SYLLABUS

1. Introduction to Computing
2. C-language -
3. Arrays and Strings
4. Modular Programming and Recursion.
5. Advanced data types in C

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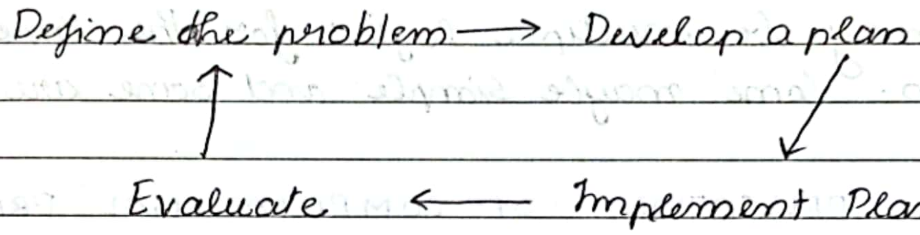
Introduction to Computing

PROBLEM SOLVING

Problem solving is the sequential process of analyzing information related to a given situation and generating appropriate responses.



WHAT IS A PROBLEM?

- A problem is a puzzle that requires logical thought or maths to solve.
- A puzzle could be a set of questions on a scenario, which consists of description of reality and set of constraints about the scenario.

Fundamental, requirement for solving problems → Logic.

LOGIC.

Logic is a language of reasoning, a method of human thought that involves thinking in a linear step by step manner to solve the problem.

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IMPORTANCE OF LOGIC IN PROBLEM SOLVING.

Solution for any problem requires: 3 things.

- Input
- Process
- Output.

The process part requires logic. ie based on the logic process is developed.

There may be multiple logics for the same problem. Some maybe simple and some are complex

BROAD APPLICATIONS OF COMPUTATIONAL PROBLEM.

- Decision ~~Pb~~ Problem - Yes or No.
- Searching and sorting problem.
- Counting Problem - No of occurrences.
- Optimization Problem - Find best solution from feasible solutions.

CLASSIFICATION OF COMPUTATIONAL PROBLEMS

- Concurrent - Operations overlap in time.
- Sequential - Operations are done step-by step.
- Distributed - Performed at different locations.
- Event Based - Based on input of the user.

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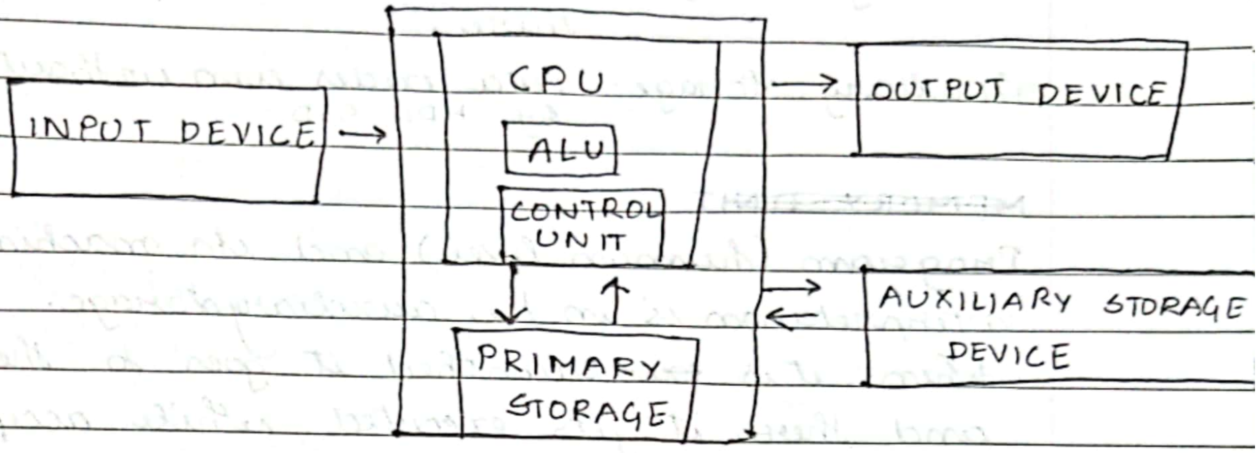
COMPUTER ORGANIZATION



CENTRAL PROCESSING UNIT

- Data and instructions are processed in the CPU.
- It has two parts - ALU
  Control Unit.

ARITHMETICAL AND LOGICAL UNIT

- Performs arithmetic and logical functions
  Example +, -, /, and logical functions like OR NOT AND, XOR etc

CONTROL UNIT

- Controls the order in which instructions are executed

FUNCTIONS OF CU:

- Fetches data and instructions to main memory
- Interprets these instructions
- Controls the transfer of data and instructions to and from main memory
- Controls IO devices
- Overall supervision of computer system.

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Primary storage - Data resides only if power is there.

Auxiliary storage - Data exists even without power.
eg. HDD, SSD

~~MEMORY UNIT~~

Program (human level) and its machine level interpretation is in the auxiliary storage.
When it is ~~exe~~ launched it goes to the CPU (CU→ALU) and there it gets executed while accepting inputs ~~to~~ from the input device and after execution it is outputed via the Output device.

MEMORY UNIT

- Storage unit where instructions and data are stored.
- An ordered sequence of storage cells, each capable of holding a piece of information.
  Each cell has a unique address.
- The info can be input data, computed values or program instructions.

Memory is measured in terms of bits, bytes and words.
A bit is a binary digit (0 or 1)
A byte is unit of memory. (8 bits = 1 byte)
The word can be defined as a sequence of 16/32/64 bits ie 2/4/8 bytes, varies according to the architecture.

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MAIN MEMORY

Memory where data and instructions currently being executed is stored

- located outside CPU
- High Speed
- Temporary (data is erased with loss of power)

Also referred as primary / temporary memory.

- Semiconductor memory.
- Measured in MB/GB

PRIMARY STORAGE: RAM AND ROM

- RAM — Random Access Memory.
  - Read and Write Memory.
  - Information typed by the user is stored here.
  - Any location can be accessed directly without scanning sequentially.
  - It is temporary / volatile memory.

- ROM - Read Only Memory.
  - Permanent, non volatile memory
  - Contents in ROM cannot be changed.
  - Mainly stores basic IO programs.

SECONDARY MEMORY

Main memory is limited and volatile.
Secondary memory is larger and can store data and various programs

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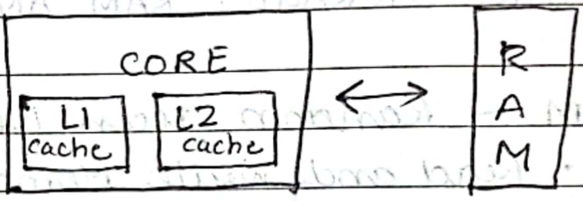
- Non volatile
- Made up of magnetic ~~memo.~~ material.
- stores large amounts of data.
- Low speed.
- Holds programs not being executed.

CACHE MEMORY

- High speed memory between CPU and main memory
- Stores data and instructions currently to be executed
- More costlier, but less capacity
- Users cannot access this memory.



OPERATING SYSTEM

- OS is an integral collection of programs which make the PC operational and helps execute program
- An interface between man and machine.
- It manages the system resources like memory, IO, processor etc.

  eg Windows, Linux, DOS, MacOS

COMPUTER LANGUAGES

- Machine language - Consists of only 0's and 1's.
- Symbolic language or Assembly language.
  - symbols used to represent instructions.
  - hardware specific

  eg MASM: ADD X, Y; add x to y.

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- High-level languages - English-like programming languages.
  - more concerned with the problem specification.

  eg C, C++, C# etc.

LANGUAGE TRANSLATOR.

- Compiler: Program that translates high-level to machine language. eg C, C++ (entire programme

- Interpreters: Program which translate one-statement at a time.

  eg Basic Interpreters, Java Interpreters.

- Assembler: Program which translates assembly language to machine language

  eg. TASM (Turbo ASseMbler), MASM.

TYPICAL C DEVELOPMENT ENVIRONMENT

Editor ⟷ DISK
Preprocessor ⟷ DISK
Compiler ⟷ DISK
Linker ⟷ DISK
Loader ⟶ Primary Memory.
CPU ⟷ Primary Memory

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