class, Polymorphism (Implementation of polymorphism using Function overloading as an example in C++); Inheritance, Advantages of Object Oriented Programming over earlier programming methodologies,

**Implementation of Object Oriented Programming concepts in C++:**

Definition of a class, Members of a class - Data Members and Member Functions (methods), Using Private and Public visibility modes, default visibility mode (private); Member function definition: inside class definition and outside class definition using scope resolution operator (::); Declaration of objects as instances of a class; accessing members from object(s), Objects as function arguments - pass by value and pass by reference;

**Constructor and Destructor:**

Constructor: Special Characteristics, Declaration and Definition of a constructor, Default Constructor, Overloaded Constructors, Copy Constructor, Constructor with default arguments;

**Destructor:** Special Characteristics, Declaration and definition of destructor;

**Inheritance (Extending Classes):**

Concept of Inheritance, Base Class, Derived Class, Defining derived classes, protected visibility mode; Single level inheritance, Multilevel inheritance and Multiple inheritance, Privately derived, Publicly derived and Protectedly derived class, accessibility of members from objects and within derived class(es);

**Data File Handling:**

Need for a data file, Types of data files - Text file and Binary file;

**Text File : Basic file operations on text file:** Creating/Writing text into file, Reading and Manipulation of text from an already existing text File (accessing sequentially);

**Binary File:** Creation of file, Writing data into file, Searching for required data from file, Appending data to a file, Insertion of data in sorted file, Deletion of data from file, Modification of data in a file;

Implementation of above mentioned data file handling in C++;

Components of C++ to be used with file handling:

Header file: fstream.h; ifstream, ofstream, fstream classes;

Opening a text file in in, out, and app modes;

Using cascading operators (>> <<) for writing text to the file and reading text from the file; open(), get(), put(), getline() and close() functions; Detecting end-of-file (with or without using eof() function);

Opening a binary file using **in, out, and app** modes;

**open(), read(), write()** and close() functions; Detecting end-of-file (with or without using **eof()** function); **tellg(), tellp(), seekg(), seekp()** functions.

**Pointers:**

**Introduction to Pointer,** Declaration and Initialization of Pointers; Dynamic memory allocation/de-allocation operators: **new, delete**; Pointers and Arrays: Array of Pointers, Pointer to an array (1 dimensional array), Function returning a pointer, Reference variables and use of alias; Function call by reference. Pointer to structures: De-reference/Deference operator: \*, ->; self referencial structures;

## UNIT 2: DATA STRUCTURES

Introduction to data structure, primitive and non-primitive data structure, linear and non-linear structure, static and dynamic data structure.

**Arrays:**

One and two Dimensional arrays: Sequential allocation and address calculation;

One dimensional array: Traversal, Searching (Linear, Binary Search), Insertion of an element in an array, deletion of an element from an array, Sorting (Insertion, Selection)

Two-dimensional arrays: Traversal, Finding sum/difference of two NxM arrays containing numeric values, Interchanging Row and Column elements in a two dimensional array;

**Stack (Array and Linked implementation of Stack):**

Introduction to stock (LIFO \_ Last in First Out Operations)

Operations on Stack (PUSH and POP) and its Implementation in C++, Converting expressions from INFIX to POSTFIX notation and evaluation of Postfix expression;

**Queue: (Circular Array and Linked Implementation):**

Introduction to Queue (FIFO - First in First out operations)

Operations on Queue (Insert and Delete) and its Implementation in C++.

## UNIT 3: DATABASES MANAGEMENT SYSTEM AND SQL

**Database Concepts:** Introduction to data base concepts and its need.

**Relational data model:** Concept of domain, tuple, relation, key, primary key, alternate key, candidate key;

**Relational algebra:** Selection, Projection, Union and Cartesian product;

**Structured Query Language:**

**General Concepts:** Advantages of using SQL, Data Definition Language and Data Manipulation Language;

**Data types:** NUMBER/DECIMAL, CHARACTER/VARCHAR/VARCHAR2, DATE;

**SQL commands:**

CREATE TABLE, DROPTABLE, ALTER TABLE, UPDATE...SET..., INSERT, DELETE;

SELECT, DISTINCT, FROM, WHERE, IN, BETWEEN, GROUP BY, HAVING, ORDER BY;

SQL functions: SUM, AVG, COUNT, MAX and MIN;

Obtaining results (SELECT query) from 2 tables using equi-join, Cartesian Product and Union

Note: Implementation of the above mentioned commands could be done on any SQL supported software on one or two tables.

## UNIT 4: BOOLEAN ALGEBRA

Role of Logical Operations in Computing.

Binary-valued Quantities, Logical Variable, Logical Constant and Logical Operators: AND, OR, NOT; Truth Tables; Closure Property, Commutative Law, Associative Law, Identity law, Inverse law, Principle of Duality, Idem potent Law, Distributive Law, Absorption Law, Involution law, DeMorgan's Law and their applications;

Obtaining Sum of Product (SOP) and Product of Sum (POS) form from the Truth Table, Reducing Boolean Expression (SOP and POS) to its minimal form, Use of Karnaugh Map for minimization of Boolean expressions (up to 4 variables);

**Application of Computing Logic:**

Building up logic circuits using basic Logic Gates (NOT, AND, OR, NAND, NOT)

Use of Boolean operators (NOT, AND, OR) in SQL SELECT statements

Use of Boolean operators (AND, OR) in search engine queries.

## UNIT 5: NETWORKING AND OPEN SOURCE SOFTWARE

### COMMUNICATION TECHNOLOGIES

Evolution of Networking: ARPANET, www, Internet, Interspace

Different ways of sending data across the network with reference to switching techniques (Circuit, Message and Packet switching)

**Data Communication terminologies:** Concept of Channel and Data transfer rate (bps, kbps, Mbps, Gbps, Tbps)

**Transmission media:** Twisted pair cable, coaxial cable, optical fiber, infrared, radio link, microwave link and satellite link

**Network devices:** Modem RJ11 and RJ45 connectors, Ethernet Card, Hub, Switch, Gateway

**Network Topologies and types:** Bus, Star, Tree; PAN, LAN, WAN, MAN

**Network Protocol:** TCP/IP, File Transfer Protocol (FTP), PPP, Remote Login (Telnet), Internet Wireless/Mobile Communication protocol such as GSM, CDMA, GPRS, WLL,

Mobile Telecommunication Technologies : 1G, 2G, 3G and 4G

Electronic mail protocols such as SMTP, POP3

Protocols for Chat and Video Conferencing VOIP

Wireless protocols such as Wi-Fi and WiMax

### **Network Security Concepts:**

Threats and prevention from Viruses, Worms, Trojan horse, Spams

Use of Cookies, Protection using Firewall;

India IT Act, Cyber Law, Cyber Crimes, IPR issues, Hacking.

### **WebServices:**

WWW, Hyper Text Markup Language (HTML), eXtensible Markup Language (XML); Hyper Text Transfer Protocol (HTTP); Domain Names; URL; Protocol Address; Website, Web browser, Web Servers; Web Hosting, Web Scripting - Client side (VB Script, Java Script, PHP) and Server side (ASP, JSP, PHP), Web 2.0 (for social networking)

### **Open Standards**

Introduction to open standards and its advantage in development of inter-operable environment.

### **Open Source Concepts**

Proprietary and Open Source Software, Freeware, Shareware, FLOSS/FOSS, GNU,FSF, OSI, W3C

### **Cloud Computing**

Characteristics, layers-client, Application, platform and infrastructure, Deployment models-Private cloud, Public cloud, Community cloud and hybrid cloud, Issues- Privacy, Compliance, Security, Sustainability and abuse.

## Class XII (Practicals)

Duration: 3 hours

Total Marks: 30

**1. Programming in C++** **10**

One programming problem in C++ to be developed and tested in Computer during the examination. Marks are allotted on the basis of following:

|                           |   |         |
|---------------------------|---|---------|
| Logic                     | : | 5 Marks |
| Documentation/Indentation | : | 2 Marks |
| Output presentation       | : | 3 Marks |

**Notes:** The types of problems to be given will be of application type from the following topics

- Arrays (One dimensional and two dimensional)
- Class(es) and objects
- Stack using arrays and or linked implementation
- Queue using arrays (circular) and or linked implementation
- Binary File operations (Creation, Displaying, Searching and modification)
- Text File operations (Creation, Displaying and modification)

**2. SQL Commands** **05**

Five Query questions based on a particular Table/Reaction to be tested practically on Computer during the examination. The command along with the result must be written in the answer sheet.

**3. Project Work** **05**

The project has to be developed in C++ language with Object Oriented Technology and also should have use of Data files. (The project is required to be developed in a group of 2-4 students)

- Presentation on the computer
- Project report (Listing, Sample, Outputs, Documentation)
- Viva

**4. Practical File** **05**

Must have minimum 20 programs from the following topics

- Arrays (One dimensional and two dimensional, sorting, searching, merging, deletion & insertion of elements)
- Class(es) and objects
- Stacks using arrays and linked implementation
- Queues using arrays (linear and circular) and linked implementation
- File (Binary and Text) operations (Creation, Updation, Query)
- Any computational based problems

15 SQL commands along with the output based on any table/relation:

**5. Viva Voce** **05**

Viva will be asked from syllabus covered in class XII and the project developed by student.

**GUIDELINES FOR PROJECTS (Class XI and XII)**

**1. Preamble**

1.1 The academic course in Computer Science includes one Project in each year. The Purpose behind this is to consolidate the concepts and practices imparted during the course and to serve as a record of competence.

1.2 A group of 2-3 students as team may be allowed to work on one project.

**2. Project content**

2.1 Project for class XI can be selected from the topics mentioned in the syllabus or domains on the similar lines

2.2 Project for class XII should ensure the coverage of following areas of curriculum:

- a. Flow of control
- b. Data Structure
- c. Object Oriented Programming in C++
- d. Data File Handling

Theme of the project can be

- Any subsystem of a System Software or Tool
- Any Scientific or a fairly complex algorithmic situation.
- School Management, Banking, Library information system, Hotel or Hospital management system, Transport query system
- Quizzes/Games;
- Tutor/Computer Aided Learning Systems

2.3 It is suggested to prepare a bilingual (English and other Indian language) user manual part of project file

2.4 The aim of the project is to highlight the abilities of algorithmic formulation, modular programming, optimized code preparation, systematic documentation and other associated aspects of Software Development.

## Suggested Reference Books

### Computer Fundamentals and Boolean Algebra

1. Rajaraman, FUNDAMENTALS OF COMPUTERS 4th Edition, Prentice Hall of India.
2. Peter Norton, INTRODUCTION TO COMPUTER 4th Edition, Tata McGraw Hill
3. Thomas C. Bartee, DIGITAL COMPUTER FUNDAMENTALS, McGraw Hill International.

### Problem Solving and Programming in C++

**Note:** Prior knowledge of C is not required in the learning of C++, eventhough reference about C are made in some of the books.

1. Robert Lafore, OBJECT ORIENTED PROGRAMMING IN TURBO C++, Galgotia Publications Pvt. Ltd.
2. David Parsons, OBJECT ORIENTED PROGRAMMING WITH C++, BPB Publications.
3. Bjarne Stroustrup, THE C++ PROGRAMMING LANGUGE, Adison Wesley.

### Data Structures

1. M.A. Weiss, Data Structures and Algorithm Analysis in C++. the Benjamin/Cummings Pub. Co., Inc.
2. Sartaj & Sahni, Fundamentals of Data Structure, Galgotia Book Source

### Database Management System and SQL

1. C.J. Date, DATABASE PRIMER, Adison Wesley.

### Communication and Open Source Concepts

1. A.S. Tanenbaum, Computer Network 4th Edition, Prentice Hall of India P. Ltd.
2. Williams Stalling, Data Communication and Networks 5th Edition, Prentice Hall of India P. Ltd.
3. Hancock, Network Concept and Architectures, BPB Publications.

Web References - [www.opensource.org](http://www.opensource.org), [www.w3schools.com](http://www.w3schools.com)

## Computer Science (Code 083)

### ANNEXURE

Tenative Inventors and their salient contributions in the field of  
Infromation Technology

| <b>Name</b>         | <b>Contribution / Field of Contribution</b>                      |
|---------------------|--|
| Alan Turing         | Turing Machine   |
| Andrew S. Tanenbaum | Operating Systems, MINIX   |
| Bjarne Stroustrup   | C++  |
| Claude Shannon      | Information Theory   |
| Dennis Ritchie      | C (Programming Language), UNIX                                   |
| Edgar F. Codd       | Formulated The Database Relational Model                         |
| George Boole        | Boolen Logic   |
| James Gusling       | JVL  |
| James Hendler       | Semantic Web   |
| John Hopcroft       | Compliers  |
| John Von Neumann    | Early Computers, Von Neumann Machine                             |
| Leonard Kleinrock   | ARPANET, Queueing Theory, Packet Switching, Hierarchical Routing |
| Linus Torvalds      | Linux Kernel, Git  |
| Peter Wegner        | Object-Oriented Programming, Interaction (Computer Science)      |
| Raj Chandel         | Hacking  |
| Raj Reddy           | Artificial Intelligence, Robotics                                |
| Richard Stallman    | Gnu Project  |
| Robert E. Khan      | TCP/IP   |
| Sabir Bhatia        | Hotmail  |
| Seymour Cray        | Cray Research, Supercomputer                                     |
| Tim Berners-Lee     | World Wide Web   |
| Vinod Dham          | Pentinum Processor, AMD K6 Processor                             |
| Vinton Cerf         | Internet, TCP/IP   |