

# BASIC OVERVIEW OF COMPUTER SUBJECTS

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**Abstract :** This Research paper gives basic information on how subjects of Computers are related to each other also how computer works, how data is stored, compiled, retrieved.

**Keywords—** Computer; Compiler; Data; Design; Instruction; Data structures; Requirements; Software; Hardware

## I. INTRODUCTION

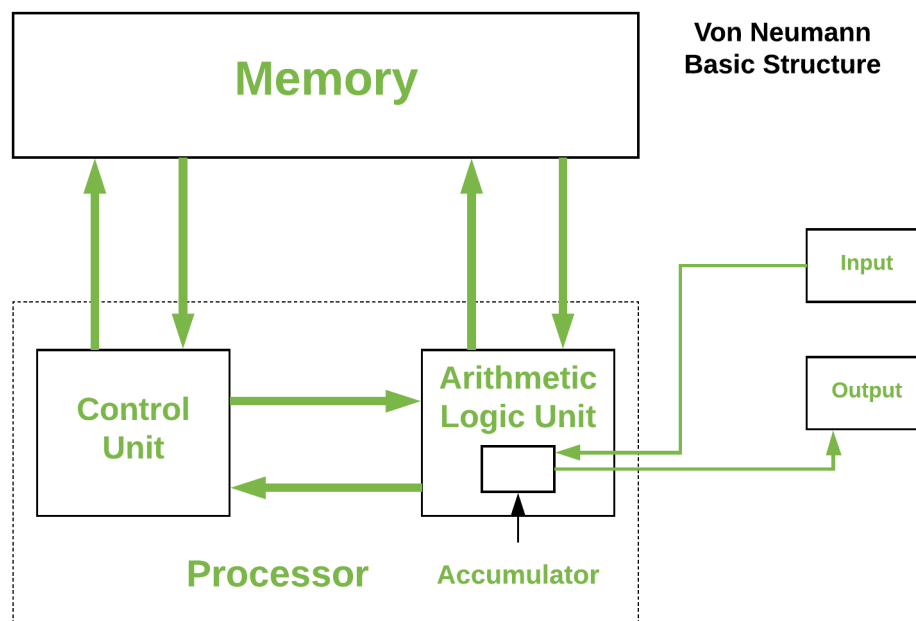
**Computer:** Computer is an electronic device used for storing and processing data. Data will be in Binary format and only computer can understand it. Data is given as input via Input devices and end user will get output via output devices. Data is stored in a common place called memory and in today's world scenario data is very precious. Sharing and Storing are the two important operations performed on data.

## II. VARIOUS SUBJECTS RELATED TO COMPUTERS

- COMPUTER ORGANIZATION<sup>1</sup>
- DATA STRUCTURES<sup>2</sup>
- COMPILER DESIGN<sup>3</sup>
- OPERATING SYSTEMS<sup>4</sup>
- COMPUTER NETWORKS<sup>5</sup>
- SOFTWARE ENGINEERING<sup>6</sup>
- DATA BASE MANAGEMENT SYSTEMS<sup>7</sup>
- UNIFIED MODELING LANGUAGE<sup>8</sup>
- ARTIFICIAL INTELLIGENCE<sup>9</sup>
- PROGRAMMING LANGUAGES<sup>10</sup>

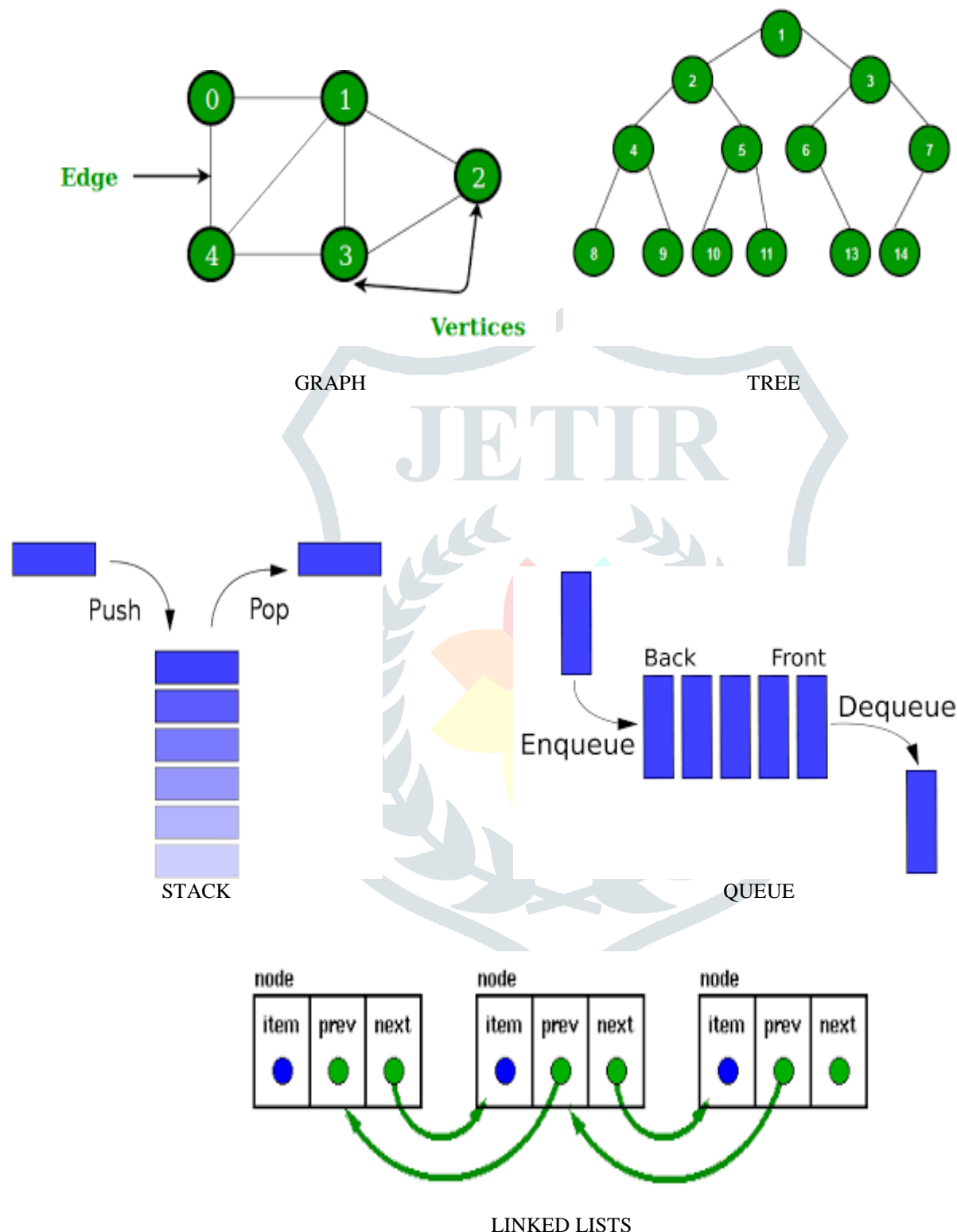
## III. COMPUTER ORGANIZATION

To execute task given by the user, we need a machine called computer and subject that deals with the structure and behavior of a computer system is called COMPUTER ORGANIZATION. Here we study about Functional units of computer, Memory Organization, Input-Output Organization, Multi Processing, Interrupt and in detail about CPU (Processor)



### IV.DATA STRUCTURES

Representation of the data in a Computer memory is called a Data Structure. In this subject we learn about Arrays, Stacks, Queues, Trees, Graphs, Linked lists and various sorting techniques. Following are some of the structures that show how data stored in a memory is related..



Sorting is nothing but arrangement of data in either ascending or descending or in alphabetical order. Various sorting techniques in data structures are

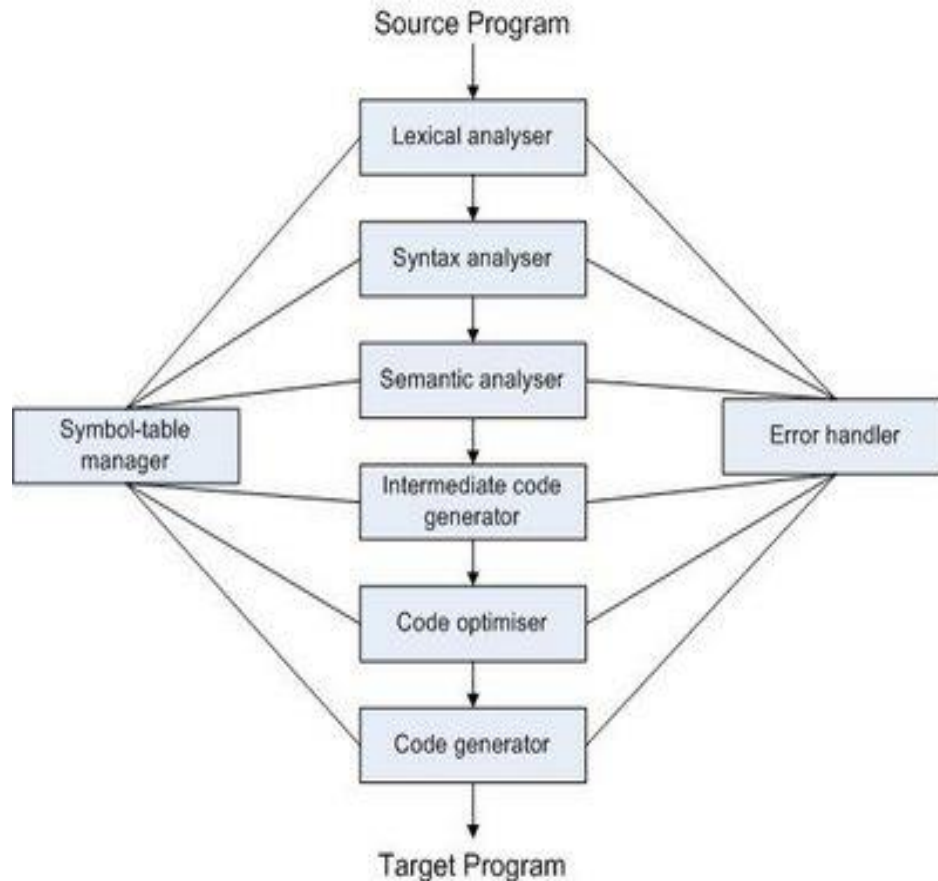
- Bubble Sort.
- Selection Sort.
- Merge Sort.

- Insertion Sort.
- Quick Sort.
- Heap Sort.

### V.COMPILER DESIGN

When user completed writing the program the immediate step is to compile and run it. Compiler is used to convert the program written in user understandable language to machine level language. Compiler will check the program and find errors if any.

Compiler has the following structure



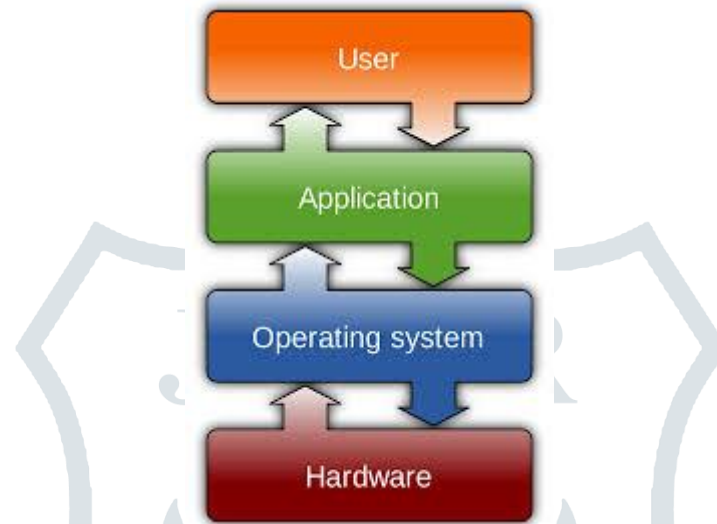
- Lexical Analyzer read the program line by line and generate tokens. Tokens are given as input to Syntax analyzer.
- Syntax analyzer generates syntax tree as output and it is given as input to semantic analyzer.
- Semantic analyzer checks the meaning of source program as the word semantic itself represents meaning, Input is syntax tree and output is parse tree (syntax tree with meaning).
- Intermediate code (IC) is code between high level language and low level language or we can say IC is code between source code and target code. Here the output is output is intermediate code and most commonly used intermediate code is three address code. There are three representations used for three address code such as Quadruple, Triple and Indirect Triple.
- Code optimization is used to improve the intermediate code and execution speed. various techniques for code optimization are constant folding, copy propagation, common sub expression elimination, dead code elimination, strength reduction etc.
- Code Generation is the final phase of a compiler. Intermediate code is translated into machine language which is pass and parse from above phases.
- Symbol table is used to store the information about entities such as interfaces, objects, classes, variable names, function names, keyword, constants, subroutines, label name and identifier etc.
- Each and every phase of compiler detects errors which must be reported to error handler whose task is to handle the errors so that compilation can proceed.

### VI. OPERATING SYSTEMS

An operating system is a program that acts as an interface between the user and the computer hardware and controls the execution of all kinds of programs.

Some of the major functions of an operating system are

- **Resource management:**The operating system manages a computer's resources, allocating them as needed. Which tasks the CPU processes in what order, which functions or programs are assigned processing power or memory first, and many other important resource allocation tasks are controlled by the operating system.
- **Providing user interface:** Operating system acts as an interface to the user who is using the computer.It is one of the basic function of the OS
- **Computer control hardware:** All programs that need hardware must go through the operating system which can be accessed through the BIOS.
- **Network Communication:**It is one of the basic function of the OS.It enables all the connected network devices to communicate with the Computer.



## VII.COMPUTER NETWORKS

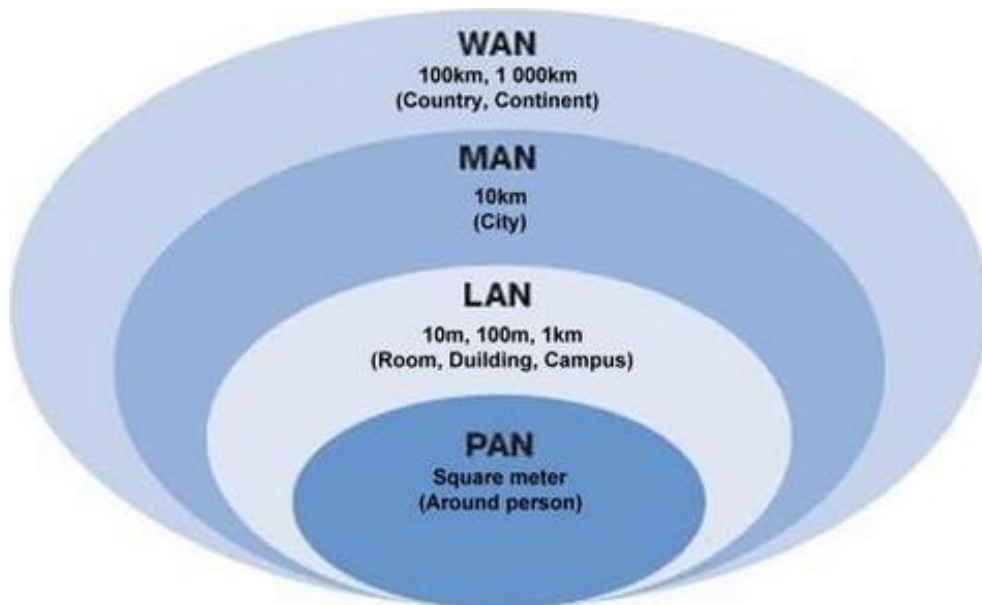
Two or more systems connected together to communicate or to transfer data between each other via a transmission media( wired or wireless),which follow some protocols is called a COMPUTER NETWORK.

There are two main categories of transmission media

- **Guided:Transmission:**Done via wired Twisted pair cables,optical cables,Coaxial cables comes under wired transmission media.
- **Unguided Transmission:**It is wireless.Examples of unguided transmission are wifi,Bluetooth,infra red.

Computer networks are of following types

- Personal Area Network(PAN)
- Local Area Network(LAN)
- Metropolitan Area Network(MAN)
- Wide Area Network(WAN)
- Virtual Area Network(VAN)
- Wireless
- Internet

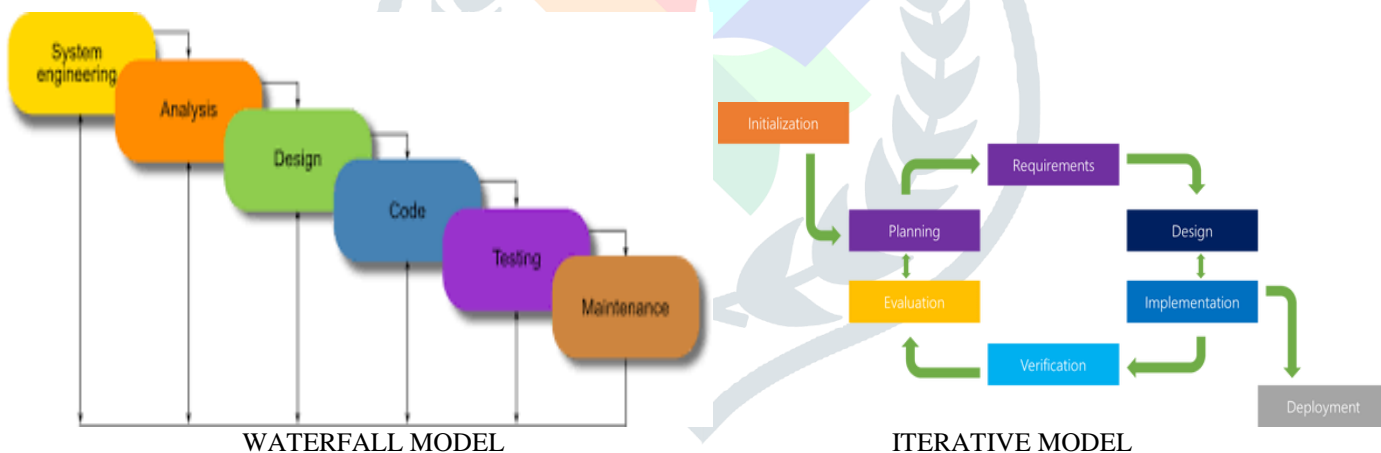


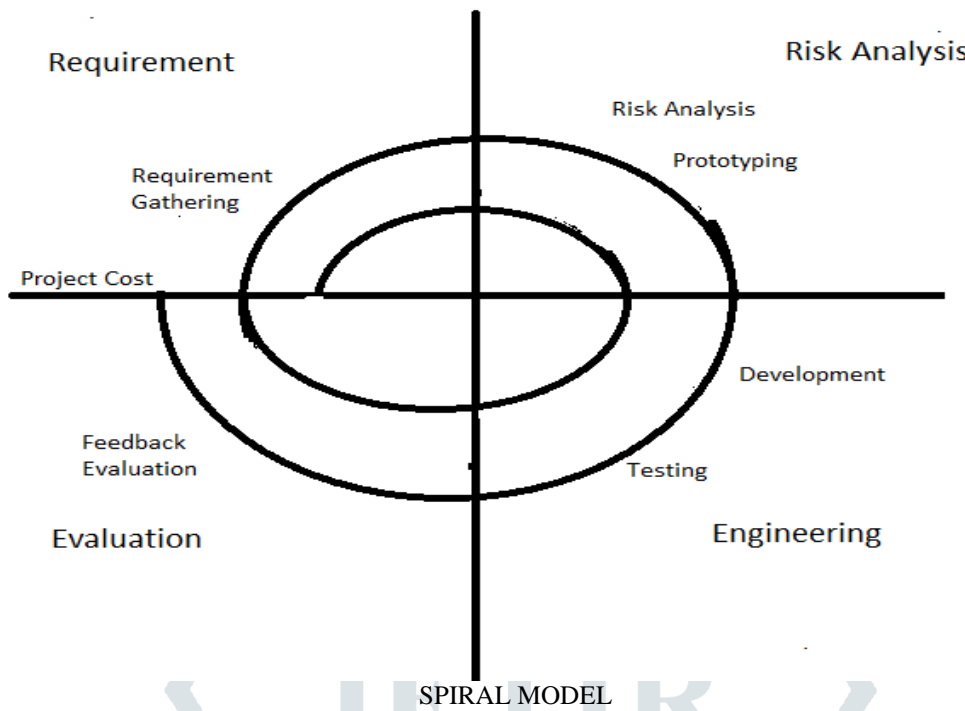
**VIII.SOFTWARE ENGINEERING**

Software Engineering is concerned with all aspects of software production from the early stages of collecting user requirements(system specification) through to maintaining the software after it has gone into use.

The process from collecting user requirements,analysing those requirements,writing the code,testing it and maintining the software is called a Software Development Life Cycle(SDLC).The most important SDLC models are

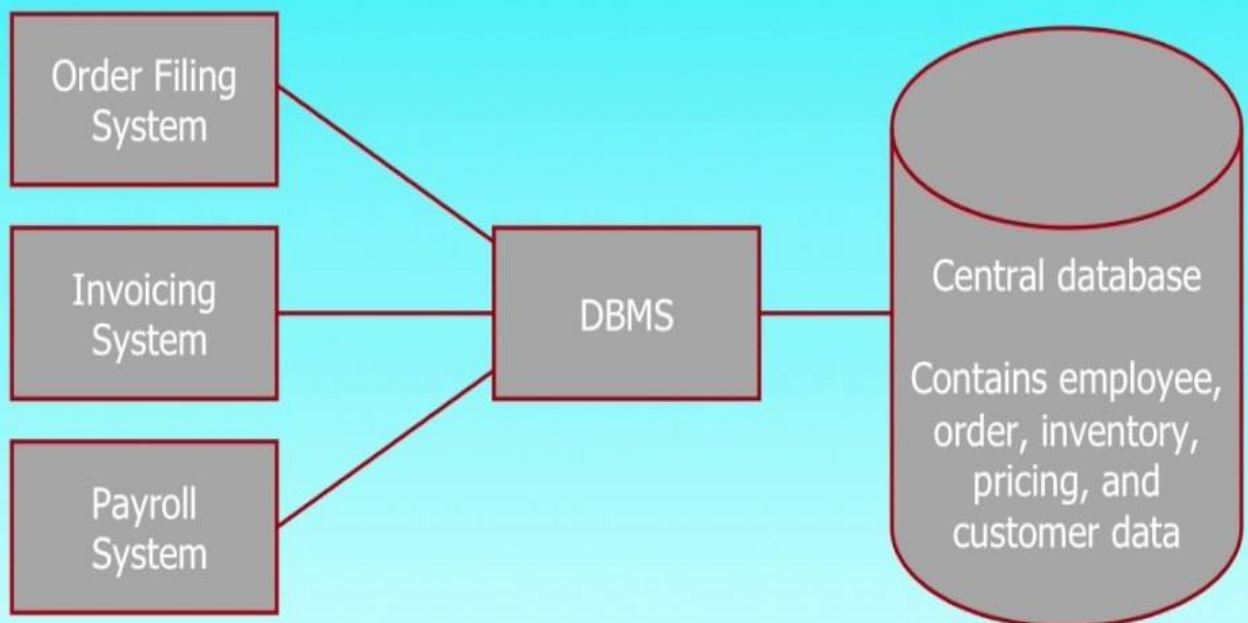
- Water fall model
- Iterative model
- Spiral Model





**IX.DATABASE MANAGEMENT SYSTEMS (DBMS)**

A database is a logically collection of data with some inherent meaning, In short DBMS refers to Storing and Retrieving the data. DBMS is a collection of programs that enables user to create and maintain a database. In other words it is general-purpose software that provides the users with the processes of defining, constructing and manipulating the data in the database for various applications.



*DBMS manages data resources like an operating system manages hardware resources*

- Purpose of DataBase Management System is to provide a way to store and retrieve database information that is convenient and efficient.

### X.UNIFIED MODELING LANGUAGE(UML)

UML is used to visualize the way a software has been designed. It is not a programming language.UML diagrams are used to show the behavior and structure of the software designed.

UML diagrams are divided into two distinct types

- Structural UML diagrams
- Behavioral UML diagrams

**Structural UML diagrams are**

- Class diagram
- Package diagram
- Object diagram
- Component diagram
- Composite structure diagram
- Deployment diagram

**Behavioral UML diagrams are**

- Activity diagram
- Sequence diagram
- Use Case diagram
- State diagram
- Communication diagram
- Interaction overview diagram
- Timing diagram
- Purpose of UML is user can see how the system is partitioned into static objects and how those objects interact over time.

### XI.ARTIFICIAL INTELLIGENCE

Artificial Intelligence is the subject related to machines which are designed and programmed in such a manner that they think and act like a human being. Artificial Intelligence becomes the important part of our daily life.

It is an algorithm written for a computer to take decisions itself.Some of the examples are

- Guessing the next word while sending sms or mail,
- Face recognition,
- Chess game with system etc..

The overall research goal of Artificial Intelligence is to create technology that allows computers and machines to function in an intelligent manner.

### XII.PROGRAMMING LANGUAGES

Programming languages are used to create a software on our own. These are used to solve a wide range of problems. We write the programs as per the syntax and functions related to the respective programming language.Some of the widely used programming languages are C,C++,JAVA,PYTHON,PHP,RUBY etc.

Programming languages may be a platform dependent or independent

- Platform dependent typically refers to the programs that run under only one operating system .
- Platform independent refers to the programs that run under any operating system .

### XIII.CONCLUSION-.RELATION BETWEEN ALL THESE SUBJECTS

By taking one example I try to relate the following subjects

- When a general user encounters a problem which can be solved by writing a piece of code ,he/she can approach a programming person who writes the code by using one of the various **PROGRAMMING LANGUAGES** available .
- Knowing the problem, identifying the needs, writing the code, testing it and giving it to the end user comes under the subject called **SOFTWARE ENGINEERING**.
- To write a code i.e. to execute an instruction we need a **COMPUTER**(software and hardware) The software work is related to **OPERATING SYSTEMS** and the hardware is related to **COMPUTER ORGANIZATION**.
- Storing and Retrieving of data comes under the subject called **DBMS**.
- In what way the data is stored in a system comes under **DATA STRUCTURES**.
- After writing the program to execute it,a compiler is needed and it converts the user understandable language into machine level language, it also identifies the errors(if any)and display those to the programmer,**COMPILER DESIGN** deals with these tasks.
- Presenting the software in a pictorial way, describing about each object and its relation in the program comes under **UML**.
- To transfer or to share the written code to the customer(who is not available in live)we need a communication path called a network and the subject that deals with this data transformation is **COMPUTER NETWORKS**.

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