Chapter 1
Review of C++ Programming

Basics of C++	
Character set	Fundamental unit of C++ language. Classified into letters, digits, special characters and white spaces.
Tokens	Building blocks of C++ programs. Classified into keywords, identifiers, literals, punctuators and operators.
Keywords	Reserved words that convey specific meaning to the language compiler.
Identifiers	User-defined words to identify memory locations, statements, etc. Identifiers include variables, labels, function names, etc.
Literals (Constants)	Tokens that do not change their value during the program run. Classified into integer constants, floating point constants, character constants and string constants.
Operators	Symbols that represents some operations. They consist of arithmetic, relational and logical operators. There are some special operators named *get from* (>>), *put to* (<<) and assignment (=). Another category of operators include increment (++), decrement (--) and arithmetic assignment (+=, -=, *=, /=, %=) operators.
Punctuators	Special characters like comma (,), semi colon (;), etc. used for the perfection of syntax of various constructs of the language.
Data types	These are means to identify the type of data and associated operations. Data types are classified into fundamental and user-defined data types. Fundamental data types include `int`, `char`, `float`, `double` and `void`.
Control statements	Two types – Selection statements (if, switch) Looping statements (while, for, do – while) while and for are entry controlled loops do – while is exit controlled loop
Looping statements	There will be four components – initialization expression, test expression, update expression, loop-body. In the case of entry-controlled loop, body will be executed only after evaluation the test expression (condition). But, in the case of the exit-controlled loop, condition will be checked only after executing the loop-body.

switch V/s if – else if statement

Switch	if – else if
• Only equality conditions are checked.	• Any relational expression can be used for conditions.
• Program control goes outside the block only if break is used after each case.	• No need of break to take the control outside after executing a block.
• default case is for an action where all the conditions fail.	• else is used for an action where all the conditions fail.

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Chapter 2
Arrays

An **array** is a collection of elements of the same type placed in contiguous memory locations. Arrays are used to store a set of values of the same type under a single variable name. Each element in an array can be accessed using its position in the list called index number or subscript.
The syntax for declaring an array in C++ is as follows.

```
data_type array_name[size];
```

Eg: `int num[10];`

This statement declares an array named `num` that can store 10 integer numbers.

Accessing array elements

Elements of an array are easily accessed using a **`for`** loop. For example, the elements in the above array can be displayed using the following loop:

```
for (i=0; i<5; i++)
    cout<<score[i];
```

String handling using arrays

A character array can be used to store a string, since it is a sequence of characters. The array `char my_name[10];` can store a string of 9 characters. One location will be used to store '\0' (null character) as string terminator.
A string can be input using the statement:

```
cin >> my_name;
```

This statement can store a string without any white space (that is, only one word). If we want store strings containing white spaces (strings having more than one word) we can use `gets()` function, `getline()` function or `get()` function.

`cin.getline(my_name,10);` can accept a string containing white spaces. The functions `getline()` and `get()` are stream functions to input string and `gets()` is a console function.
Similarly to display string data we can use `puts()` function and `write()` function.

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Chapter 3
Functions

Predefined functions

Type	Functions	Operation
(cstdio / stdio.h)	**`getchar()`**	To input a character
	`putchar()`	To display a character
Stream functions (iostream)	**`get()`**	To input a character To input a string of maximum 10 characters
	`getline()`	To input a string of maximum 10 characters
	`put()`	To display a character
	`write()`	To display a string of maximum 10 characters

String Functions (cstring / string.h)	`strlen()`	To find the length of a string.
	`strcpy()`	To copy one string into another
	`strcat()`	To append (concatenate) string2 to string1
	`strcmp()`	To compare two strings.
	`strcmpi()`	Same as strcmp(), except that the case of the two strings are ignored.
Mathematical Functions (cmath / math.h)	`abs()`	To find the absolute value of an integer.
	`fabs()`	To find the absolute value of a floating point number.
	`sqrt()`	To find the square root of a number.
	`pow()`	To find the power of a number. It takes two arguments **x** and **y**. Returns the value of x^y.
Character Functions (cctype / ctype.h)	`isupper()`	To check whether a character is in upper case or not.
	`islower()`	To check whether a character is in lower case or not.
	`isalpha()`	To check whether a character is alphabet or not.
	`isdigit()`	To check whether a character is digit or not.
	`isalnum()`	To check whether a character is alphanumeric or not.
	`toupper()`	This function is used to convert the given character into its uppercase.
	`tolower()`	This function is used to convert the given character into its lowercase.

Two type of Function Calling

Call by Value Method	Call by Reference Method
• Ordinary variables are used as formal parameters.	• Reference variables are used as formal parameters.
• Actual parameters may be constants, variables or expressions.	• Actual parameters will be variables only.
• The changes made in the formal arguments do not reflect in actual arguments.	• The changes made in the formal arguments do reflect in actual arguments.
• Exclusive memory allocation is required for the formal arguments.	• Memory of actual arguments is shared by formal arguments.

Chapter 4

Web Technology

Static web page V/s Dynamic web page

Static web page	Dynamic web page
The content and layout of a web page is fixed.	The content and layout may change during run time.
Static web pages never use databases.	Database is used to generate dynamic content through queries.

Client side scripting V/s Server side scripting

Client side scripting	Server side scripting
Script is copied to the client browser	Script remains in the web server
Script is executed in the client browser	Script is executed in the web server and the web page produced is returned to the client browser

Client side scripting languages: JavaScript, VB Script
Server side scripting languages: PHP, JSP, ASP, Pearl

Structure of HTML code

```
<HTML>
        <HEAD>
                <TITLE>     </TITLE>
        </HEAD>
        <BODY>
        </BODY>
</HTML>
```

HTML Tags

Tags	Use	Attributes	Values and Purpose
<HTML>	To start an HTML document		
<HEAD>	To specify the head section of an HTML document.		
<TITLE>	This tag pair contains the text to be displayed in the title bar of browser.		
<BODY>	Defines the body section of the web page.	**Bgcolor**	Colour for the background of a web page.
		Background	Image as the background of a web page.
		Text	Colour of the text in the web page.

Tags	Use	Attributes	Values and Purpose
<H1> ….. ….. <H6>	To provide different levels of headings.	**Align**	**"left"**, **"right"** and **"center"** are the values.
<BR>	To break the current line of text and continues in the next line. No attributes.		
<P>	To create a paragraph leaving a blank line.		
<HR>	To draw a horizontal line across the width of the browser window		

Text formatting tags

Tags	Use
<B> and **<STRONG>**	To make the text **bold** face.
<I> and **<EM>**	To make the text *italics* or *emphasis*.
<U>	To underline the text
<S> and **<STRIKE>**	To ~~strike through~~ the text
<BIG>	To make the text big sized
<SMALL>	To make the text small sized
<SUB>	To make the text $_{\text{subscripted}}$
<SUP>	To make the text $^{\text{superscripted}}$
<Q>	To enclose the text in “double quotes”
<BLOCKQUOTE>	To indent the text

Tags	Use	Attributes	Values and Purpose
<MARQUEE>	To scroll a text or image in the browser		
<FONT>	To change the size, style and colour of the text enclosed	**Color**	To set the text colour
		Face	It specifies the font face like Arial, Calibri, etc.
		Size	It specifies the font size
<IMG>	To insert image in a web page	**Src**	To specify the file name of the image

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Chapter 5
Web Designing using HTML

Different types of Lists in HTML

There are three kinds of lists in HTML - unordered lists, ordered lists and definition lists.

Tags	Use	Attributes	Values and Purpose
<UL>	To create bulleted list	**Type**	To specify the type of bullet. **“Disc”**, **“Circle”** and **“Square”** are the values for ●, ○ and ▪
<OL>	To create numbered list	**Type**	To specify the type of numeral. The values are **“1”**, **“I”**, **“i”**, **“a”** and **“A”**.
		Start	To specify the starting number. The value should be an integer.
<LI>	To specify an item in the unordered or ordered list. Used inside the pairs **<UL>**…**</UL>** and **<OL>** … **</OL>**		
<DL>	To create a definition list		
<DT>	Used inside **<DL>**… **</DL>** to specify each data item (or term) in the list		
<DD>	Used after each **<DT>** to describe the term		

Links in HTML

A hyperlink (or simply link) is a text or an image in a web page, on clicking which another document or another section of the same document will be opened. The **<A>** tag, called anchor tag is used to give hyperlinks. **Href** is the main attribute of **<A>** tag. The URL (address of the web page/site) is given as its value. There are two types of linking – internal linking and external linking.

Creating Table in Web page

Tags	Use	Attributes	Values and Purpose
<TABLE>	To create table	**Border**	Thickness of the border line around the table.
<TR>	To specify a row in a table		
<TH> **<TD>**	To specify the heading cell. To specify the data in a cell.		

Input controls in Forms

Textbox – To input a line of text
Password box – To input passwords
Option button (Radio button) – To select an item from a groups of options
Checkbox – To select one or more items in a group
List box – To select one or more items from list of items
Text area – To input multi line text
Submit button – To submit data to the Form handler
Reset button – To clear the entries in the Form

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Chapter 6
Client side Scripting using JavaScript

<SCRIPT> tag: To embed JavaScript code in an HTML file.

Data Types in JavaScript: Number, String, Boolean

Variables: Used for storing values. Declared using the keyword **var** as: **`var x;`**

Operators

Arithmetic operators	+ – * / %
Increment, decrement	++ – –
Assignment operators	= += –= *= /= %=
Relational operators	< <= > >= == !=
Logical operators	|| && !
String concatenation	+

Control Statements

if statements	if (test_expression)
	    Statement;

	if (test_expression)
	    statement_1;
	else
	    statement_2;

	if (test_expression1)
	    statement_1;
	else if (test_expression2)
	    statement_2;

	::
	else
	    statement_n;

switch statement	switch (variable/expression)
	{
	    case value1: statement1; break;
	    case value2: statement2; break;
	        :
	    default: statement;
	}

for loop	for (initialization; test; update)
	        body;

while loop	initialization;
	while (test_expression)
	{ body;
	        update;
	}

Built-in Functions

Function	Use	Syntax / Example
alert()	To display a text in a message window.	alert("Welcome");
isNaN()	Returns True if the given value is not a number. That is, the argument contains a non-numeric character. Returns False is the argument is numeric.	isNaN("welcome"); and isNaN("A123"); return True. isNaN("13"); and isNaN(13); return False
toUpperCase()	Returns the upper case form of the given string.	"Java".toUpperCase(); will give JAVA.
toLowerCase()	Returns the lower case form of the given string.	"JavaSCIPT".toLowerCase(); will give javascript.
charAt()	Returns the character at a particular position. charAt(0) gives the 1st character of a string.	"JavaScript".charAt(4); gives S, the 5th character.
length property	Returns the length (number of characters) of the string.	"JavaScript".length will give 10.

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Chapter 7
Web Hosting

Types of web hosting

(i) **Shared hosting:** Most suitable for small websites that have less traffic. Cheaper and easy to use. Services will be slow.

(ii) **Dedicated hosting:** Dedicated servers provide guaranteed performance, round-the-clock power supply, and fast access. But they are very expensive.

(iii) **Virtual Private Server (VPS):** VPS provides almost the same services at a lesser cost than that of dedicated hosting. Some popular server virtualization softwares are VMware, FreeVPS, etc.

FTP Client software: FTP client software establishes a connection with a remote server and is used to transfer files from our computer to the server computer. SFTP uses Secure Shell (SSH) protocol which provides facilities for secure file transfer. The popular FTP client software are FileZilla, CuteFTP, SmartFTP, etc.

Free Hosting: Provides web hosting services free of charge. The size of the files that can be uploaded may be limited. Audio/video files may not be permitted. Sites.google.com, yola.com, etc. are free web hosting services.

Chapter 8

Database Management System

Database is an organized collection of inter-related data stored together with minimum redundancy, which can be retrieved as desirable.

Database Management System (DBMS) is essentially a set of programs which facilitates storage, retrieval and management of database.

Advantages of DBMS:

- Data redundancy (duplication of data) is controlled.
- Data inconsistency is avoided.
- Data are efficiently accessed.
- Data integrity is maintained.
- Data security is ensured.
- Data sharing is allowed.

Components of DBMS: Hardware, Software, Database, Users, Procedures:

Data organisation:

- Field: The smallest unit of stored data.
- Record: A collection of related fields.
- File: A collection of all occurrences of same type of records.
- Database: A collection of files associated with an organisation.

Types of Users of database

- Database Administrator (DBA): The person responsible for the control of the centralized and shared database.
- Application Programmers: Computer professionals who interact with the DBMS through application programs.
- Sophisticated Users: They interact with the database through their own queries.
- Naive Users: People accessing data by invoking one of the application programs.

Relation: A relation is also called Table. Data are organized in the form of rows and columns

Tuple: The rows (records) of a relation are known as tuples.

Attribute: The columns of a relation are called attributes.

Degree: The number of attributes in a relation determines the degree of a relation.

Cardinality: The number of rows (records) or tuples in a relation is called cardinality of the relation.

Domain: It is a pool of values in a given column of a table.

Schema: The description or structure of a database is called the database schema.

Instance: An instance of a relation is a set of tuples in it.

Types of Keys:

- Candidate key: It is the minimal set of attributes that uniquely identifies a row in a relation.
- Primary key: It is one of the candidate keys chosen to uniquely identify tuples within the relation.
- Alternate key: It is a candidate key that is not chosen as the primary key.
- Foreign key: A key in a table can be called foreign key if it is a primary key in another table.

Relational algebra

The fundamental operations in relational algebra are SELECT(σ), PROJECT (π), UNION, INTERSECTION, SET DIFFERENCE, CARTESIAN PRODUCT, etc.

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Chapter 9
Structured Query Language

Components of SQL: Data Definition Language (DDL), Data Manipulation language (DML) and Data Control Language (DCL).

DDL commands: CREATE TABLE, ALTER TABLE, DROP TABLE, CREATE VIEW, DROP VIEW.

DML commands: INSERT INTO, SELECT, UPDATE, DELETE FROM.

DCL commands: GRANT, REVOKE.

SQL Data Types: INT or INTEGER, DEC or DECIMAL, CHAR or CHARACTER, VARCHAR, DATE, TIME.

COUNT()	To count the non-null values of a column. Also used to get number of rows
SUM()	To find the sum of values in a column.
AVG()	To find the average of values in a column.
MAX()	To find the highest value in a column.
MIN()	To find the lowest value in a column.

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Chapter 10
Enterprise Resource Planning

Functional units of ERP

1. Financial module
2. Manufacturing module
3. Production planning module
4. HR module
5. Inventory control module
6. Purchasing module
7. Marketing module
8. Sales and distribution module
9. Quality management module

Popular ERP packages

- **Oracle:** The ERP package from Oracle provides strong finance and accounting module. It also provides good customer and supplier interaction, effective production analysis, efficient human resource management and better pricing module.
- **SAP:** SAP stands for Systems, Applications and Products for data processing. SAP also developed Customer Relationship Management (CRM), Supply Chain Management (SCM), and Product Life cycle Management (PLM) software.

- **Odoo:** Odoo is an open source ERP. In open source ERP the source code or program can be modified as necessary, based on the requirement of organization.
- **Microsoft Dynamics:** It provides a group of enterprise resource planning products primarily aimed at midsized enterprises. This package can be installed and used easily and it provides good user interface.
- **Tally ERP:** Tally ERP is a business accounting software for accounting, inventory and payroll.

Benefits of ERP system

- Improved resource utilization
- Better customer satisfaction
- Provides accurate information
- Decision making capability
- Increased flexibility
- Information integrity

Chapter 11
Trends and Issues in ICT

Mobile communication services

Short Message Service (**SMS**) is a text messaging service in mobile communication systems that allows exchanging short text messages containing up to 160 characters.

Multimedia Messaging Service (**MMS**) is a standard way to send and receive messages that consists of multimedia content using mobile phones. MMS does not specify a maximum size for a multimedia message and it supports contents such as text, graphics, music, video clips and more.

Global Positioning System (**GPS**) is a satellite based navigation system that is used to locate a geographical position anywhere on earth, using its longitude and latitude. GPS is used for vehicle fleet tracking by transporting companies to track the movement of their trucks.

A **smart card** is a plastic card embedded with a computer chip / memory that stores and transacts data. The advantages of using smart cards is that it is secure (data is protected), intelligent (it can store and process data) and that it is convenient (it is easy to carry).

Mobile Operating System

The software that manages the hardware, multimedia functions, Internet connectivity, etc. in a mobile device. Eg: Android from Google, iOS from Apple, BlackBerry OS from BlackBerry and Windows Phone from Microsoft.

Cyber crimes against individuals:

- **Identity theft** occurs when someone uses another person's identifying information, like their name, credit card number, etc. without their permission to commit fraud or other crimes.
- **Harassment** means posting humiliating comments focusing on gender, race, religion, nationality at specific individuals in chat rooms, social media, e-mail, etc. is harassment.
- **Impersonation and cheating:** Impersonation is an act of pretending to be another person for the purpose of harming the victim.
- **Violation of privacy:** Violation of privacy is the intrusion into the personal life of another, without a valid reason.
- **Dissemination of obscene material:** The Internet has provided a medium for the facilitation of crimes like pornography. The distribution and posting of obscene material is one of the important cyber crimes today.
