ISA :-

What is an Instruction Set?

It is the Collection of <u>machine language instructions</u> that a particular processor understands and executes.

OR.

Set of <u>Assembly language mnemonics</u> represents the m/c Code of a particular Computer.

** Instruction in a machine is dependant on Computer that is different processor have different instruction sets.

A newer processor that may belong to some family may have a Compatible but extended instruction set of an old processor of that family.

Instructions can take different formats :-

→ the Instruction Length.

→ the type

→ Length and position of operation Codes in an instruction

→ and the number and length of operand addresses etc.

Two major part of Instruction

→ OP Code
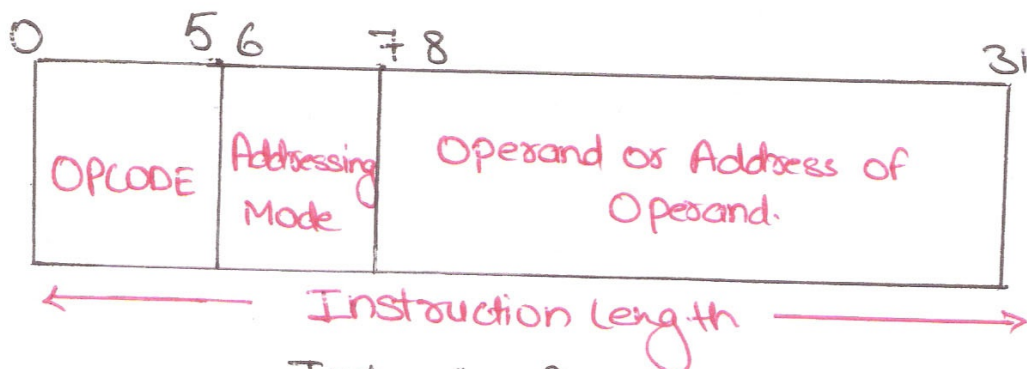
→ Operands

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Opcode:- An Operation Code field termed as Opcode that specified Operations to be performed.

Operands :- → An address field of Operand on which data processing is to be performed.

→ An Operand can reside in the memory or a processor register or can be incorporated within the Operand field of instruction as an immediate Constant.

There a mode field is needed that specifies the way the operand or its address is to be addressed.

0	5 6	7 8	31
OPCODE	Addressing Mode	Operand or Address of Operand.	

← ——— Instruction Length ——— →

Instruction format of 32 bits.

→ The opcode size is 6 bits. So in general it will have $2^6 = 32$ Operations.

→ There is Only one operand address machine.

→ There are 2 bits ie 6 & 7 for addressing modes. ie $2^2 = 4$ different addressing modes possible for this machine.

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→ the Last field (8-31) bits = 24 bits is the operand or the address of operand field.

* In case of immediate operands the maximum size of the unsigned operand would be 2^{24}

In case it is an address of operand in memory, then the maximum physical memory size supported by this machine is $2^{24} = 16 MB$.

The opcode field of an instruction is a group of bits that defines various processor operations such as LOAD, STORE, ADD and SHIFT to be performed on some data stored in Registers or memory.

* The operand address field can be data, or can refer to data - that is address of data, or can be Labels, which may be the address of an instruction you want to execute next. Labels used in Subroutine Call instruction
An operand address can be :-
   → The memory address.
   → CPU Register Address.
   → I/O Device Address.

The mode field of an instruction specifies a variety of alternatives for Referring to operands using the given address.

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→ If the operands are placed in processor Registers then an instruction executes faster than that of operands placed in memory, as the Registers are very high speed memory used by the CPU.

But to put the value of a operand which resides in Memory Unit to a register we Require a Register LOAD instruction.

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