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COMPUTER SYSTEMS ARCHITECTURE

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2. THE CENTRAL PROCESSING UNIT

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UNIT I - COMPUTER SYSTEM ARCHITECTURE

SYLLABUS

UNIT- I

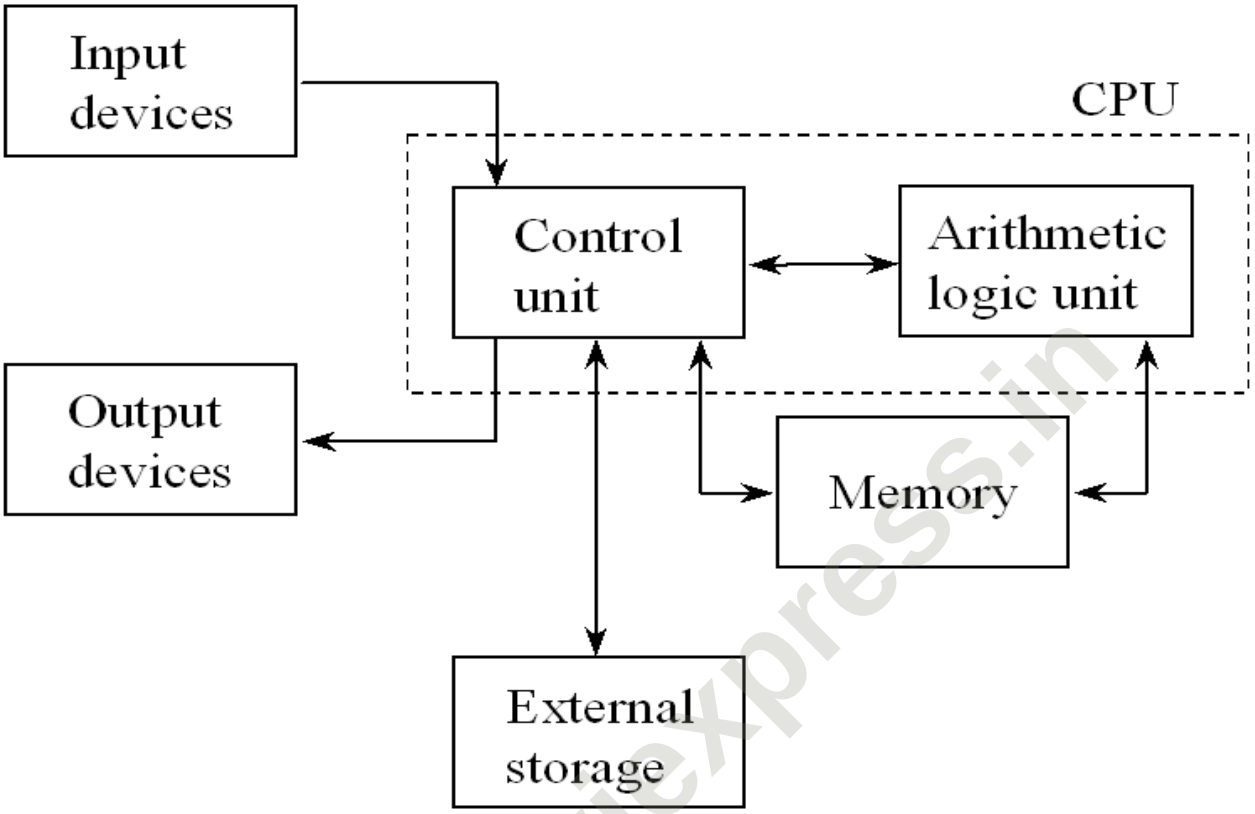
THE COMPUTER SYSTEM- System buses - Computer components - Computer functions - Interconnection structures - Internal memory - Computer memory system overview- Cache memory - Input/ Output - External devices - Direct Memory Access-The external interface.

OPERATING SYSTEM OVERVIEW.

THE CENTRAL PROCESSING UNIT- Computer Arithmetic - The Arithmetic and Logic Unit (ALU) - Floating-point arithmetic – Instruction sets- Types of operands- Register organization- The instruction cycle.

THE COMPUTER SYSTEM

ARCHITECTURE OF COMPUTER



INTRODUCTION TO COMPUTER:

- Computer system = Hard ware+ software + user
- Computer is an electronic machine.
- *The term computer* is *derived from the Latin term* -'computare',
- Meaning - calculate or *programmable machine*.
- Charles Babbage is called the "Father" of the computer.
- It can process both numerical and non-numerical (arithmetic and logical) calculations.
- Computer is an advanced electronic device that takes raw data as input from the user and processes these data under the control of set of instructions (called program) and gives the result (output) and saves output
- It represents the decimal numbers through binary digits.(0,1)

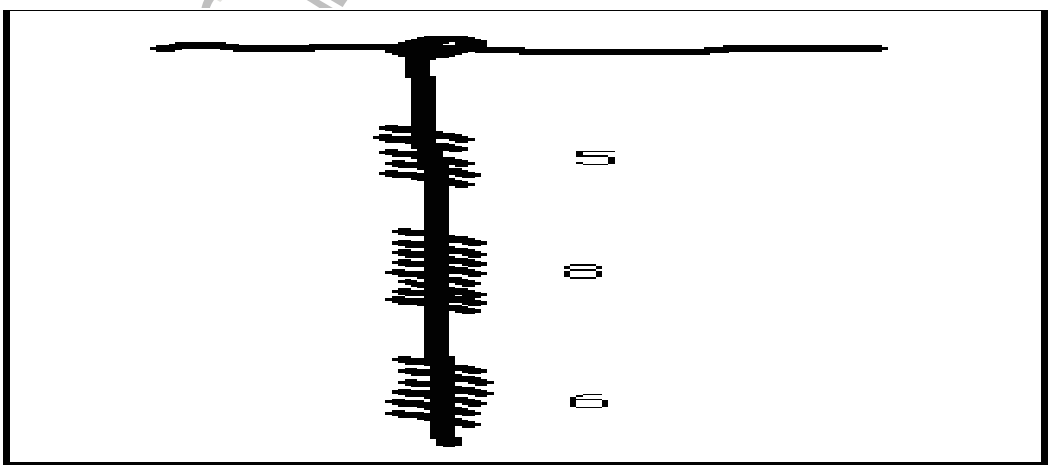
UNITS OF MEMORY:

- The smallest unit is a bit. Which means either 0 or 1
- 1 bit 0 or 1
- 4 bit = 1nibble
- 8 bit = 1 byte
- 1024 byte = 1KILO byte=2^{10} byte
- 1024 KB =1 MEGA byte = 2^{10} KB
- 1024MB = 1GIGA byte = 2^{10} MB
- 1024 GB= 1 TERA byte = 2^{10} GB
- 1024 TB = 1PETA byte = 2^{10} TB
- 1024 PB = 1EXA byte = 2^{10} PB
- 1024 EB = 1 ZETTA byte = 2^{10} EB
- 1024 ZB = 1 YOTTA byte = 2^{10} ZB
- 1024 YB = 1 BRONTO (or) HELLA byte = 2^{10} YB

EVOLUTION OF COMPUTER

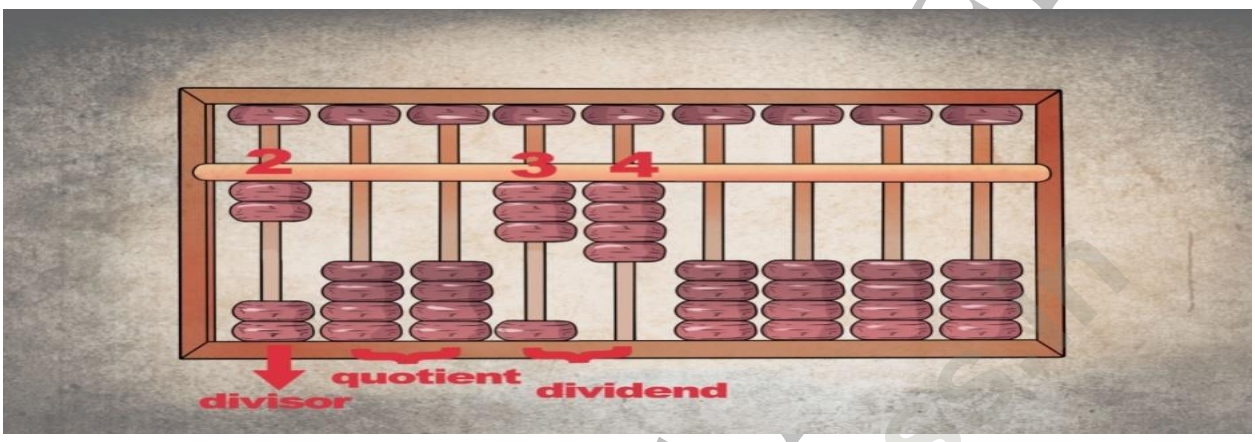
QUIPA (15TH & 16 TH CENTURY)

- A Tree Branches with a Thread knocked and made a additions and subtractions.



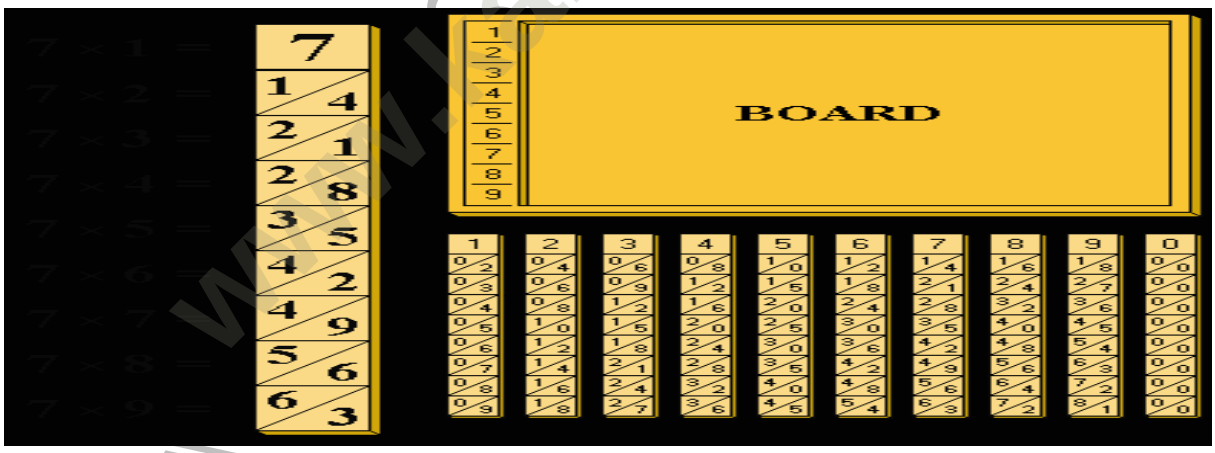
ABACUS (600 B.C)

- Invented by Babylonians at china
- Works By monitoring beads according the rules. The user can done addition, subtraction, multiplication, division.
- It was used by the Chinese and Egyptians



JOHN NAPIER'S BONE CARDBOARD MULTIPLICATION CALCULATOR (17TH CENTURY)

- A complete set of Napier bone's Consists of rods, one for each of the digit 0 to 9 Called bones, with number carried on them.
- It was first Appeared in print in 1614.



BLAISE PASCAL (1642)

- Blaise Pascal developed another mechanical adding machine Called ***pascaline***, *which could add and subtract numbers.*
- first digital computer

PRACTICE QUESTIONS:

1. Floating point representation is used to store

A) Boolean values
B) Whole numbers
C) Real integers
D) Integers

2. Suppose that a bus has 16 data lines and requires 4 cycles of 250 nsecs each to transfer data The bandwidth of this bus would be 2 Megabytes/sec If the cycle time of the bus was reduced to 125nsecs and the number of cycles required for transfer stayed the same what would the bandwidth of the bus?

A) 1 Megabyte/sec
B) 4 Megabytes/sec
C) 8 Megabytes/sec
D) 2 Megabytes/sec

3. Assembly language

A) Uses alphabetic codes in place of binary numbers used in machine language
B) is the easiest language to write programs
C) need not be translated into machine language
D) None of these

4. A three input NOR gate gives logic high output only when

A) One input is high
B) One input is low
C) Two input are low
D) All input are high

5. n bits in operation code imply that there are _____ possible distinct operators

A) 2n
B) 2n
C) n/2
D) N2

6. _____ register keeps tracks of the instructions stored in program stored in memory.

A) AR (Address Register)
B) XR (Index Register)
C) PC (Program Counter)
D) AC (Accumulator)

7. Memory unit accessed by content is called

A) Read only memory
B) Programmable Memory
C) Virtual Memory
D) Associative Memory

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UNIT II – OPERATING SYSTEM

SYLLABUS (Mark – 10)

Introduction: System software, OS strategies; multiprogramming, batch.

Operating System Organization: basic OS function, kernels, device drivers.

Device management: buffering

Process Management: resource abstraction, process hierarchy.

Scheduling: Strategy selection.

Synchronization Principles: deadlock, semaphores, multiprocessors.

Deadlocks: hold and wait, Banker's Algorithm, consumable resources.

Memory Management: memory allocation strategies, variable partition.

Protection and Security: internal access authorization

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OPERATING SYSTEMS

INTRODUCTION

SYSTEM SOFTWARE

- System software is a type of computer program that is designed to run a computer's hardware and application programs.
- It is the interface between the hardware and user applications. The operating system is the best-known example of system software. The OS manages all the other programs in a computer.
- System software is used to manage the computer itself.
- It runs in the background, maintaining the computer's basic functions so users can run higher-level application software to perform certain tasks.
- Essentially, system software provides a platform for application software to be run on top.

Important features of system software

- Computer manufacturers usually develop the system software as an integral part of the computer.
- The primary responsibility of this software is to create an interface between the computer hardware they manufacture and the end user.
- It generally includes the following features:
  1. **High speed:** To provide an effective platform for higher-level software in the computer system.
  2. **Hard to manipulate:** It often requires the use of a programming language, which is more difficult to use than a more intuitive user interface (UI).
  3. **Written in a low-level computer language:** Written in a computer language the central processing unit (CPU) and other computer hardware can read.
  4. **Close to the system:** It connects directly to the hardware that enables the computer to run.
  5. **Versatile:** Communicate with both the specialized hardware it runs on and the higher-level application software that is usually hardware-agnostic and often has no direct connection to the hardware it runs on. System software also must support other programs that depend on it as they evolve and change.

OS Definition:

- An operating system is an intermediary between users and computer hardware
- It acts as an interface and controls the execution of all kinds of programs.

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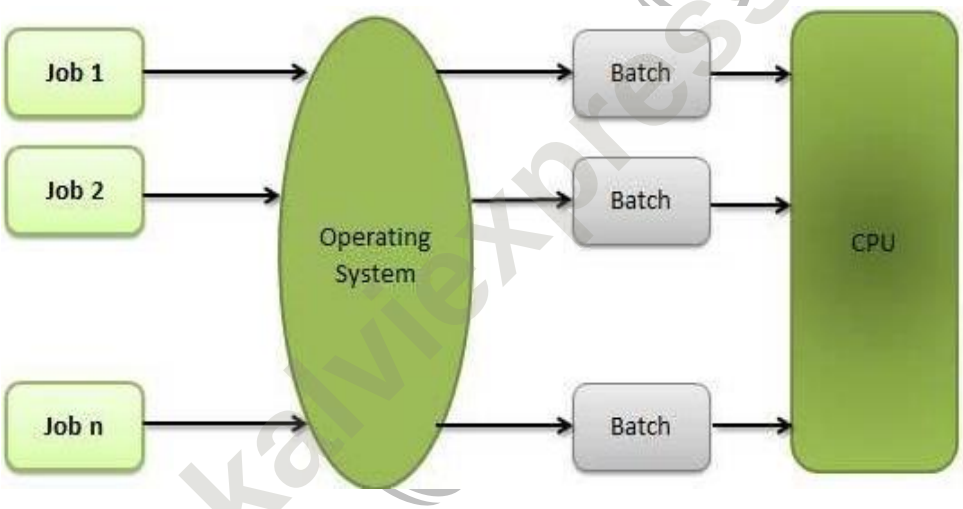
OPERATING SYSTEM STRATEGIES

Batch processing

- Batch processing is a technique in which an Operating System collects the programs and data together in a batch before processing starts.
- An operating system does the following activities related to batch processing.
  - ✓ The OS defines a job which has predefined sequence of commands, programs and data as a single unit.
  - ✓ The OS keeps a number a jobs in memory and executes them without any manual information.
  - ✓ Jobs are processed in the order of submission, i.e., first come first served fashion.
  - ✓ When a job completes its execution, its memory is released and the output for the job gets copied into an output spool for later printing or processing.



Advantages

- Batch processing takes much of the work of the operator to the computer.
- Increased performance as a new job get started as soon as the previous job is finished, without any manual intervention.

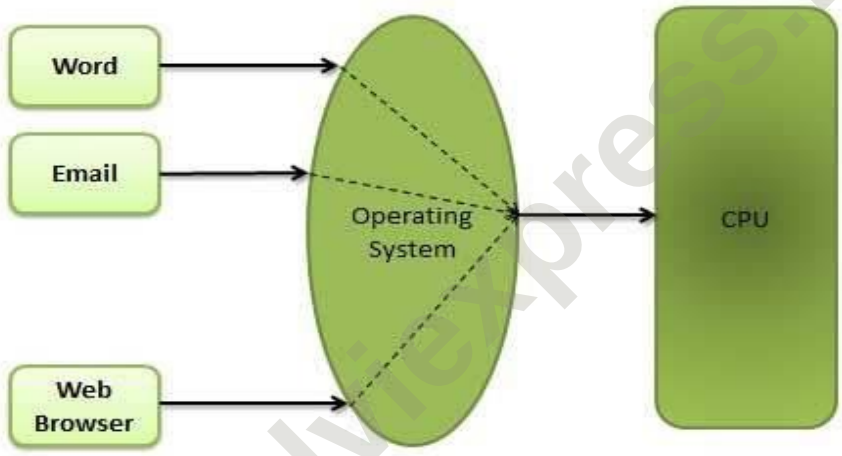
Disadvantages

- Difficult to debug program.
- A job could enter an infinite loop.
- Due to lack of protection scheme, one batch job can affect pending jobs.

Multitasking

- Multitasking is when multiple jobs are executed by the CPU simultaneously by switching between them.
- Switches occur so frequently that the users may interact with each program while it is running.

- An OS does the following activities in multitasking
  - ✓ The user gives instructions to the operating system or to a program directly, and receives an immediate response.
  - ✓ The OS handles multitasking in the way that it can handle multiple operations/executes multiple programs at a time.
  - ✓ Multitasking Operating Systems are also known as Time-sharing systems.
  - ✓ These Operating Systems were developed to provide interactive use of a computer system at a reasonable cost.
  - ✓ A time-shared operating system uses the concept of CPU scheduling and multiprogramming to provide each user with a small portion of a time-shared CPU.
  - ✓ Each user has at least one separate program in memory.



  - ✓ A program that is loaded into memory and is executing is commonly referred to as a **process**.
  - ✓ When a process executes, it typically executes for only a very short time before it either finishes or needs to perform I/O.
  - ✓ Since interactive I/O typically runs at slower speeds, it may take a long time to complete. During this time, a CPU can be utilized by another process.
  - ✓ The operating system allows the users to share the computer simultaneously. Since each action or command in a time-shared system tends to be short, only a little CPU time is needed for each user.
  - ✓ As the system switches CPU rapidly from one user/program to the next, each user is given the impression that he/she has his/her own CPU, whereas actually one CPU is being shared among many users.

Multiprogramming

- Sharing the processor, when two or more programs reside in memory at the same time, is referred as **multiprogramming**.

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PRACTICE QUESTIONS:

1. Which one of the following is not a real time operating system?

A) VxWorks
B) Windows CE
C) RTLinux
D) Palm OS

2. What is the main function of the command interpreter?

A) to get and execute the next user-specified command
B) to provide the interface between the API and application program
C) to handle the files in operating system
D) none of the mentioned

3. Which of the following is NOT a valid deadlock prevention scheme?

A) Release all resources before requesting a new resource
B) Number the resources uniquely and never request a lower numbered resource than the last one requested.
C) Never request a resource after releasing any resource
D) Request and all required resources be allocated before execution.

4. Which of the following is major part of time taken when accessing data on the disk?

A) Settle time
B) Rotational latency
C) Seek time
D) Waiting time

5. A virtual memory system uses First in First out (FIFO) page replacement policy and allocates a fixed number of frames to a process. Consider the following statements:

P: Increasing the number of page frames allocated to a process sometimes increases the page fault rate.
Q: Some programs do not exhibit locality of reference.

Which one of the following is TRUE?

A) Both P and Q are true, and Q is the reason for P
B) Both P and Q are true, but Q is not the reason for P
C) P is false, but Q is true
D) Both P and Q are false

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Digital Electronics

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UNIT III – DIGITAL ELECTRONICS

SYLLABUS (Marks -10)

Fundamental concepts: NAND, NOR, Exclusive OR operations, Boolean Algebra: Number systems and codes: Primary, Octal, Hexadecimal, Signed numbers codes.

Combinational Logic Design: K-Map representation of logical function and simplification using K-map of 4 and 5 variables.

Multiplexers, Decoders

Flip flop: Edge triggered Flip flop.

Text Books:

1. **Digital Fundamentals by Floyd.**
2. **Digital Design by Morris Mano.**

Reference Books:

1. **Digital Circuits and Microprocessors by Herbart Taub.**
2. **Digital Electronics by S.Salivahan**

INTRODUCTION:

- Electronic systems usually deal with information. Representation of information is called a **signal.** Signal in electronics is generally in form of voltage or current. Value of a signal is proportional to some physical quantity and it gives information about it. For example, temperature represented in terms of voltage signal.

- There are two types of signals which are different in terms of their characteristics with respect to time and value.
  1. Analog Signals
  2. Digital Signals

- A signal whose value is defined at all instances of time is called **continuous time signal.** On the other hand signal whose values are defined only at discrete instances of time is called **discrete time signal.** Most of the signals that occur in nature are analog in form. A discrete time signal can be obtained from continuous time signal by process called **sampling.** This has been illustrated in Fig. 1.1.

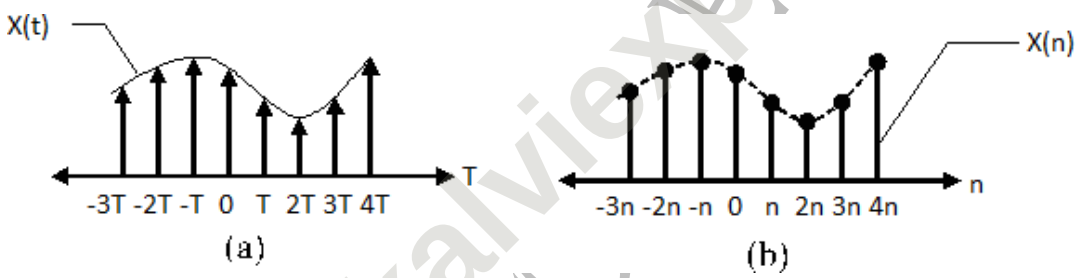

Fig. 1.1: (a) Continuous time signal x(t) sampled at every T interval, (b) Resulting discrete time signal x(n)

- Similarly if a signal can take any value in a given range between some minimum and maximum value then the signal is called **continuous value signal.** On the other hand if a signal takes only certain fixed values in a given range then it is called **discrete value signal**. The process of converting a continuous value signal to a discrete value signal is called **quantization.** This is illustrated in Fig. 1.2.

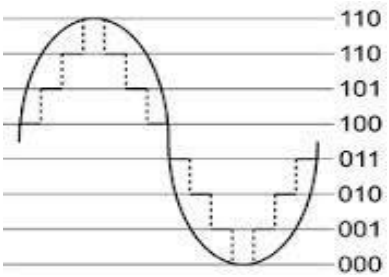

Fig. 1.2: Continuous value signal (solid line) and discrete value signal (dotted line)

Analog signal: Signals that are continuous in time and continuous in value are called analog signal.

Digital signal: Signals that are discrete in time and discrete in values are called digital signals. Digital signals are generally processed by digital systems like computers and hence their values are represented in terms of binary as shown in Fig. 1.2.

- Analog signal being continuous in time will have infinite values in any given period of time. Practically a digital system like computer cannot handle infinite values due to limited physical resources and processing power. This is the reason why a continuous time signal has to be sampled and converted to discrete time signal.

- Again Analog signals are continuous in value and hence can take any value in a given range. Now ideally number of values in any given range will be infinite which cannot be represented by finite number of bits on a computer. For example, as shown in Fig. 1.2, with three bits used for representing values only eight different values can be represented. Thus a continuous value signal has to be quantized and converted to discrete value signal.

1.1.1 Levels of Integration

- Digital electronic circuits have become increasingly popular and successful due to integrated circuit (IC) technology. Advancement in IC technology has made it possible to construct large number of devices (eg. transistor, diode, resistors, capacitors, etc) on a very small chip. Classification of IC technology based on number of components per chip is as follows.

1. Small-scale integration (SSI), containing fewer than 100 components
2. Medium-scale integration (MSI), containing 100 to 1000 components
3. Large-scale integration (LSI), containing 1000 to 10,000 components
4. Very large-scale integration (VLSI), containing more than 10,000 components

1.1.2 Comparison of Analog and Digital Systems

	Analog Systems	Digital Systems
1	Analog systems operate on continuous time and continuous value signals.	Digital systems operate on discrete time and discrete value signals generally represented in binary.
2	Analog systems are difficult to design.	Digital systems are easy to design as most of the components are in form of Integrated circuits (IC).
3	Analog systems are mostly custom made and lack flexibility.	Digital systems have high degree of flexibility.
4	Less efficient in storage of information.	More efficient in storage of information.
5	Analog signal processed by these systems are affected by noise very easily.	Digital signal are more noise-immune compared to analog signals.
6	Relatively costly compared to digital system	Low cost due to mass production of components.
7	Analog systems are more sensitive to parameter variation.	Digital systems are less sensitive to parameter variation
8	No conversion of input signals are required before processing	Input signals are converted from analog to digital form before it is processed
9	As no conversion of input signal is required there is no loss of information.	Due to process of sampling and of quantization there is loss information.
10	Analog systems are more efficient for real time processing	Digital systems may offer limitations for real time processing

1.2 Introduction to Digital System:

- A digital system uses a building blocks approach. Many small operational units are interconnected to make up the overall system.
- The most basic logical unit system is gate circuit. There are several different types of gates with each perform differently from other logic gates.
- Digital signal consist of only two values, '0' and '1'. These two values have logical

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DIGITAL ELECTRONICS MODEL QUESTIONS:

1. The voltages corresponding to LOW and HIGH levels respectively are given below. Identify the voltages which correspond to the negative logic system.

A) 0 V and 5 V
B) –1.5 V and – 0.5 V
C) 5 V and 0 V
D) 1 V and 5 V

2. Which of the following is the most widely used alphanumeric code for computer input and output?

A) Gray
B) ASCII
C) PARITY
D) EBCDIC

3. **The given hexadecimal number (1E.53)16 is equivalent to _____ .**

A) (35.684)8
B) (36.246)8
C) (34.340)8
D) (35.599)8

4. Convert 59.72_{10} to BCD.

A) 111011
B) 01011001.01110010
C) 1110.11
D) 0101100101110010

5. The ASCII code is basically

A) 5 bit
B) 6 bit
C) 7 bit
D) 4 bit

6. Decode the following ASCII message.

10100111010100101010110001001011001
01000001001000100000110100101000100

A) STUDYHARD
B) STUDY HARD
C) stydyhard
D) stydy hard

7. Using 4-bit numbers (n = 4) if $k = (0011)_2$ how is k expressed in 2's complement.

A) $(1011)_2$
B) $(1101)_2$
C) $(1100)_2$
D) $(0101)_2$

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Data Structures

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6. TREES

7. BALANCED BINARY TREE

8. GRAPH

9. ALGORITHMS FOR SEARCHING AND SORTING

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UNIT IV: DATA STRUCTURES

SYLLABUS

ABSTRACT DATA TYPES AND OBJECTS, GRAPHICAL USER INTERFACE; LANGUAGE SUPPORT AND OOP: INHERITANCE, CLASSES AND SUB CLASSES, HEADER FILES, OVERLOADING

PROGRAMMING WITH DATA STRUCTURES: STACKS, QUEUES, LISTS, TREES AND BALANCED BINARY TREES, ALGORITHMS FOR SEARCHING AND SORTING AND OPEN OFFICE

BOOKS TO STUDY:

1. CLASSIC DATA STRUCTURES - D.SAMANTA
2. DATA STRUCTURES MADE SIMPLE - SATHISH JAIN, SHASHI SINGH.
3. DATA TYPES AND STRUCTURES - GOTLIEB, C.C. AND L.R.GOTLIEB.
4. FUNDAMENTALS OF DATA STRUCTURES - HOROWITZ, ELLIS, AND SARTAJ SAHNI.
5. AN INTRODUCTION TO DATA STRUCTURES WITH APPLICATIONS - TREMBLY, JEAN PAUL, AND PAUL G. SORENSON

UNIT IV - DATA STRUCTURES

1.1 INTRODUCTION

WHAT IS MEANT BY A DATA?

- ❖ Data is a Single (or) a set of values. (Or) Facts and statistics collected together for reference or analysis

WHAT IS MEANT BY DATA STRUCTURE?

- It is a logical or mathematical model of a particular organization of data.

(Or)

- Data Structure is a specialized format for organizing and storing data so that it can be accessed and worked with in appropriate ways to make a program efficient.
    - **Data Structure = Organized Data + Allowed Operations.**

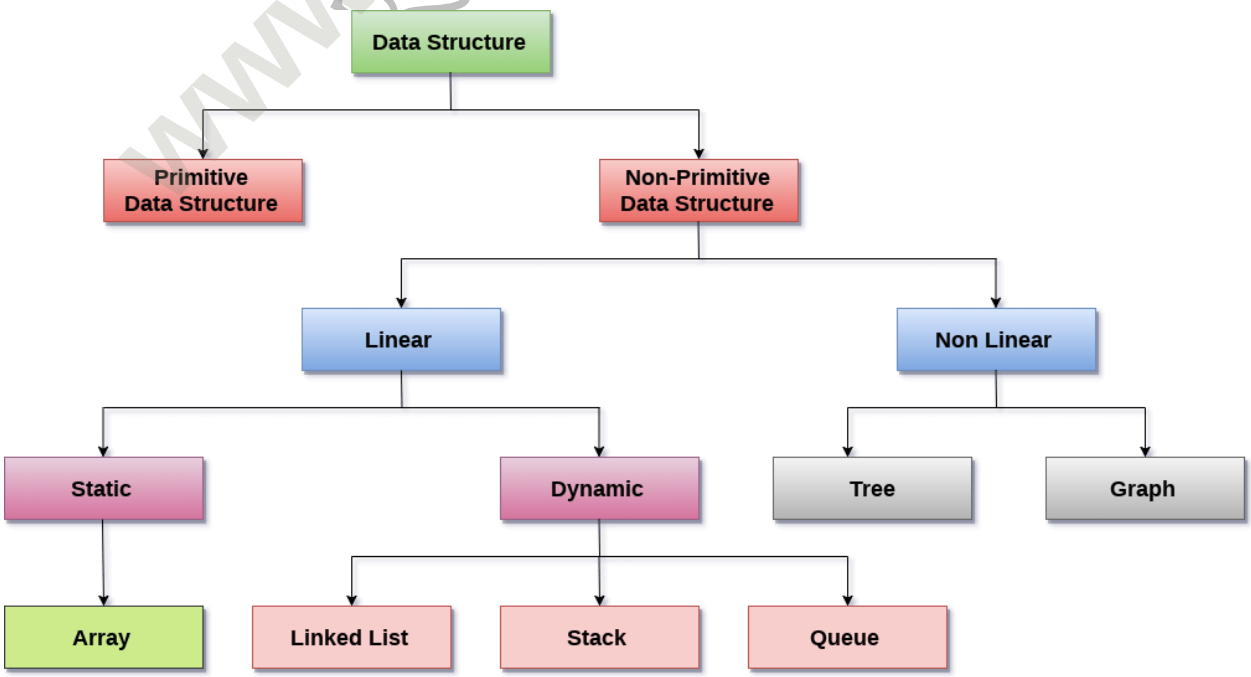
APPLICATIONS OF DATA STRUCTURE

Areas	*Type of Data Structure*
Operating System	*Arrays and Tables*
Data Base Management System	*Array, Tables, B- Trees*
Compiler Design	*Hash Tables (look up an identifier)*
Neural Network	*Graph*
Hierarchical Data Model	*Trees*

Categories of data structures:

- Two types:

1) Linear data structure → Single generic type
2) Non-linear data structure → Multiple Individual type



2. ARRAY

- An array is a collection of items stored at contiguous memory locations.
- The idea is to store multiple items of the same type together.

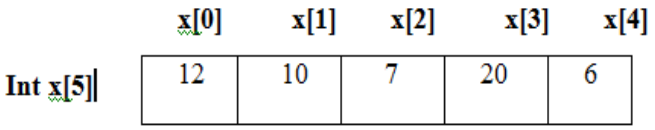


Fig : An array of size 5 containing integers

- This makes it easier to calculate the position of each element by simply adding an offset to a base value, i.e., the memory location of the first element of the array (generally denoted by the name of the array).

2.1.ARRAYS TERMINOLOGY:

Size:

- Number of elements in an array is called the size of the array. Also called as length or dimension.

Type:

- Type of an away represents the kind of data type. Ex: int, string

Base:

- Base of an array is address of memory location where the first element in the array is located.

Range of index:

- Indices of array elements any charge can be referenced by subscript like Ai or A[i], this subscript is known as index. Index is always as integer value. Every element is identified by a subscripted or indexed variable
- Ex:
  - ✓ Int A[100]; The range of index is from 0 to 9
  - ✓ A:Array[-5….19] of integer: The Points of the rage is -5,-4,-3,….18,19.
  - ✓ Here L is the Lower Bound.
  - ✓ If the range of index varies from L…U then the size of the away can be calculated as Size(A)=U-L+1.

Word:

- It denotes the size of an element. In memory location computer can store an element of word size w. This word size varies from machine to machine such as 1 byte to 8 bytes.

2.2. OPERATIONS ON ARRAY

- The common operations can be performed on an array are
  - ✓ **Traversing-processing each element in the array.**
  - ✓ **Sorting -Organizing the elements in some order.**
  - ✓ **Searching -Finding the location of an element with a given value.**
  - ✓ **Insertion - Adding a new element.**
  - ✓ **Deletion -Removing an element.**
  - ✓ **Merging -Combining two arrays into a single array.**
- Although searching, and traversal of an array is an easy job, insertion and deletion is time consuming. The elements need to be shifted down before insertion and shifted up after deletion.

1. Traversing:

This operation is used visiting all elements in an array.

- Example: Array 'a' contains the following elements:

5	3	4	8	7			

The result of traversing is:

5
3
4
8
7

The algorithm for traversing is as follows:

1) Read the Array elements.
2) Display the elements of the array.

Algorithms: Traverse-array ( )

Input: An array A with elements

Output: According to process ( )

Steps:

1. i=L // start from first location L
2. while i<=U do // U upper bound
   1. Process (A[i])
   2. i=i+1 // move to next position
3. End while
4. Stop

Here process ( ) is an procedure which when called for an element can perform an action

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Date: **Time: 3 Hours** **Total Marks: 150**

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UNIT IV – DATA STRUCTURES

MODEL EXAMINATIONS

1) A tool for specifying logical properties of data types is_____
   a) Abstract Data Type
   b) Logical Data Type
   c) Non Abstract Data Type
   d) Linear Data Type
2) What data structure can be used to check if syntax has balanced parenthesis?
   a) Queue
   b) Tree
   c) List
   d) Stack
3) In an array range specifies_____
   a) Scope of the Array
   b) Number of the Elements in the Array
   c) The Group of the Array
   d) Size-1 of the array
4) Which of the following data structures are indexed structures
   a) Linear arrays
   b) Linked lists
   c) Both (A) & (B)
   d) None of above
5) The '*' is known as
   a) Referencing Operator
   b) Dereferencing Operator
   c) Memory Allocation Operator
   d) Memory freeing Operator

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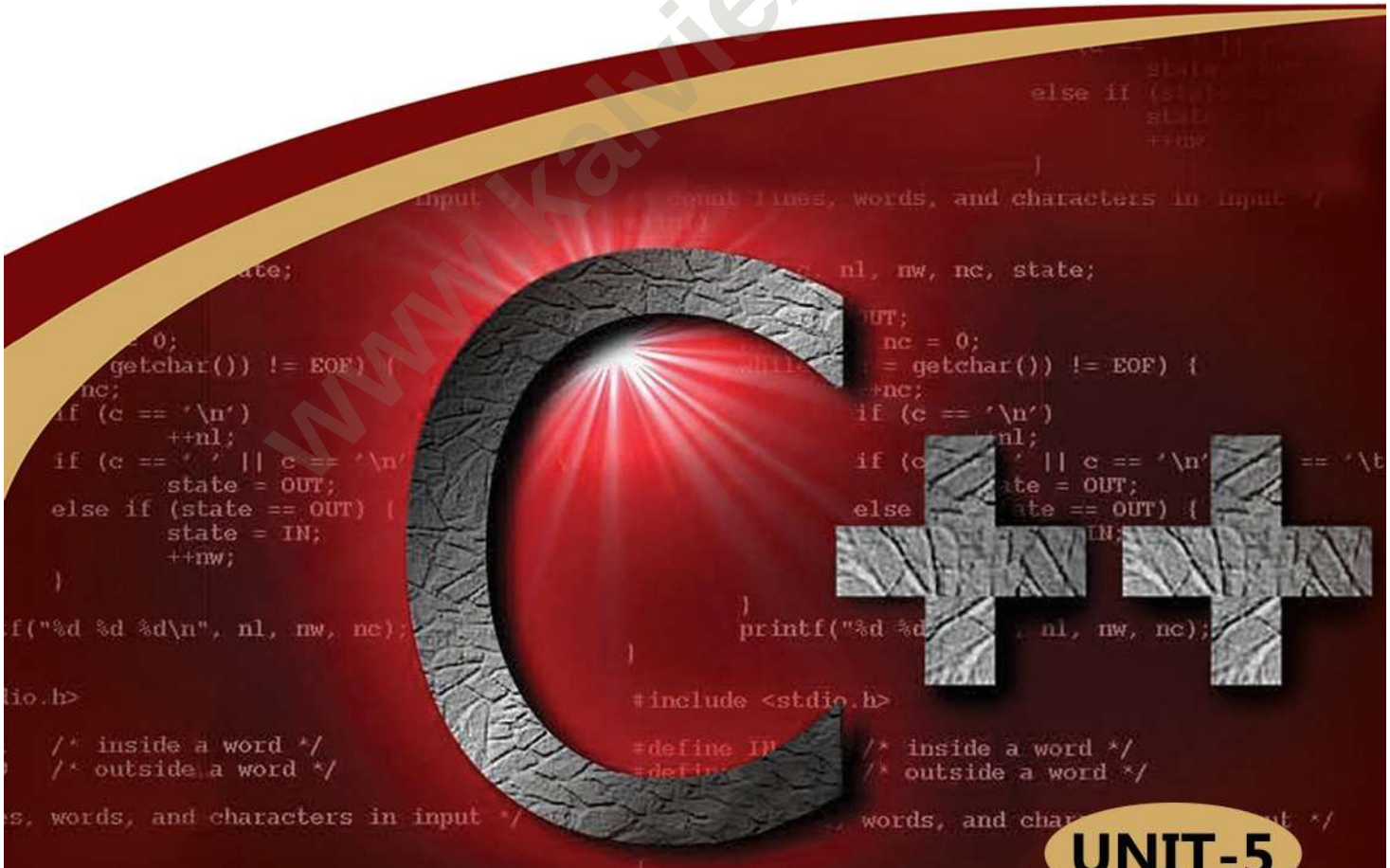
Programming in C++



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UNIT V – PROGRAMMING in C++

SYLLABUS **(Mark – 20)**

1. **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.**

2. **IMPLEMENTATION OF OBJECT ORIENT PROGRAMMING CONCEPTS IN C++:**

   Members Functions (methods), inside class definition and outside class definition using scope resolution operator (::) Objects as function arguments pass by value and pass by reference ;

- **CONSTRUCTOR AND DESTRUCTOR:**
  - **CONSTRUCTOR: Declaration and Definition of a constructor;**
  - **DESTRUCTOR: (Extending Class): Concepts of inheritance, Base Class, Derived Class, Defining Derived Class, Multillevel Inheritance and Multiple Inheritance**

Data File Handling: Reading and Manipulation of text from an already existing text file (Accessing Sequentially);

3. **POINTERS: Declaration and Initialization of Pointers: Dynamic memory allocation/deallocation Operators: New, delete; Pointers and Arrays: Array od Pointers, Function Returning a Pointer. Deference Operator: Self referential Structures, Python, PHP.**

1. OBJECT-ORIENTED PROGRAMMING

OOPS: Object Oriented Programming. It is a programming paradigm in its own right and it is a set of software engineering tools which can be used to build more reliable and reusable system.

1.1 Introduction

Definition: OOP is a method of implementation in which programs are organized as cooperative collection of objects each of which represents an instance of some class and whose classes are all members of a hierarchy of classes united through the property called inheritance.

Software Crisis

The major issues in software are

1. How to represent real life entities of problem in system design?
2. How to design systems with open interfaces?
3. How to ensure reusability?
4. How to develop modules?
5. How to improve quality and productivity of software?

Software Evolution

Some of the programming approaches: Layers of computer software.

- **Modular programming**
- **Top-down programming**
- **Bottom-up programming**
- **Structured programming**

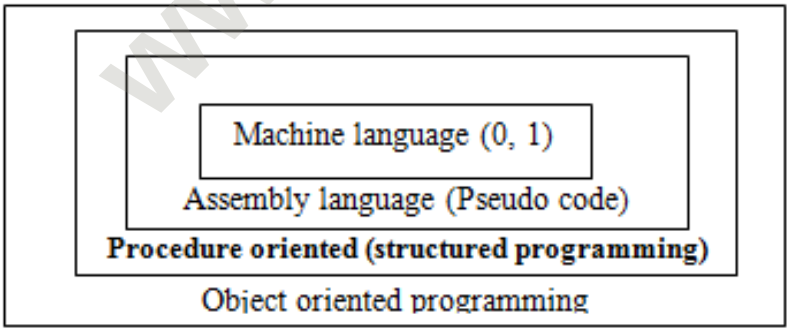


Fig: **Layers of computer software**

1.2 Procedure Oriented Programming

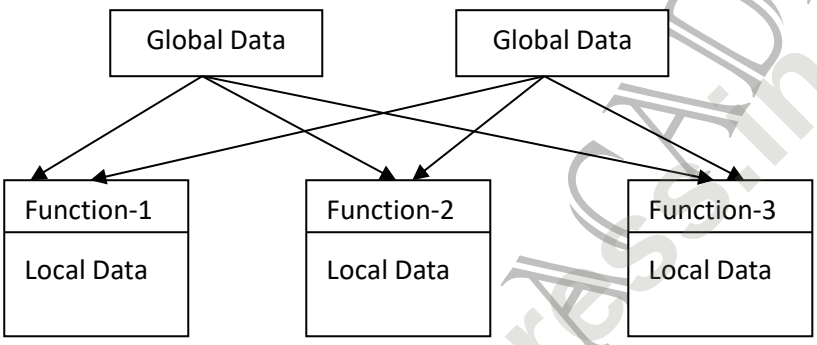
Important features:

1. Programs are organized in the form of subroutines and all data items are global.

2. Program controls are though jumps and call to subroutine.
3. Subroutines are abstracted to avoid repetitions.
4. Suitable for medium sized software applications.
5. Difficult to maintain and enhance the program code.

Structure of procedure oriented program

COBOL, FORTRAN and C are commonly known as Procedure oriented programming (POP).



Disadvantages:

1. No security of data.
2. No better memory management.
3. No code reusability
4. Slow performance as length of the program increase.
5. Code maintenance and enhancement are difficult.

Characteristics of procedure oriented programming

1. Emphasis is on doing things (algorithms)
2. Large program are divided into smaller programs known as functions.
3. Most of the functions share global data.
4. Data move openly around the system from function to function.
5. Functions transform data from one form to another.
6. Employs top-down approach in program design.

1.3 Object Oriented Programming Paradigm

Development of a software system is through the use of data abstraction. It is classified into two categories.

1. Object based programming language.
2. Object oriented programming language.

Object Based Programming Language:

It supports encapsulation and object identity without supporting important features like polymorphism, inheritance and message based communication.

Object Oriented Programming Language:

Incorporate all the features of object based along with inheritance and polymorphism.

OOP=Object based Language +inheritance+ polymorphism.

Module

The modules represent the physical building blocks. It is a collection of classes and objects. OOP is a methodology that allows the association of data structure with operations.

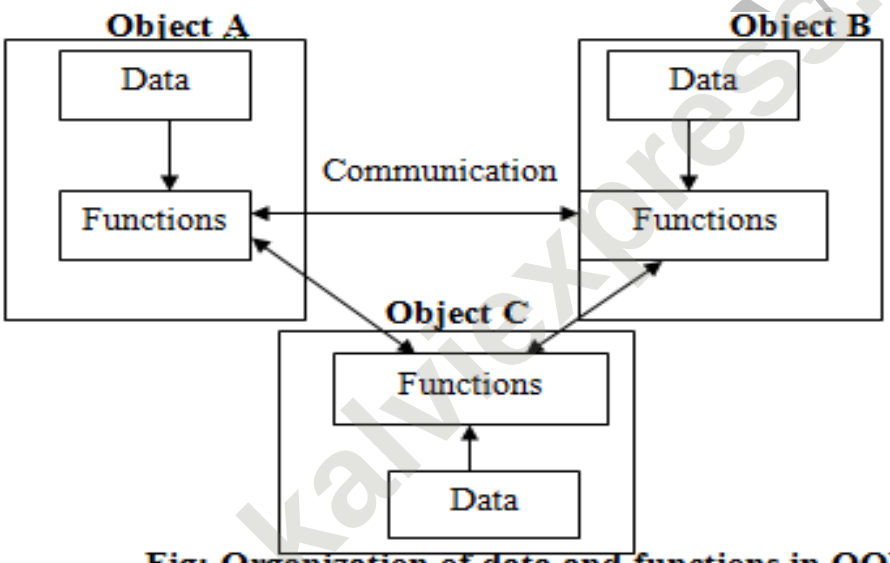


Fig: Organization of data and functions in OOP

Features of OOP as follows,

1. Improvement over the structure programming
2. Emphasis is on data rather than procedure.
3. Data abstraction is introduced in addition to procedural abstraction.
4. Data and associated operations are unifies into a single unit, thus the objects are grouped with common attributes, operations and semantics.
5. Programs are designed around the data being operation rather than operations themselves.
6. Relationships can be created between similar yet distinct data types. EX: C++, Samll talk, Eiffel, Java, etc.
7. Follow bottom-up approach in program design.

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Programming in C++

1. Classes and object

1) Correct way of creating an object of a class called Car is

A. Car obj;

B. Car *obj = new Car();

C. Only B

D. A & B both

2) In C++, Class object created statically(e.g. Car obj; and dynamically (Car *obj = new Car() ;) are stored in memory

A. Stack, heap

B. Heap, heap

C. Heap, stack

D. Stack, stack

3) True statement about Class and structure in C++ is

A. Default access specifier is private in class and public in structure

B. Way of creating objects of class and structure are different

C. Way of inheriting class and structure are different

D. None

4) In C++ programming, cout is a/an

A. Function

B. Operator

C. Object

D. macro

5) Which is Abstract Data Type in C++

A. Class

B. Int

C. Float

D. array

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Releational Database Management Systems

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Unit – VI -RELATIONAL DATABASE MANAGEMENT SYSTEM

SYLLABUS

Chapter 1: Database Management System

Introduction to database concepts: Relation/Table, Data, Concept of String Candidate Key, Alternate Key, Primary Key, Foreign Key, Data Normalization – First, Second, Third, BCNF Normal Forms

Examples of Commercially available Database Management System's (Back-End) – MySQL

Examples of Front End Software's Visual C++

Chapter 2: RDBMS Tools: Oracle

Classification of SQL Statements: DML (SELECT, INSERT, UPDATE, DELETE)

SQL SELECT Statement: SQL SELECT statement, selecting all the columns, selecting specific column, column heading default

SELECT statement continued: Limiting Rows during selection (using WHERE clause), Logical operators, use of Logical operators (AND/OR/NOT Operators), Logical Operator Precedence, ORDER BY Clause, Sorting in Ascending/Descending order

Functions:

SQL Functions, Types of SQL Function (Single Row/ Multiple Row), Character Functions: UPPER(), TRIM(), SUBSTR(), ROUND(), TRUNC(), MOD(), Working with Dates : LAST_DAY(), MONTHS_BETWEEN(), ROUND(), Implicit and Explicit conversion

Grouping Records:

Types of Group Functions: MAX(), MIN(),COUNT(), SUM(), AVG(), Using AVG() and SUM() functions, Group By clause, Grouping By more than one columns, Having clause

Sub Queries:

Guidelines for using sub queries, types of sub queries (Single row and Multiple row)

Database Objects: DDL (Data Definition Language), Creating Synonyms, querying a view, modifying a view,

Including constraints: UNIQUE KEY, PRIMARY KEY, FOREIGN KEY

Creation of Table/Relation: CREATE TABLE Statement, creating a table by using a sub-query

Managing Existing Tables and other Database objects: The ALTER TABLE Statement, adding a new column in a table, Dropping tables

Chapter 1 :Database Management System

1.1.Introduction to Database Concepts

1.1.1.Basic Terminologies of DBMS

- Data : collection of raw facts or materials
- Information : Processed data or meaningful data. After data getting processed, it will have some meaning.
- Data item : Field Name or Column Name or Attribute Name or Domain Name. Ex: Name, DoB, Address
- Record : Collection of data items. Example : Bio-Data
- File : Collection of records. Example : Bio-Data File, Payroll File
- Database: Collection of inter-related data items with less redundancy to server multiple applications. Example: Student database, Employee Database
- Redundancy : Repeated data or Unwanted data or Duplicate Data
- DBMS : Applications programs or software used to provide interface between users and databases.
- Table : It is a interaction of rows and columns. It is also called as Relation
- Row : It is a record which contains a entire information about an entity. It is also known as Tuple
- Entity : It may be a thing or a place or a person.
- Column : Field Name where a single piece information has been pasted. It is also known as Domain
- Degree : The number of attributes in a relation determines the degree of relation.
- Cardinality: The number of tuples or rows in a relation is termed as Cardinality
- Simple Attribute : It can not be further sub-divided. Example : Rollno
- Composite Attribute: It can be further sub-divided. Example: Date. It has Day, Month and Year
- Single Valued Attribute : It can take only one value for each entity. Example: Account_Number
- Multivalued Attribute: It can take more one value. Example: Color
- Derived Attribute: It can be derived from another attribute. Example: Age which can be derived from DoB
- Key Attribute : It is unique identification of a record. Ex: Primary key – Rollno, Exam-No, Account-No

1.1.2. Purpose of Database Systems

Database systems came to existence in response to early methods of computerized management of commercial data. As an example of such methods, during 1960s, consider part of a university organization that, among other data, keeps information about all instructors, students, departments, and course offerings. Information was stored in operating system files. The users were able to manipulate the information through number of application programs which include the following programs.

- Add new students, instructors, and courses
- Register students for courses and generate class rosters
- Assign grades to students, compute grade point averages (GPA), and generate transcripts

System programmers wrote these application programs to meet the needs of the university. New application programs are added to the system as the need arises. For example, suppose that a university decides to create a new major (say, computer science).As a result, the university creates a new department and creates new permanent files (or adds information to existing files) to record information about all the instructors in the department, students in that major, course offerings, degree requirements, etc. The university may have to write new application programs to deal with rules specific to the new major. New application programs may also have to be written to handle new rules in the university. Thus, as time goes by, the system acquires more files and more application programs.

This typical **file-processing system** is supported by a conventional operating system. The system stores permanent records in various files, and it needs different application programs to fetch records from, and add records to, the appropriate files. Before database management systems (DBMSs) came to existence, organizations usually stored information in such systems. Keeping organizational information in a file-processing system has a number of major disadvantages:

- **Data redundancy and Inconsistency**

Since different programmers create the files and application programs over a long period, the various files are likely to have different structures and the programs may be written in several programming languages. Moreover, the same information may be duplicated in several places (files). For example, if a student has a double major (say, music and mathematics) the address and

telephone number of that student may appear in a file that consists of student records of students in the Music department and in a file that consists of student records of students in the Mathematics department. This redundancy leads to higher storage and access cost. In addition, it may lead to **data inconsistency**; that is, the various copies of the same data may no longer agree.

For example, a changed student address may be reflected in the Music department records but not elsewhere in the system.

• Difficulty in Accessing Data

Suppose that one of the university clerks needs to find out the names of all students who live within a particular postal-code area. The clerk asks the data-processing department to generate such a list. Because the designers of the original system did not anticipate this request, there is no application program on hand to meet it. There is, however, an application program to generate the list of *all* students. The university clerk has now two choices: either obtain the list of all students and extract the needed information manually or ask a programmer to write the necessary application program. Both alternatives are obviously unsatisfactory.

Suppose that such a program is written, and that, several days later, the same clerk needs to trim that list to include only those students who have taken at least 60 credit hours. As expected, a program to generate such a list does not exist. Again, the clerk has the preceding two options, neither of which is satisfactory.

The point here is that conventional file-processing environments do not allow needed data to be retrieved in a convenient and efficient manner. More responsive data-retrieval systems are required for general use.

• Data Isolation

Because data are scattered in various files, and files may be in different formats, writing new application programs to retrieve the appropriate data is difficult.

• Integrity Problems

The data values stored in the database must satisfy certain types of **consistency constraints**. Suppose the university maintains an account for each department, and records the balance amount in each account. Suppose also that the university requires that the account balance of a department may never fall below zero. Developers enforce these constraints in the system by adding

PG-TRB 2020-21 Question Bank

Objective Question

1. Data and its relationships are represented in rows and columns, that is table which is called _____ data model

A) Hierarchical B) Relational
C) Network D) Object

2. The database should be in consistent state before and after the transaction which has been made against the database. This is called _____

A) Atomicity B) Durable
C) Isolation D) Consistent

3. _____ data model has tree structure for representing data and its relationships

A) Hierarchical B) Logical
C) Network D) ER

4. In which layer of the database abstraction, How data is going to be stored in the database has been described _____

A) Logical B) View
C) Physical D) Conceptual

5. The highest level of data abstraction is _____

A) View Level B) Physical Level
C) Logical Level D) None of these

6. In which layer of the database abstraction, conceptual schema will be obtained _____

A) Logical level B) Physical level
C) Sub Schema D) View level

7. The technical term for the row of the table or record of the relation is _____

A) Row B) Column
C) Table D) Tuple

8. _____ is the application programs or software used to provide interface between databases and the users

A) DBMS B) DBA
C) Database D) Table

9. _____ attribute can be further subdivided.

A) Single B) Multi-value
C) Composite D) Stored

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UNIT – VII

BUSINESS COMPUTING

SYLLABUS

Integration of User Interface and Database;

More application areas of Databases;

Inventory control, Financial Accounting, Fees Management System, Result Analysis System, Admission Management System, Income Tax Management System;

Advance Program Development Methodology: System Development

Life cycle, Data Models (Entity Relationship Model), Attributes (single, Composite and Multi – valued), Relationship (One-to-One, One-to-Many and Many-to-Many SQL Statements

Data Dictionary, Data Warehousing, Data Mining.

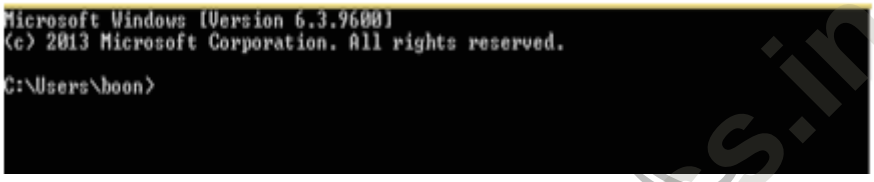
1.Integration of User Interface and Database

1.1 User Interface

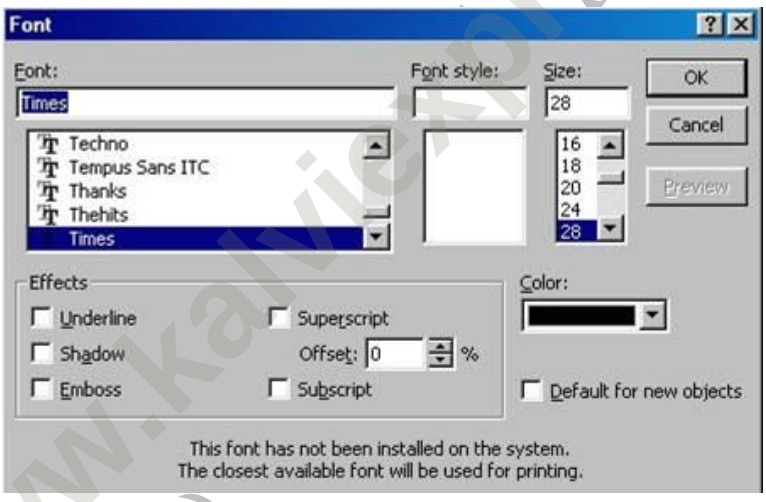
The user interface (UI) is the point of human-computer interaction and communication in a device. This can include display screens, keyboards, a mouse and the appearance of a desktop. It is also the way through which a user interacts with an application or a website.

1.2 Types of User Interface:

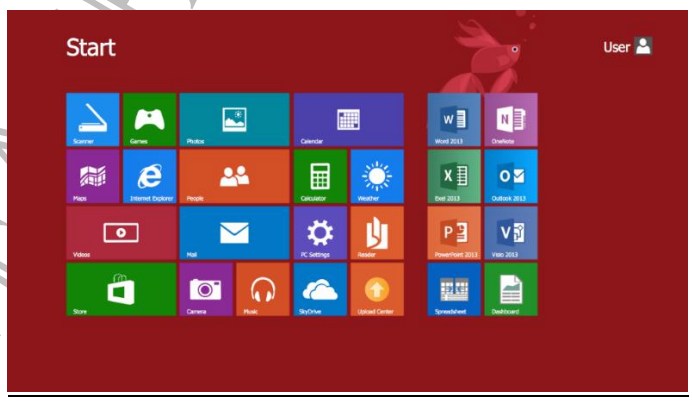
- **Command Line Interface:** Allows the user to interact with the computer by typing in commands. The computer displays a prompt, the user keys in the command and presses enter or return.



- **Form-based user interface:** Used to enter data into a program or application by offering a limited selection of choices. For example, a settings menu on a device is form-based.



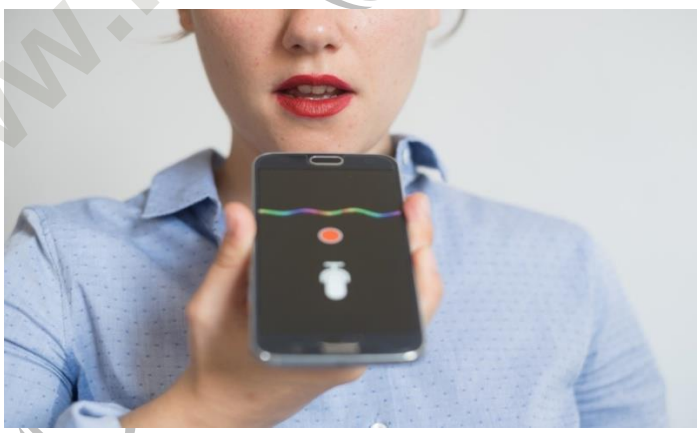
- **Graphical user interface:**A GUI (graphical user interface) is a system of interactive visual components for computer software. A GUI displays objects that convey information, and represent actions that can be taken by the user. The objects change color, size, or visibility when the user interacts with them.



- **Menu-driven user interface:** A UI that uses a list of choices to navigate within a program or website. For example, ATMs use menu-driven UIs and are easy for anyone to use.

- **Touch user interface:** User interface through haptics or touch. Most smart phones, tablets and any device that operates using a touch screen use haptic input.

- **Voice user interface:** Interactions between humans and machines using auditory commands. Examples include virtual assistant devices, talk-to-text, GPS and much more.



1.3 DBMS: Basic Concepts

1.3.1 Introduction:

In computerized information system data is the basic resource of the organization. So, proper organization and management for data is required for organization to run smoothly.

Database management system deals the knowledge of how data stored and managed on a computerized information system.

In any organization, it requires accurate and reliable data for better decision making, ensuring privacy of data and controlling data efficiently.

Examples:

1. Deposit and/or Withdrawal from a bank
2. Hotel, Airline or Railway reservation
3. Purchase items from supermarkets in all cases, a database is accessed.

1.3.2 What is data?

- Data is the known facts or figures that have implicit meaning.
- Unprocessed value or raw fact is known as Data.

Data can be represented:

1. Alphabets: (A-Z,a-z)
2. Digits (0-9) and
3. Special characters(+,-.#,$,etc)

e.g : 25, “raj”etc.

1.3.3 Information:

Information is the processed data on which decisions and actions are based. Information can be defined as the organized and classified data to provide meaningful values.

Eg: “The age of Ravi is 25”

1.3.4File:

File is a collection of related data stored in secondary memory.

File Oriented approach:

The traditional file oriented approach to information processing has for each application a separate master file and its own set of personal file. In file oriented approach the program dependent on the files and files become dependent on the files and files become dependents upon the programs

Disadvantages of file oriented approach:

1. **Data redundancy and inconsistency:** The same information may be written in several files.
2. **Difficulty in accessing data:** The conventional file processing system do not allow data to retrieved in a convenient and efficient manner according to user choice.

BUSINESS COMPUTING

Data Mining and warehousing

1: Which of the following applied on warehouse?

A) write only
B) read only
C) both A & B
D) none of these

2: Data can be store , retrive and updated in …

A) SMTOP
B) OLTP
C) FTP
D) OLAP

3: Which of the following is a good alternative to the star schema?

A) snow flake schema
B) star schema
C) star snow flake schema
D) fact constellation

4: Patterns that can be discovered from a given database are which type…

A) More than one type
B) Multiple type always
C) One type only
D) No specific type

5: Background knowledge is…

A) It is a form of automatic learning.
B) A neural network that makes use of a hidden layer
C) The additional acquaintance used by a learning algorithm to facilitate the learning process
D) None of these

6: Which of the following is true for Classification?

A) A subdivision of a set
B) A measure of the accuracy
C) The task of assigning a classification
D) All of these

7: Data mining is?

A) time variant non-volatile collection of data
B) The actual discovery phase of a knowledge
C) The stage of selecting the right data
D) None of these

8: ——- is not a data mining functionality?

A) Clustering and Analysis
B) Selection and interpretation
C) Classification and regression
D) Characterization and Discrimination

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Web Development

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UNIT VIII – WEB DEVELOPMENT

SYLLABUS (Marks -10)

WEB DEVEOLOPMENT

HTML/DHTML

Introduction, Objectives, Introduction to Universal Resource Identifier (URI) Basic Tags of HTML; HTML, HEAD, TITLE, BODY, Ordered List- OL (L1, Type-1, l, A, a: START VALUE), Unordered List-UL (Bullet Type – Disc, Circle, Square, DL, DT, DD), Web Page Authoring Using HTML

Tables: Creating Tables, Border, WIDTH, CAPTION, ALIGN

Frames: Frameborder, height and width

Forms: Definition, MS-Access or Oracle

Form Tags: FORM, METHOD, Document Object Model

Active Server Pages (ASP)

Active Server Pages (ASP): Concept of ASP, features of ASP,

Variables: Explicit and Implicit Declaration:

Functions:

String Manipulation Functions: Ucase (), Lcase (), Len (), Left (), Right (), Mid (), Ltrim (), InStr ()

Time & Date Functions: Date (), Day (), Hour (), Left (), Len (), Minute (), Month (), Monthname (), Now (),

Arrays: Declaration and use of 1 dimensional and 2 dimensional arrays;

Procedures and Functions, Passing parameters/ arguments;

Connecting with Databases: Creation of DSN, using OLEDB

CHAPTER - 1

INTRODUCTION AND BASIC TAGS OF HTML

1.1 INTRODUCTION

- HTML stands for HyperText Markup Language. HTML provides a way of displaying Web pages with text and images or multimedia content.
- HTML is not a programming language, but a markup language. An HTML file is a text file containing small markup tags. The markup tags tell the Web browser, such as Internet Explorer or Netscape Navigator, how to display the page.
- An HTML file must have an .htm or .html file extension. These files are stored on the web server. So if you want to see the web page of a company, you should enter the URL (Uniform Resource Locator), which is the web site address of the company in the address bar of the browser. This sends a request to the web server, which in turn responds by returning the desired web page. The browser then renders the web page and you see it on your computer.
- HTML allows Web page publishers to create complex pages of text and images that can be viewed by anyone on the Web, regardless of what kind of computer or browser is being used. Despite what you might have heard, you don't need any special software to create an HTML page; all you need is a word processor (such as Microsoft Word) and a working knowledge of HTML.
- Fortunately, the basics of HTML are easy to master. However, you can greatly relieve tedium and improve your productivity by using a good tool. A simple tool is Microsoft FrontPage that reduces the need to remember and type in HTML tags. Still, there can always be situations where you are forced to handcode certain parts of the web page.
- HTML is just a series of tags that are integrated into a document that can have text, images or multimedia content.
- HTML tags are usually English words (such as blockquote) or abbreviations (such as p for paragraph), but they are distinguished from the regular text because they are placed in small angle brackets.
- So the paragraph tag is <p>, and the blockquote tag is <blockquote>. Some tags dictate how the page will be formatted (for instance, <p> begins a new paragraph), and others dictate how the words appear (<b> makes text bold).
- Still others provide information - such as the title - that doesn't appear on the page itself. The first thing to remember about tags is that they travel in pairs. Most of the time that you use a tag - say <blockquote> - you must also close it with another tag - in this case, </blockquote>. Note the slash - / - before the word "blockquote"; that is what distinguishes a closing tag from an opening tag.

- The basic HTML page begins with the tag <html> and ends with </html>. In between, the file has two sections - the header and the body.
- The header - enclosed by the <head> and </head> tags - contains information about a page that will not appear on the page itself, such as the title. The body - enclosed by <body> and </body> - is where the action is. Everything that appears on the page is contained within these tags.
- HTML pages are of two types:
  1. Static
  2. Dynamic

Static Pages

- Static pages, as the name indicates, comprise static content (text or images). So you can only see the contents of a web page without being able to have any interaction with it.

Dynamic Pages

- Dynamic pages are those where the content of the web page depend on user input. So interaction with the user is required in order to display the web page.
- For example, consider a web page which requires a number to be entered from the user in order to find out if it is even or odd. When the user enters the number and clicks on the appropriate button, the number is sent to the web server, which in turn returns the result to the user in an HTML page.

1.2 OBJECTIVES OF HTML

- Recognize the components of an HTML file and create such a file
- Link to local files and Web pages from their Web pages.
- Add graphics and sound to their Web pages using HTML.
- Create different kinds of lists to their Web page using HTML.
- Create a multi-column and multi-row tables using HTML.
- Set background colors and graphics for Web pages.
- Evaluate Web page design and consider design issues that affect web pages.
- Add links to sites from their Web pages.
- Tailor web design and development to Interlink Environment.
- HTML is the *lingua franca* of the Internet. Publishing HTML-formatted documents on the Internet via the World Wide Web proved to be the answer to these needs.
- HTML is a subset of the Standard Generalized Markup Language (SGML). SGML is an international standard (ISO 8879) published in 1986 as a format for structuring and marking up documents.

- HTML adopts a simplified set of SGML's structural, semantic, and formatting tags, keeping the emphasis on the content rather than on the document itself. An important addition to HTML was the inclusion of support for hypertext, which enabled authors to define a semantic network of linked information.

FEATURES OF HTML

1) It is a very **easy and simple language**. It can be easily understood and modified.

2) It is very easy to make an **effective presentation** with HTML because it has a lot of formatting tags.

3) It is a **markup language**, so it provides a flexible way to design web pages along with the text.

4) It facilitates programmers to add a **link** on the web pages (by html anchor tag), so it enhances the interest of browsing of the user.

5) It is **platform-independent** because it can be displayed on any platform like Windows, Linux, and Macintosh, etc.

6) It facilitates the programmer to add **Graphics, Videos, and Sound** to the web pages which makes it more attractive and interactive.

7) HTML is a case-insensitive language, which means we can use tags either in lower-case or upper-case.

1.3 INTRODUCTION TO UNIVERSAL RESOURCE IDENTIFIER (URI)

- A URI (Uniform Resource Identifier) is a sequence of characters that identifies a logical or physical resource. Universal Resource Identifiers are specified in the Internet Engineering Task Force (IETF) Request for Comments (RFC) 3986 and are summarized and extended in documentation for the W3C's Web Architecture, Architecture of the World Wide Web, Volume 1. According to the specifications, resources do not have to be accessible on the Internet.
- Examples of resources include electronic documents, elevator door sensors, XML namespaces, web pages and ID microchips for pets.
- There are two types of URIs, Uniform Resource Locators (URLs) and Uniform Resource Names (URNs).

1. **Uniform Resource Locator (URL)** – this type of URI begins by stating which protocol should be used to locate and access the physical or logical resource on a network. If the resource is a web page, for example, the URI will begin with the protocol HTTP. If the resource is a file, the URI will begin with the protocol FTP or if the resource is an email address, the URI will begin with the protocol mailto. It is important to remember that

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PRACTICE QUESTIONS

1. Which tag tells the browser where the page starts and stops?

A) <html> B) <body>

C) <head> D) <title>

2. All HTML documents will be basically

A) Graphs B) Text

C) Pictures D) None of the above

3. Which one of the following is always used to enclosed HTML tags?

A) {} B) []

C) < > D) ()

4. Which one of the following is used to represent a closing tag or end tag?

A) / B) \

C) & D) #

5. Which one of the following is ignored by the browses?

A) Tags B) Attributes

C) Comments D) Head section

6. Which o the following tag is used to provide a name to a web document?

A) <html> B) <body>

C) <head> D) <title>

7. Which one of the following tag is not visible in the browser?

A) <html> B) <body>

C) <meta> D) <title>

8. Which section is used for text and tags that are shown directly on your web page?

A) Head B) Meta

C) Body D) title

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Web Scripting

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UNIT-9

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UNIT – IX - WEB SCRIPTING

SYLLABUS

Java script

Event handling, adding java script in an HTML page

Multimedia and authoring tools

Image Formats

TIFF, BMP, JPG/JPEG, GIF, IC, PDF, PSG:

Image scanning with the help of scanner: Setting up resolution, size, file Formats of images; Image preview

Significance of PDF-creation, modification; Animation, Morphing and Applications

Graphic Tools: Image Editing Software (Photoshop / CorelDraw)

Image Handling: Cropping an image, adjusting image size, saving an image;

Layers: Adding layers, dragging and pasting selections on to layers, moving and copying layers, duplicating layers, deleting layers, merging layers. Opacity.

Concept of multimedia: Picture/ Graphics, Audio, Video;

Sound: Recording sound using sound recorder (capture), Sound editing, Effect enhancement;

Voice Recognition software Philips / Dragon, MIDI player, sound recorder.

Sound Quality: Radio Quality,

1. Movie File Formats: AVI, MPEG.

   Movie Frames: Concept of Frame, Frame Buffer;

2. Multimedia authoring using macromedia flash

   Making of simple flash movie.

WEB SCRIPTING

1. Java Script

1.1 Introduction

JavaScript is *an object-based scripting language* which is lightweight and cross-platform.

JavaScript is not a compiled language, but it is a translated language. The JavaScript Translator (embedded in the browser) is responsible for translating the JavaScript code for the web browser.

1.2 What is JavaScript

JavaScript (js) is a light-weight object-oriented programming language which is used by several websites for scripting the webpages. It is an interpreted, full-fledged programming language that enables dynamic interactivity on websites when applied to an HTML document. It was introduced in the year 1995 for adding programs to the webpages in the Netscape Navigator browser. Since then, it has been adopted by all other graphical web browsers. With JavaScript, users can build modern web applications to interact directly without reloading the page every time. The traditional website uses js to provide several forms of interactivity and simplicity.

Although, JavaScript has no connectivity with Java programming language. The name was suggested and provided in the times when Java was gaining popularity in the market. In addition to web browsers, databases such as CouchDB and MongoDB uses JavaScript as their scripting and query language.

1.3 Features of JavaScript

There are following features of JavaScript:

1. All popular web browsers support JavaScript as they provide built-in execution environments.
2. JavaScript follows the syntax and structure of the C programming language. Thus, it is a structured programming language.
3. JavaScript is a weakly typed language, where certain types are implicitly cast (depending on the operation).
4. JavaScript is an object-oriented programming language that uses prototypes rather than using classes for inheritance.
5. It is a light-weighted and interpreted language.

6. It is a case-sensitive language.
7. JavaScript is supportable in several operating systems including, Windows, macOS, etc.
8. It provides good control to the users over the web browsers.

1.4 History of JavaScript

In 1993, **Mosaic**, the first popular web browser, came into existence. In the **year 1994**, **Netscape** was founded by **Marc Andreessen**. He realized that the web needed to become more dynamic. Thus, a 'glue language' was believed to be provided to HTML to make web designing easy for designers and part-time programmers. Consequently, in 1995, the company recruited **Brendan Eich** intending to implement and embed Scheme programming language to the browser. But, before Brendan could start, the company merged with **Sun Microsystems** for adding Java into its Navigator so that it could compete with Microsoft over the web technologies and platforms. Now, two languages were there: Java and the scripting language. Further, Netscape decided to give a similar name to the scripting language as Java's. It led to 'Javascript'. Finally, in May 1995, Marc Andreessen coined the first code of Javascript named '**Mocha**'. Later, the marketing team replaced the name with '**LiveScript**'. But, due to trademark reasons and certain other reasons, in December 1995, the language was finally renamed to 'JavaScript'. From then, JavaScript came into existence.

1.5 Application of JavaScript

JavaScript is used to create interactive websites. It is mainly used for:

- Client-side validation,
- Dynamic drop-down menus,
- Displaying date and time,
- Displaying pop-up windows and dialog boxes (like an alert dialog box, confirm dialog box and prompt dialog box),
- Displaying clocks etc.

1.6 JavaScript Comment

The JavaScript comments are meaningful way to deliver message. It is used to add information about the code, warnings or suggestions so that end user can easily interpret the code.

The JavaScript comment is ignored by the JavaScript engine i.e. embedded in the browser.

Advantages of JavaScript comments:

There are mainly two advantages of JavaScript comments.

- To make code easy to understand It can be used to elaborate the code so that end user can easily understand the code.
- To avoid the unnecessary code It can also be used to avoid the code being executed. Sometimes, we add the code to perform some action. But after sometime, there may be need to disable the code. In such case, it is better to use comments.

Types of JavaScript Comments:

There are two types of comments in JavaScript.

1. Single-line Comment
2. Multi-line Comment

JavaScript Single line Comment

It is represented by double forward slashes (//). It can be used before and after the statement.

Let's see the example of single-line comment i.e. added before the statement.

```
<script>
// It is single line comment
document.write("hello javascript");
</script>
```

Let's see the example of single-line comment i.e. added after the statement.

```
<script>
var a=10;
var b=20;
var c=a+b;//It adds values of a and b variable
document.write(c);//prints sum of 10 and 20
</script>
```

JavaScript Multi line Comment

It can be used to add single as well as multi line comments. So, it is more convenient.

It is represented by forward slash with asterisk then asterisk with forward slash. For example:

/* your code here */

It can be used before, after and middle of the statement.

```
<script>
/* It is multi line comment.
It will not be displayed */
document.write("example of javascript multiline comment");
</script>
```

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PRACTICE QUESTIONS

1. Which of the following is not considered as an error in JavaScript?

A) Syntax error

B) Missing of semicolons

C) Division by zero

D) Missing of Bracket

2. What will be the output of the following JavaScript code?

```
function compare()
{
   int a=1;
   char b=1;
if(A)tostring()===B)
returntrue;
else
returnfalse;
}
```

A) true

B) false

C) runtime error

D) logical error

3. The expression of calling (or executing) a function or method in JavaScript is called _____

A) Primary expression

B) Functional expression

C) Invocation expression

D) Property Access Expression

4. What will be the output of the following JavaScript code?

```
<p id="demo"></p>
<script>
function myFunction()
{
   document.getElementById("demo").innerHTML=Math.cbrt(125);
}
</script>
```

A) 125

B) 25

C) 5

D) Error

5. What will be the output of the following JavaScript code?

var o = new F();

o.constructor === F

A) false

B) true

C) 0

D) 1

6. The meaning for Augmenting classes is that _____

A) objects inherit prototype properties even in a dynamic state

B) objects inherit prototype properties only in a dynamic state

C) objects inherit prototype properties in the static state

D) object doesn't inherit prototype properties in the static state

7. Which of the following function of Boolean object returns a string containing the source of the Boolean object?

A - toSource()

B - valueOf()

C - toString()

D - None of the above.

8. What will be the output of the following JavaScript code?

document.writeln("
navigator.language: "+navigator.language);

A) Broswer name

B) Browser language

C) Browser version

D) Error

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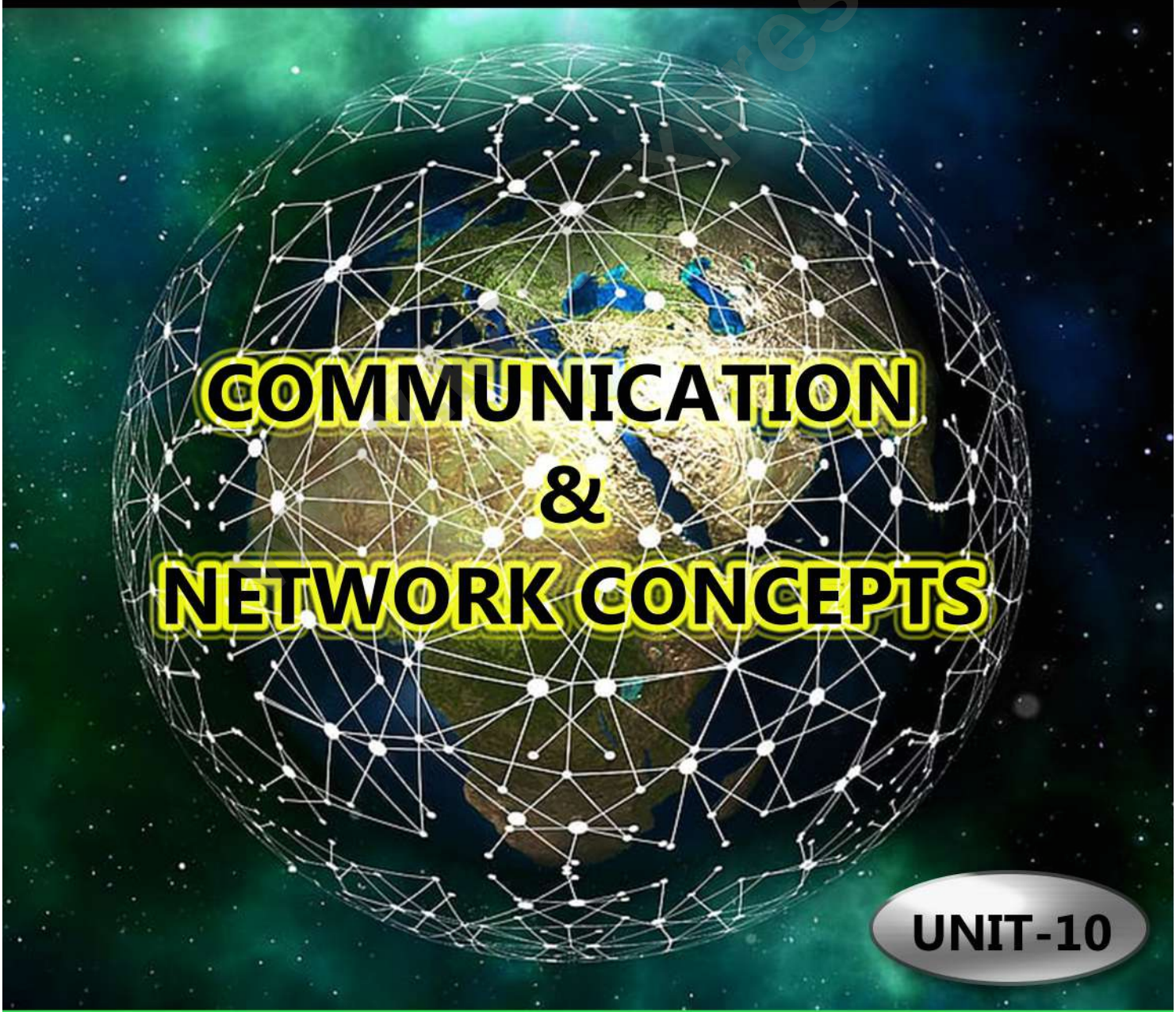

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UNIT-X

COMMUNICATION AND NETWORK CONCEPTS

SYLLABUS

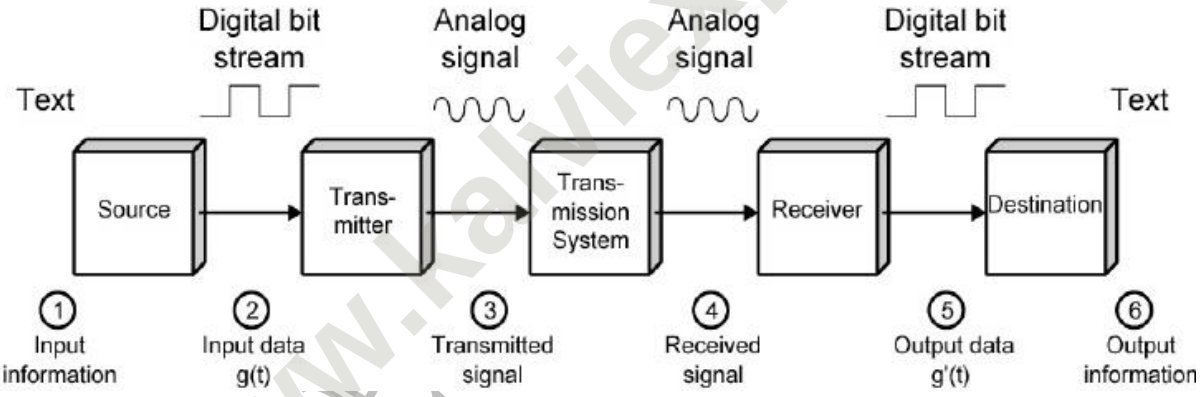
- Evolution of Networking : Internet
- Data Communication Terminologies: Bandwidth (Hz, KHz, MHz) and Data transfer rate (bps,kbps,Mbps,Gbps,Tbps)
- Network Devices : Modem, Ethernet Card, Hub, Switch, Router.
- Different Topologies – Bus, Tree
- Concepts of LAN, WAN, MAN.
- Protocol : TCP/IP, Internet
- Wireless/Mobile Communication , GSM
- Electronic Mail, Chat, Video Conferencing
- Network Security Concepts : Cyber Law, Hackers and Crackers.
- Web Pages : Hyper Text Markup Language (HTML), Hyper Text Transfer Protocol (HTTP), Website, Web Browser, Web Server.

CHAPTER 1

INTRODUCTION

1.1 COMMUNICATION SYSTEM

- Sending or Receiving information, such as speaking, writing, telephone lines , computers or using some other medium is communication.
- The **communication system** basically deals with the transmission of information from one point to another using the well-defined steps which are carried out in sequential manner. The system for data transmission makes use of the sender and destination address, In this other so many elements are also there that allows it to transfer data from one set of point to another set of point after dividing the **elements of communication system** in groups and these interface elements acts as the main **component for data communication**.
- Data communication system made up of five basic components, they are
    - Message
    - Sender
    - Receiver
    - Transmission Medium
    - Protocol



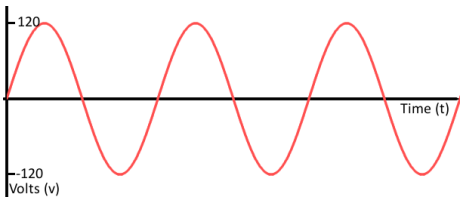
1.1.1. SIGNAL

- A signal is an electromagnetic or electrical current that carries data from one system or network to another.
- In electronics, a signal is often a time-varying voltage that is also an electromagnetic wave carrying information, though it can take on other forms, such as current.
- There are two main types of signals used in electronics: analog and digital signals.

a.) Analog Signal

- Because a signal varies over time, it's helpful to plot it on a graph where time is plotted on the horizontal, *x*-axis, and voltage on the vertical, *y*-axis.

- Looking at a graph of a signal is usually the easiest way to identify if it's analog or digital; a time-versus-voltage graph of an analog signal should be **smooth** and **continuous**.



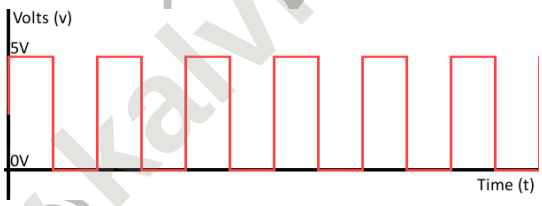
- While these signals may be limited to a **range** of maximum and minimum values, there are still an infinite number of possible values within that range.

For example:

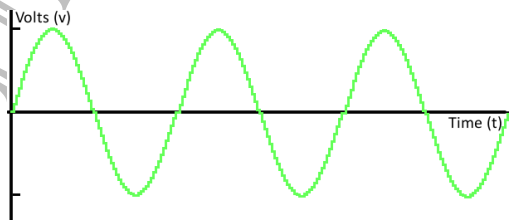
- The analog voltage coming out of your wall socket might be clamped between -120V and +120V, but, as you increase the resolution more and more, you discover an infinite number of values that the signal can actually be (like 64.4V, 64.42V, 64.424V, and infinite, increasingly precise values).

b.) Digital Signals

- Digital signals must have a finite set of possible values.
- The number of values in the set can be anywhere between two and a-very-large-number-that's-not-infinity.
- Most commonly digital signals will be one of **two values** -- like either 0V or 5V.
- Timing graphs of these signals look like **square waves**.



- Or a digital signal might be a discrete representation of an analog waveform. Viewed from afar, the wave function below may seem smooth and analog, but when you look closely there are tiny discrete **steps** as the signal tries to approximate values:



- That's the big difference between analog and digital waves. Analog waves are smooth and continuous, digital waves are stepping, square, and discrete.

c.) Key Differences:

- An analog signal is a continuous signal whereas Digital signals are time separated signals.

- Analog signal is denoted by sine waves while It is denoted by square waves
- Analog signal uses a continuous range of values that help you to represent information on the other hand digital signal uses discrete 0 and 1 to represent information.
- The analog signal bandwidth is low while the bandwidth of the digital signal is high.
- Analog instruments give considerable observational errors whereas Digital instruments never cause any kind of observational errors.
- Analog hardware never offers flexible implementation, but Digital hardware offers flexibility in implementation.
- Analog signals are suited for audio and video transmission while Digital signals are suited for Computing and digital electronics.

d.) Characteristics Of Analog Signal

Here, are essential characteristics of Analog Signal

- These type of electronic signals are time-varying
- Minimum and maximum values which is either positive or negative.
- It can be either periodic or non-periodic.
- Analog Signal works on continuous data.
- The accuracy of the analog signal is not high when compared to the digital signal.
- It helps you to measure natural or physical values.
- Analog signal output form is like Curve, Line, or Graph, so it may not be meaningful.

e.) Characteristics of Digital Signals

Here, are essential characteristics of Digital signals

- Digital signal are continuous signals
- This type of electronic l signals can be processed and transmitted better compared to analog signal.
- Digital signals are versatile, so it is widely used.
- The accuracy of the digital signal is better than that of the analog signal.

f.) Difference Between Analog and Digital Signal

Here are important differences between Analog and Digital Signal:

Analog	Digital
An analog signal is a continuous signal that represents physical measurements.	Digital signals are time separated signals which are generated using digital modulation.
It is denoted by sine waves	It is denoted by square waves

PG TRB (2020-2021) QUESTION BANK

1.) The number of bits used for addressing in Gigabit Ethernet is _____.

(A) 32 bit (B) 48 bit

(C) 64 bit (D) 128 bit

2.) Which of the following devices takes data sent from one network device and forwards it to the destination node based on MAC address?

(A) Hub (B) Modem

(C) Switch (D) Gateway

3.) _____ do not take their decisions on measurements or estimates of the current traffic and topology.

(A) Static algorithms (B) Adaptive algorithms

(C) Non – adaptive algorithms (D) Recursive algorithms

4.) Which of the following layer of OSI Reference model is also called end-to-end layer ?

(A) Network layer (B) Data layer

(C) Session layer D) transport layer

5.) The IP address _____ is used by hosts when they are being booted.

(A) 0.0.0.0 (B) 1.0.0.0

(C) 1.1.1.1 (D) 255.255.255.255

6.) Suppose we want to download text documents at the rate of 100 pages per second. Assume that a page consists of an average of 24 lines with 80 characters in each line. What is the required bit rate of the channel?

(A) 192 kbps (B) 512 kbps

(C) 1.248 Mbps (D) 1.536 Mbps

7.) If a file consisting of 50,000 characters takes 40 seconds to send, then the data rate is __.

(A) 1 kbps (B) 1.25 kbps

(C) 2 kbps (D) 10 kbps

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