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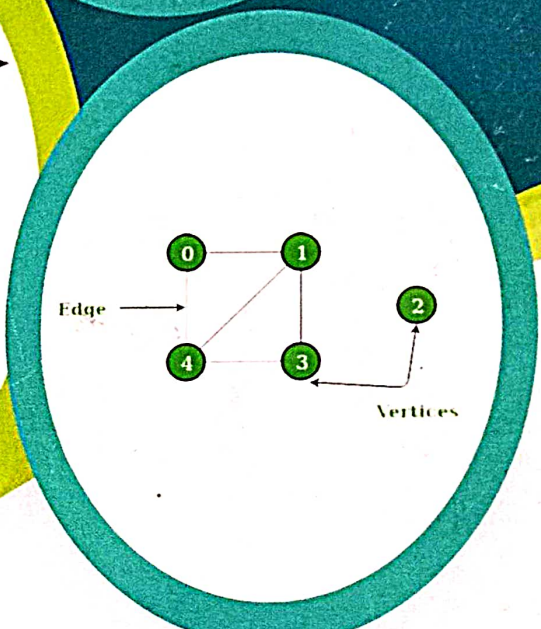
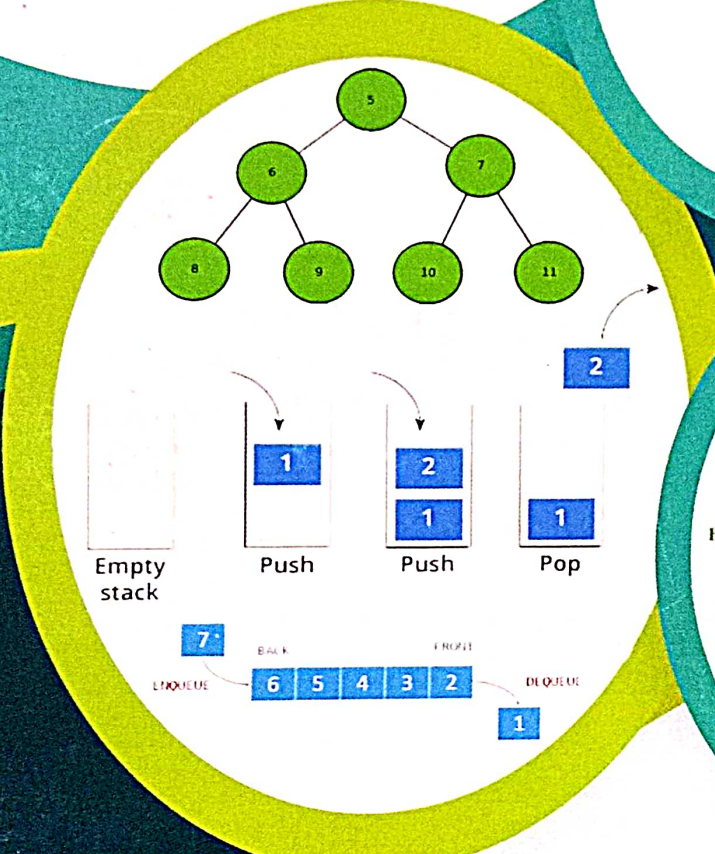
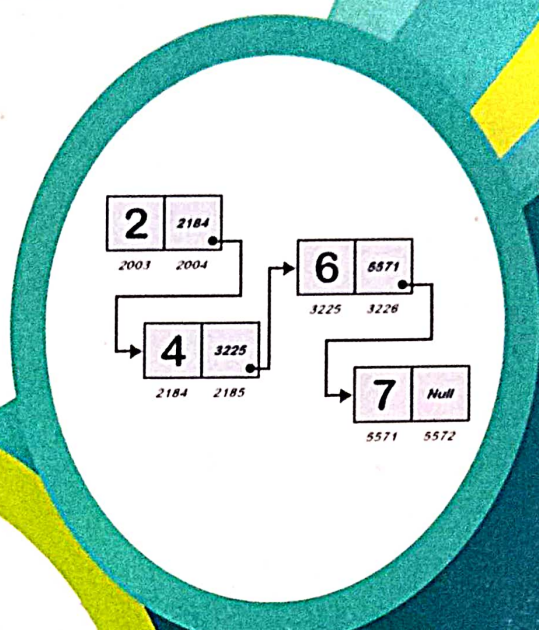
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*B.Sc - IV Semester
According to New Syllabus
Krishna University*



Data Structures

Cheekatimarla Anil Kumar

DATA STRUCTURES

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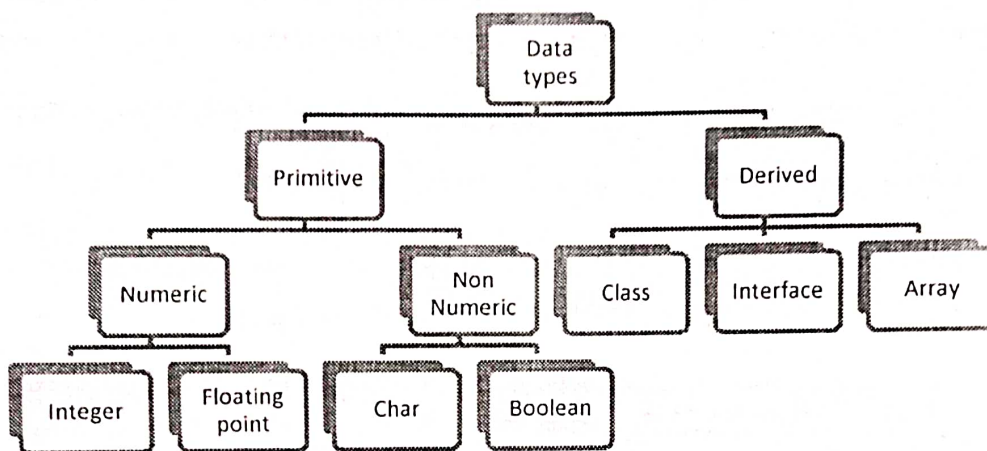
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Chapter - 1 : Concept of Abstract Data Types (ADTs)

1. Data Types:

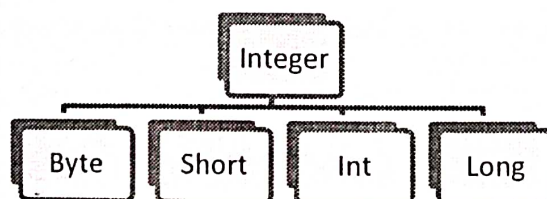
In every programming language, every variable has a data type. Data type specifies the size and type of values that can be stored. The variety of data types available allows the programmer to select the type appropriate to the needs of the application.



Primitive data types are also called as intrinsic or built-in data types and non primitive data types are also called as derived or reference data types.

Integer types:

Integer numbers can hold whole numbers such as 123, 9, -6, etc. the size of the values that can be stored depends on the integer data types we choose. Java supports four types of integers, they are: byte, short, int and long.



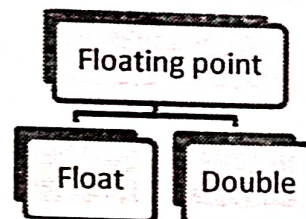
Range of Integer types are:

Type	Size	Minimum value	Maximum value
Byte	One byte	-128	127
Short	Two bytes	-32768	32767
Int	Four bytes	-2147483648	2147483647
Long	Eight bytes	-9223372036854775808	9223372036854775807

For example storing a number like 50 in an integer type variable, we must use a byte data type to handle this number; this will improve the speed of execution of the program.

Floating point types:

Integer numbers can hold only whole numbers and therefore we use another type known as floating point type to hold numbers containing fractional parts such as 27.59 and -1.36, etc. There are two types of floating point types in Java. They are:



Size and range of Floating point types are:

Type	Size	Minimum value	Maximum value
Float	Four bytes	3.4×10^{-38}	3.4×10^{38}
Double	Eight bytes	1.7×10^{-308}	1.7×10^{308}

Based on the size of number we use float / double type, generally for all mathematical functions such as sin, cos, etc. we use double type data.

Character types:

In order to store character constants to memory, Java provides a character data type called **char**. A char type assumes a size of two bytes, but basically it can hold only a single character.

Boolean types:

Boolean type is used when we want to test a particular condition during the execution of the programme. There are only two values that a Boolean type can take true or false. Boolean type is denoted by the keyword **Boolean** and used only one bit of storage.

2. Data Structure

Data Structure is a systematic way to organize data in order to use it efficiently.

Characteristics of a Data Structure:

- a. **Correctness** – Data structure implementation should implement its interface correctly.
- b. **Time Complexity** – Running time or the execution time of operations of data structure must be as small as possible.
- c. **Space Complexity** – Memory usage of a data structure operation should be as little as possible.

Need for Data Structure:

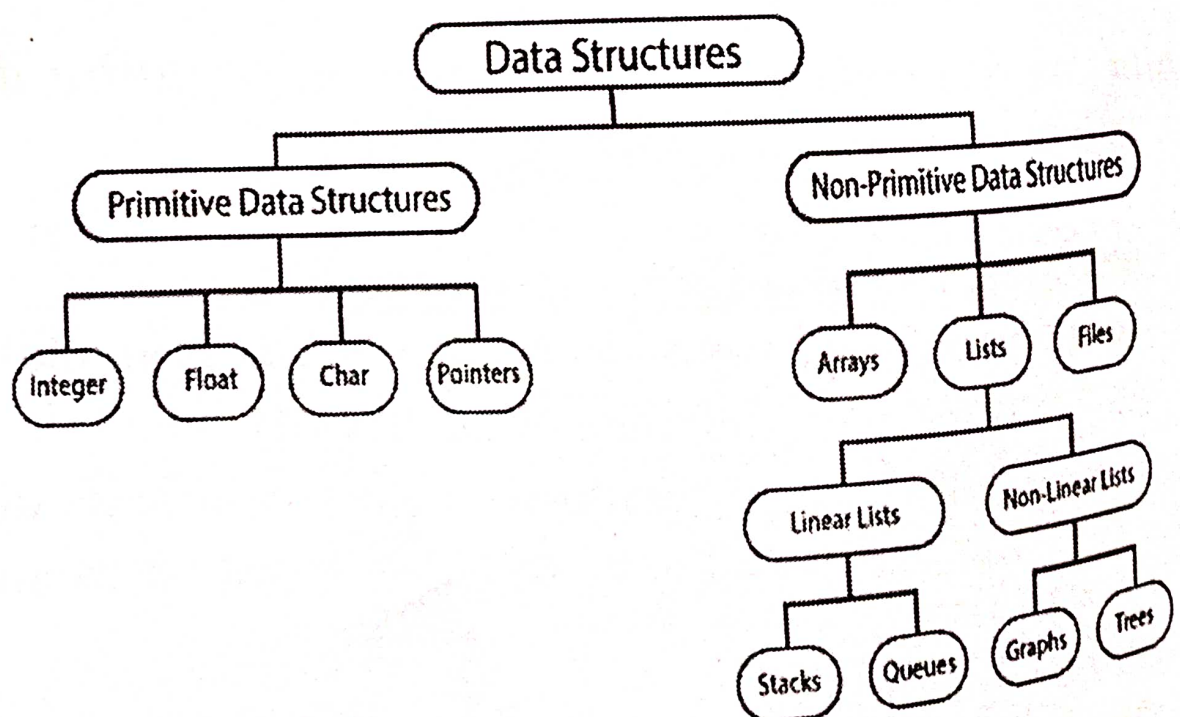
As applications are getting complex and data rich, there are three common problems that applications face now-a-days.

- a. **Data Search** – Consider an inventory of 1 million(10^6) items of a store. If the application is to search an item, it has to search an item in 1 million(10^6) items every time slowing down the search. As data grows, search will become slower.
- b. **Processor speed** – Processor speed although being very high, falls limited if the data grows to billion records.
- c. **Multiple requests** – As thousands of users can search data simultaneously on a web server, even the fast server fails while searching the data.

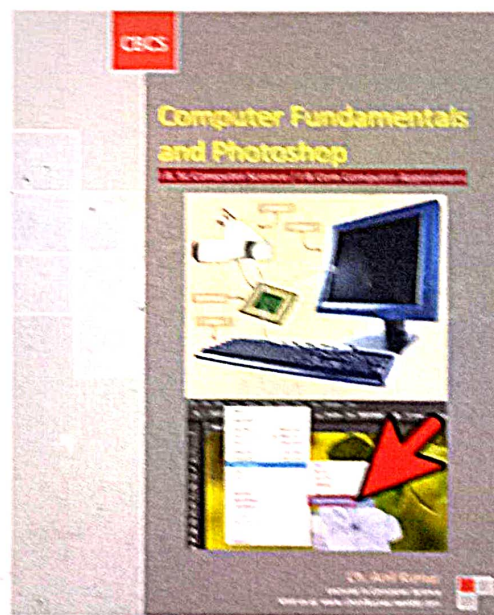
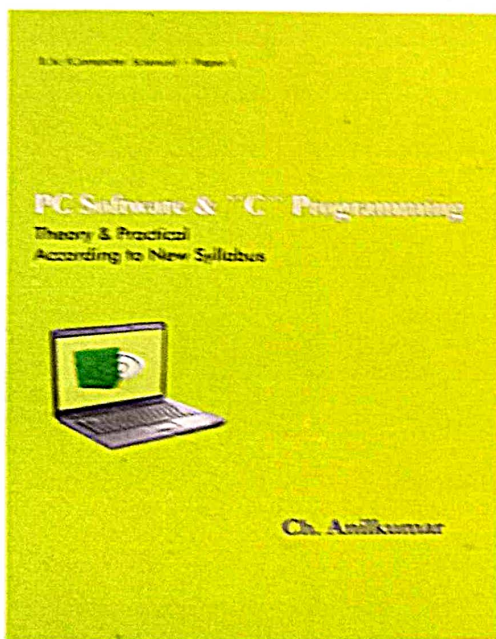
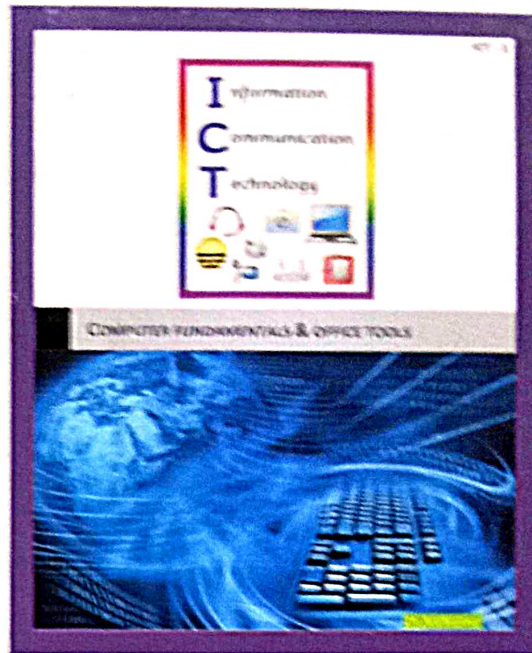
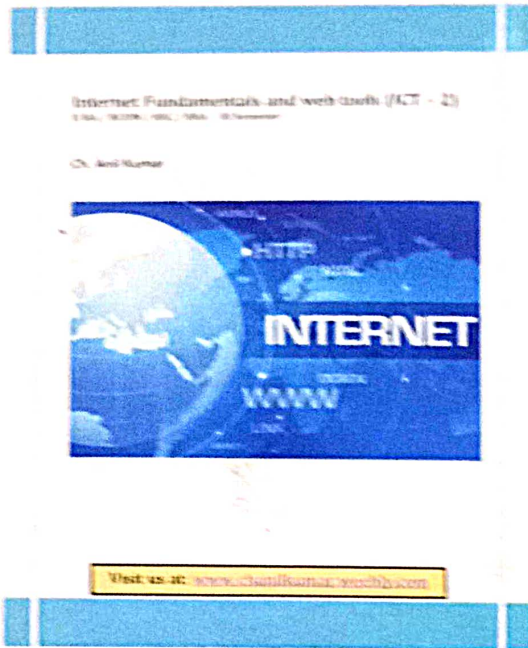
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3. Primitive and Non-Primitive Data Structures

There are two types of data structures: Primitive data structures and Non-Primitive Data structures.



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