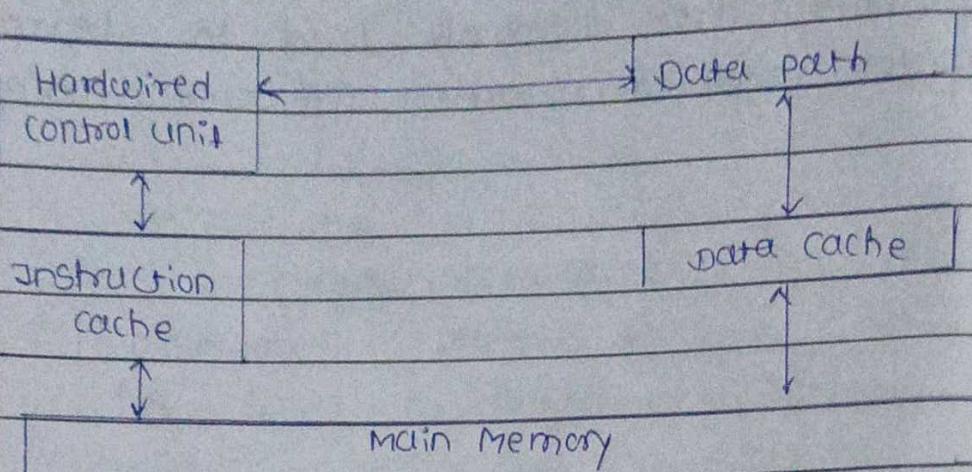


Unit 2 Instruction Set

RISC ARCHITECTURE (Reduced instruction set computer)



The full form of RISC is Reduced instruction set computer this type of architecture is used to process the instruction set. Instruction set are the parts of work to be perform in order to process the entire work. therefore per handling this entire architecture of computer process we will make use of the instruction set.

There are five parameters for RISC Architecture i.e.

- ① Hardwired control unit
- ② Data path
- ③ Data Cache
- ④ IAS Main memory
- ⑤ Instruction cache

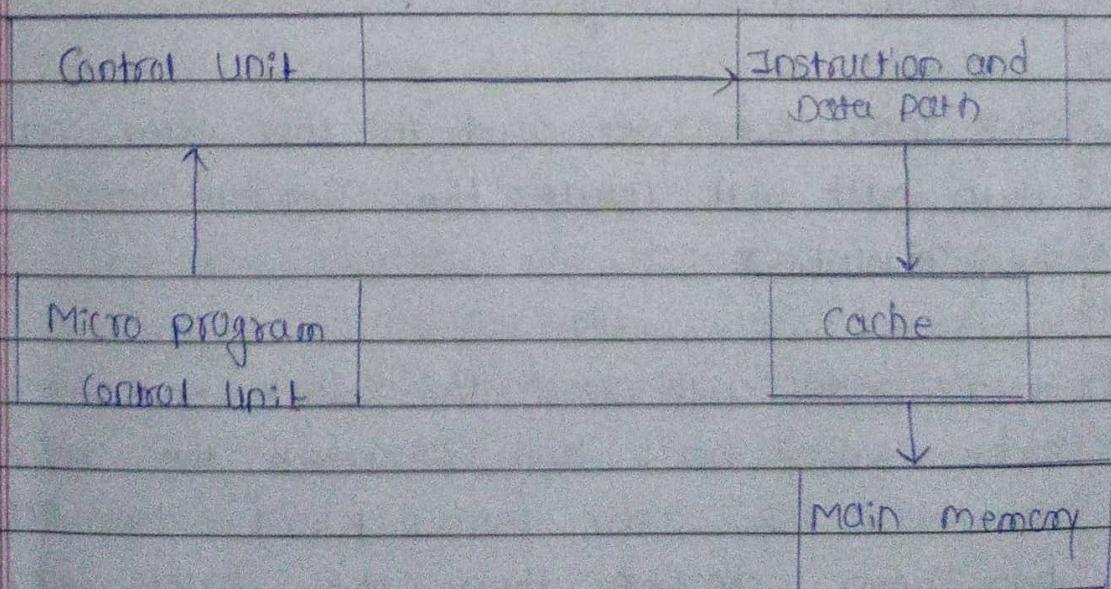
Their working are as follows -

- ① Firstly the control unit will send the combine instruction set to the data path
- ② Data path will process the instruction set

further.

- ③ Data path will send the instruction set to the data cache.
- ④ Data cache will cross check the errors and if the error occurs then it will short out the error and make the instruction error free then the data cache will send the data to the main memory and the data gets stored. finally the data from main memory will get transferred to the instruction cache.
- ⑤ Instruction cache is the particular arrangement which is used to keep all the instructions in a particular box then the completion of the process is remove to the control Unit in this way RISC architecture gets takes place.

~~IMP~~ CISC Architecture (Complex instruction set computer architecture)



CISC architecture can handle one instruction at a time single time therefore there are five types of block which performs the operation on CISC

- ① Micro program control unit
- ② Control Unit
- ③ Instruction and Data path
- ④ Cache
- ⑤ Main memory

The working of CISC architecture is as follows

- ① firstly the micro program control unit will store the entire instruction inside a particular block structure
- ② one step instruction gets taken out from the folder and send it to the control unit.
- ③ control unit will take out the instruction and start the processing on it.
- ④ the instruction gets send to the data path, data path will create the separate way for the instruction
- ⑤ data path will send the instruction towards cache, cache block will crosscheck the instruction and check the error from it, if the error has been occurred then the error gets shorted out and through it to the outside from

therefore the entire instruction will make the entire free code by the cache block and the output is send to the main memory.

Main memory is the particular block which store the output and reside it therefore after the execution of first block gets completed then the second instruction will follow the same path this cycle goes on repeating until the entire operation of the all instruction gets takes place. This is the one of the important architecture in the field of computer architecture and organization.

Instruction Set

Instruction is a 'group of command' which has been past to the CPU in order to perform the operation related to the computer therefore such type of set of commands is known as instruction set.

Instruction set can perform any type of operation according to the CPU therefore CPU is one of the major parameter to perform the operation of the computer.

It performs the operation like read, write, move, handle the devices as well as handle the software and hardware part therefore such type of the concept who follow this command is termed as Instruction set.

Characteristics of instruction set

Characteristics stands for the Speciality that an instruction set contain therefore the such type of the parameters is termed as instruction set.

- (1) Complete - complete stands for existing all the data therefore instruction set which contain the command is totally complete or does not consist of half field com data therefore instruction set is term to be complete.
- (2) Efficient - Efficient stands for useful it is basically useful in code generation or for the programming concept and for handling the project.
- (3) Regular - Regular stands for available whenever a require any data then instruction set will already consist of that data in this way we can state that instruction set is regular.
- (4) Compatible - Compatible stands for adjacent the instruction set can adjacent at any machine or at any device therefore we can state that instruction set is compatible.
- (5) primitive :- Instruction set can perform all the basic operation like addition, subtraction,

multiplication, division, etc therefore this operation are termed as primitive operations.

- ⑥ Simple :- Simple means easy to understand and easy to learn, any new user can learn the concept very easily therefore it is considered as simple.
- ⑦ Smaller :- Smaller means the length of the code is very small that means there is known it perform the huge operation therefore it is termed as smaller in size.

- * Types of operand in instruction set operand are the particular component

Address :- Address is the particular operand on the basis of which operation gets perform therefore such type of this space is termed as address.

Number - Number is a particular type of operand which consist of two parameter, integers means numbers in a round figure and floating point numbers stands for decimal number.

Character - character will gives us alphabetical value ranging from A to Z it performs the operation on the basis of key values

Logical Data : The data which is represented in

the pattern of one or zero then it is considered as 'bits' and true or false is detected then it is termed as flag value. In this way operand are performed the mechanism of instruction set.

Instruction format

The representation of instruction format as follows -

opcode	Mode	Address or Operand
--------	------	--------------------

Fig Instruction format with mode field

Instruction format is the particular structure to join write the given instruction in a proper structure. there are three type of instruction parameters in instruction format.

- ① **opcode** - opcode are the particular 'symbol' which are used to perform specific operation like +, -, ×, ÷, % therefore such type of the symbols are known as the 'opcode'
- ② **Mode** :- Mode is a type of purpose with the help of which we can find the operation there are three types of mode
- ③ **Read Mode** :- Read mode is used to read the instruction format.

- ② Write Mode :- Write mode is used to write the code in a particular structure therefore such type of the component is termed as write mode.
- ③ Read - Write Mode :- Read - write mode is used to read and write the instruction set, therefore such type of the parameters is termed as read - write instruction.
- ④ Addresses or Operand : operand stands for the variable through which the operation get performed therefore such type of the a variable Content is termed as 'operand'

Types of Instruction

Instruction is the main part of the computer system because it manages and handles the all the operation of the computer therefore such type of the component is termed as instruction.

There are Four types of instruction

- ① Data processing instruction :- In case of data processing instrucn there are two types of operatn which get performed.
- ② Arithmetic operation :- It consist of all the arithmetic operation like +, -, ×, ÷, . and it also performs the operation in a "logical" pattern as greater than, >, <, >=, <= etc such operations are Data processing instrucn operatn.

- ① Data storage :- with the help of storage the data gets stored into the registered and the memory also such type of instruction is termed as data storage instruction.
- ② Data movement :- with the help of data movement we can move the data from one place to another.
- ③ program flow control :- We can represent the flowchart for giving the instruction flow therefore with the help of this pattern we can represent the flow diagram in a very easy manner.

This instruction type can handle bulk of data in a easiest way.

* Addressing mode

The methods which are used to specify the data of the instruction set therefore such type of the method is termed as addressing mode.

Addressing mode are the very important factor which is used to handle all types of the mechanism related to the instruction set.

There are five types of Addressing Mode.

- ① Immediate addressing mode
- ② direct Addressing mode
- ③ Register Addressing mode
- ④ Register indirect Addressing mode
- ⑤ Implied Addressing mode

Immediate Addressing Mode

Instruction	
opcode	operand

Immediate Addressing Mode

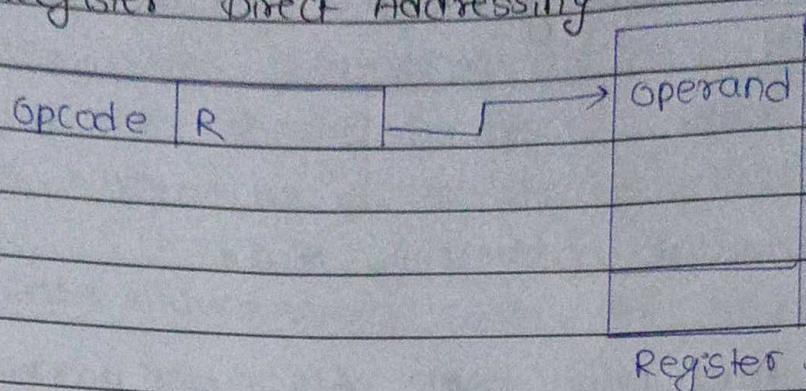
Every instruction consist of two part that is opcode and operand. opcode stands for 'symbol' like +, -, x ÷ and operand stand for 'variable' therefore whenever we apply the direct instruction to which we have to perform the operation then such type of addressing mode is termed as Immediate addressing mode where the instruction is given in the direct manner.

Direct Addressing Mode :-

Instruction		Address	Memory
Opcode	Address		operand

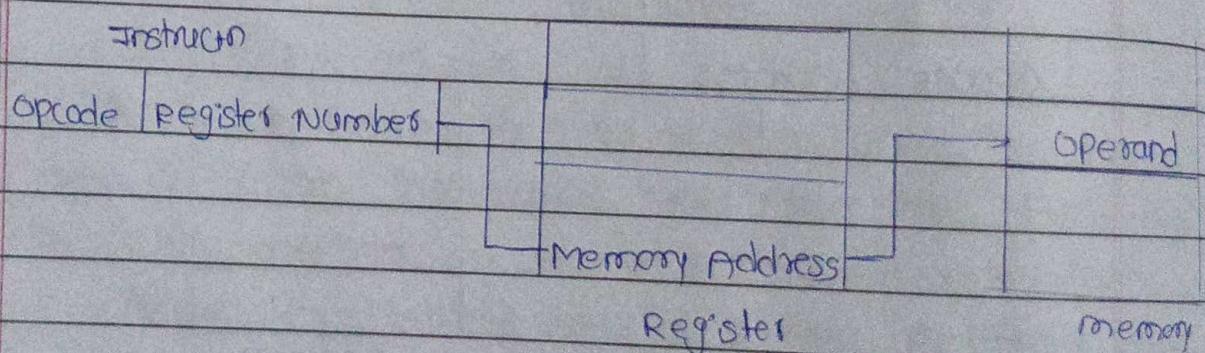
In this case Address the specifies where our operand is stores inside the memory therefore such type of direct address given mode is termed as direct addressing mode.

Register Direct Addressing Mode



In this case the operands are hidden behind the register therefore whenever we will click on the register directly our cursor moves to the operand which is placed inside register set, therefore such type of the addressing mode is termed as register direct addressing mode.

Register Indirect Addressing Mode



In this case we have register number in place of operand therefore whenever we click on the register number at the time our cursor moves on to the memory addressed which is placed inside the register therefore whenever we click on memory address at the time we can directly move on to the operand where the exact instruction variable gets stored.

such type of the addressing mode is termed as registers & indirect addressing mode.

Implied Addressing Mode

OPCODE

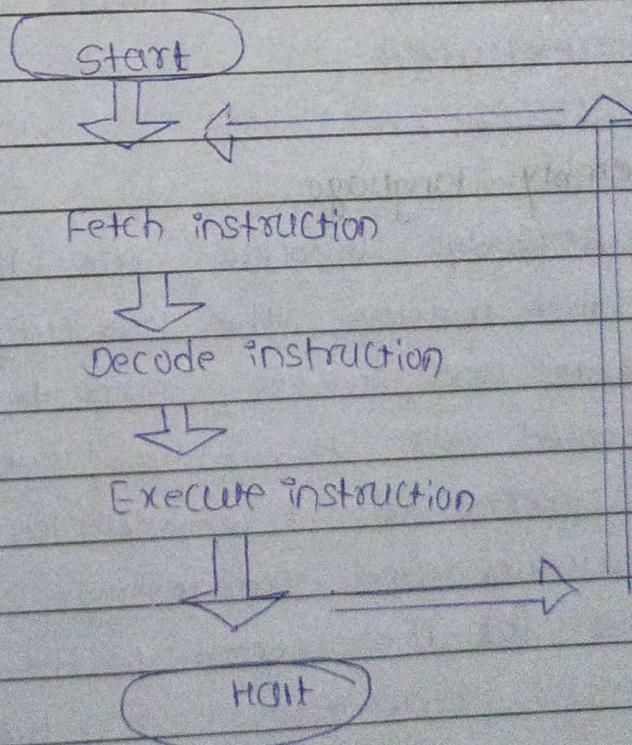
OPERAND

Implied Addressing mode

In case of implied addressing mode the operand is placed inside the opcode therefore such type of the addressing mode is termed as implied addressing mode where the opcode itself consisting of operand.

* Instruction execution *

The execution of instruction set is as follows



- ① firstly all the instruction are combine together and placed at the start step when the instruction is send to the such instance at that time the opcode and operand are detected.
- ② S fetch instruction will send the instruction to the decode instruction , the decode instruction will take out the numbers from the operand after wards the decode instruction will send to the execution step the cycle will goes on repeating until the entire operation gets takes place . when the execution is completed entirely at that time the entire the instruction set will get halt . In this way the instruction gets executed.

Assembly language

Assembly language are the low level languages that means the languages which uses symbols and labels such type of the language is termed as Assembly language there are two parts of assembly language i.e instruction and addresses , instruction stands for the work to be done and addresses will gives us the value on which we are going to perform ^{the} operation.

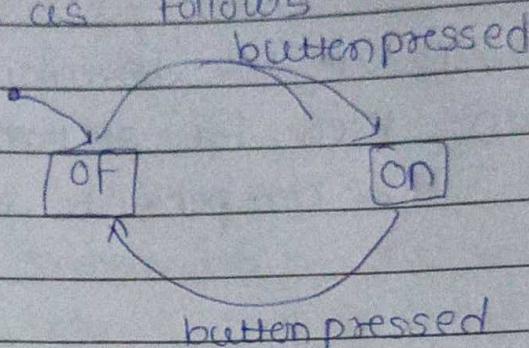
There are four types of component

- ① values
- ② symbols
- ③ labels
- ④ macros

- ① **values**:- values may be the constants or the expression.
 - ② **symbols** Symbols are the symbolic representation which we can used for performing the operation such type of the component is termed as symbols.
 - ③ **labels** Labels are the address on which we can perform the operation therefore such type of addresses location is termed as label.
 - ④ **macros** Macros are the shortest definition to be provided for performing the operation there are three components are macros.
-
- ① **Instruction** Instruction are the commands through which we can perform the operation.
 - ② **shouldo** Shouldo instruction are the simple code which is used in order to placed the working process.
 - ③ **Raw data** Raw data is the collection of information which get combine together.
we can not make use of dot symbol in order to perform the operation therefore such type of the parameter is termed as assembly languages.

* Machine state *

The diagrammatic representation machine state is as follows



Machine state is a particular concept showing our computer that whether it is in a on state and it is in a off state therefore such type of this status known concept of the computer system is termed as machine state. In this concept button pressed is used in order to turn making computer on or off therefore such type of the notation of the computer through this button it is known as machine state.

The working of machine state is as follows :-

- ① firstly the buttonpress is function is called and on the basis of this function the button gets on
- ② when the button is completely on at that time we can perform all the required necessary operation related therefore such type of the operation gets done in a very fast manner at that time we have to call the buttonpress the function to off the

entire the circuit therefore such type of ammeter is termed as the machine state.

* Processor status *

Diagrammatic representation of processor status are as follows

The operation of processor status is basically performed on the basis of five points or five components

- ① Negative / less than :- This type of component is basically used to keep to the instruction which is less than zero.
 - ② z component : . z stand for zero whenever we have the instruction equal to zero then it is considered as zero component.
 - ③ c component : if we have perform any operation of addition , subtraction and in this concept

if we are applying any carry bit then it comes under C component.

V comp. = V stands for over flow - when the instructions are properly working and it is completely fulfill even after some instructions are deposited into it then such type of the condition is termed as overflow.

O :- O stands for sticky over flow that means the data is completely instruction and you applied the data on it even after the instructions are depositing again therefore such type of component is known as sticky overflow.

We also have the new component which is stand for GE here all the instruction whose value is greater than or equal to zero then this type of material is placed inside the component known as 'GE'.

Data endianness bit stands for all the instruction to be placed in a proper sequence such type of the pattern is termed as data endianness bit. In this way the processor status gets work.

Types of operation

There are eight type of operation in instruction set

- ① Arithmetic and logical operation :- with the help of it all the arithmetic operation gets performed like +, -, ×, ÷ and operation like <, >, <=, >= etc
- ② Data transfer :- with the help of data transfer operation we can transfer the data from one place to another.
- ③ Control operation :- control operation will perform the operation of controlling that is branch, return etc
- ④ System :- system operation will manages the entire operations related to the computer like operating system, virtual memory and management instruction
- ⑤ Floating point operation :- floating point operation will consist of decimal point data that mean add, +, -, etc
- ⑥ Decimal operation :- in case of decimal operation the data of real number and the float number is used
- ⑦ String :- string stands for the combination of character therefore all the string related

operation gets performed.

Graphics: Graphics stand for all the operation related to the images, shapes as well as the new graphic concept therefore it is termed as the graphics operation.

* Structure of program * in instruction Set *

The general structure of writing the instruction set program is depends upon the four parameters.

① **OP CODE :-** OP code stands for the symbol which are the operator with the help of which we can perform the operation therefore the symbol which is used in order to provide operations in arithmetic manner therefore such type of the symbols which is used is termed as the opcode.

② **Address 1 :** Address 1 is the particular type of input parameter which is used to give the address of sending the source data therefore we can say that address 1 is the basic address of destination location computer therefore it is termed as source address also.

③ **Address 2 :** Address 2 is the address of the destination location which is used to retrieve the final output. Here address 2

is also known as Secondary address which is used to store the output of the data therefore the such type of the port address is known as final detected address result.

Operand: operand is the variable names which are used to perform any type of operation therefore operation is one of the parameters which is only done by the operand.

operand can be immediate value, direct value as well as the register value also therefore such type of parameter is termed as operand.

Let's take an example of immediate addresses which perform the operation related to the structure of program.

Format:	MIPS32	Add	Immediate	Instruction
	00110000 Op code	00001 Addr 1	00010 Addr 2	0000000101011110 Immediate value

Equivalent mnemonic: add \$r1, \$r2, \$r3 \$350

This type of the struc. is always used in order to perform any type of operation in the instruction set.