



# **SNS COLLEGE OF ENGINEERING**

**Kurumbapalayam (PO), Coimbatore - 641 107**

**Accredited by NAAC-UGC with 'A' Grade**

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## **DEPARTMENT CSE (IoT)**

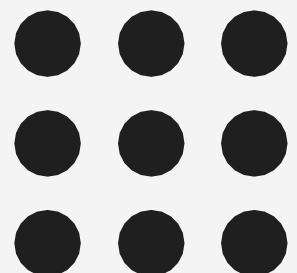
**COURSE NAME: 23ITT201 DIGITAL PRINCIPLES AND**

**COMPUTER ORGANIZATION**

**II YEAR/ III SEM**

### **Unit 3 : COMPUTER FUNDAMENTALS**

**Instruction Set Architecture (ISA)**

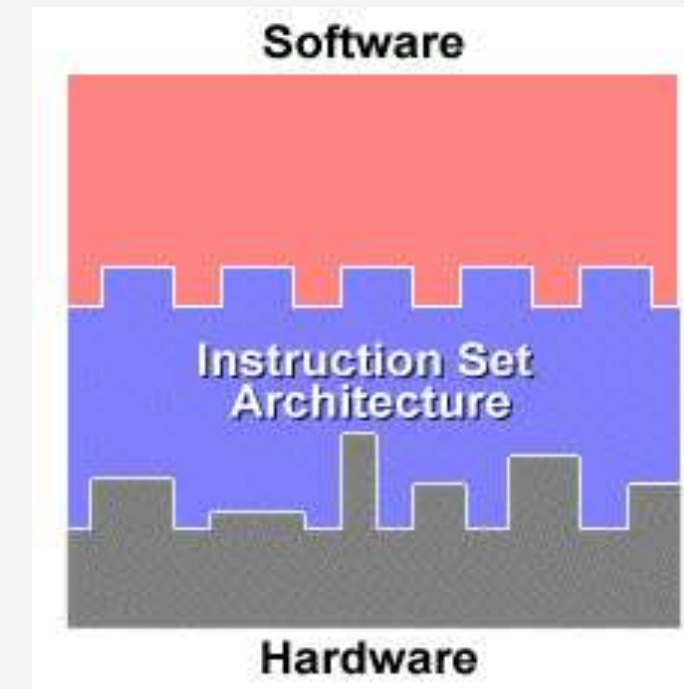


**23ITT201 / DP & CO / D.KAVITHA/AP/CSE(IoT) / Unit 3 / COMPUTER FUNDAMENTALS**

**10/19/2024**

# Instruction Set Architecture (ISA)

- Instruction set or instruction set architecture (ISA) is the structure of the computer that provides commands to guide the computer for processing data manipulation.
- Instruction set consists of
  - ✓ instructions
  - ✓ addressing modes
  - ✓ registers
  - ✓ interrupt
  - ✓ exception handling
  - ✓ memory architecture



Instruction set of Processor

# RISC

**RISC or Reduced Instruction Set Computer** is a type of microprocessor architecture that utilizes a small, highly-optimized set of instructions for processing computations.

- It is also called as LOAD/STORE architecture
  - Divides instruction into memory access and ALU operations
- The IBM was the first company to define the RISC architecture in the 1970s.
- This research was further developed by the universities of Berkeley and Stanford to give basic architectural models.



A Sun UltraSPARC,  
a RISC microprocessor



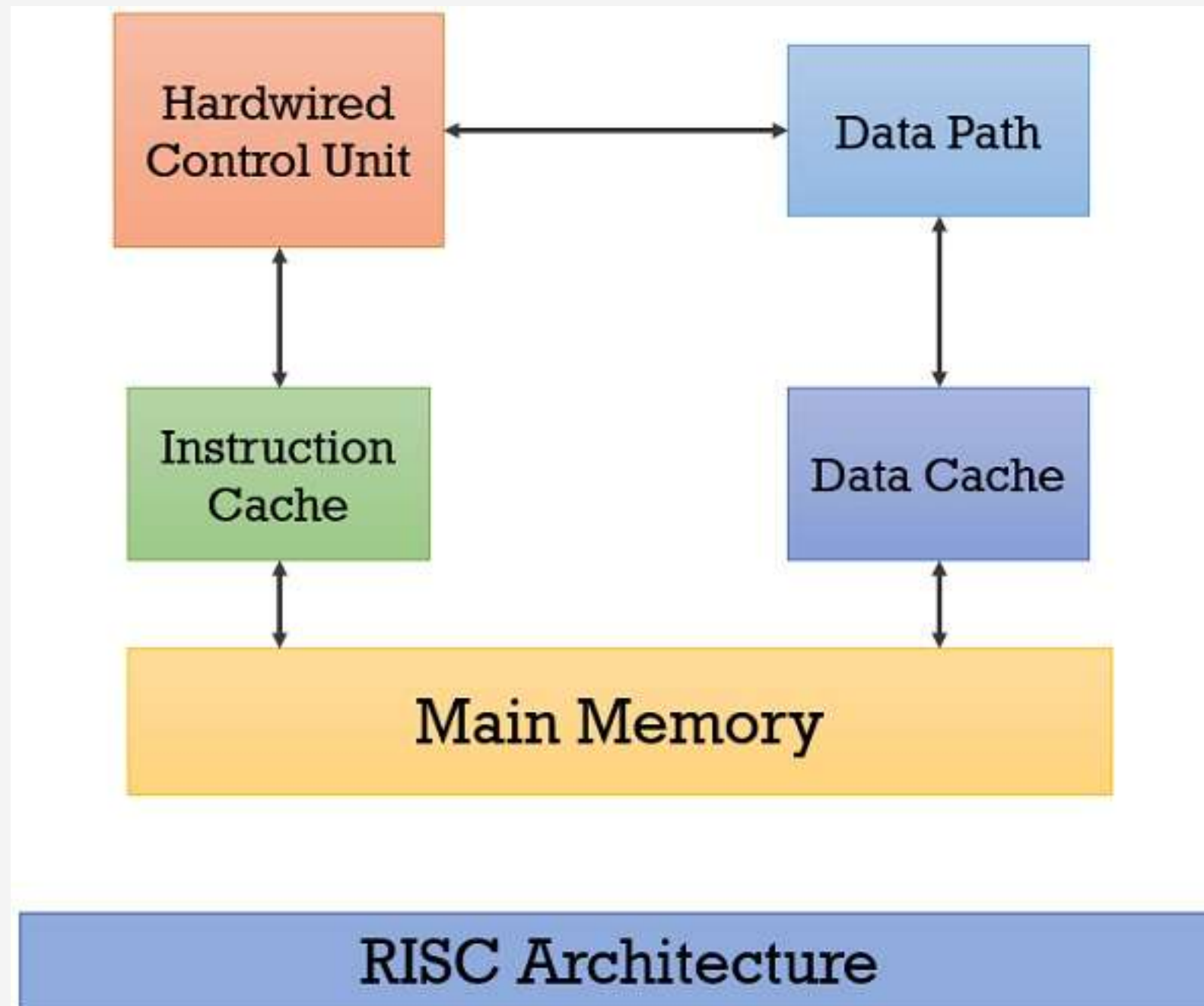
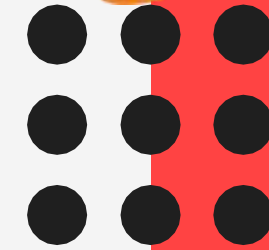
# Characteristic/features of RISC processors



- Low number of clock cycles per instruction (CPI)
- Large number of registers(32 or more)
- Instruction pipeline
- Simple addressing modes



# RISC Processor Architecture

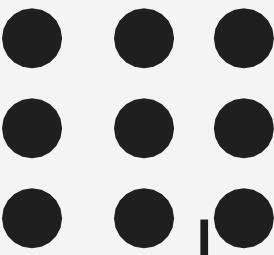


- Hardwired is a circuitry approach generates the control signals to fetch and execute instructions.

Examples: MIPS, PowerPC, SUN SPARC, Alpha, RISC-V, ARM(Advanced RISC Machine)



# Advantages of RISC Processor



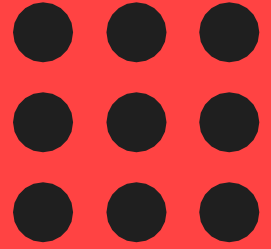
- RISC instructions are simpler machine instruction
- RISC instructions are hardwired to fasten the execution
- Very less number of instruction formats (less than four), a few number of instructions (around 150) and a few addressing modes (less than four) are needed
- Register based instructions
- Less design complexity



# Disadvantages of RISC Processor



- The machine instructions are hardwired in RISC so, it would cost if any instruction needs modification
- RISC instructions do not allow direct memory to memory transfer, it requires Load and Store instructions to do so.
- RISC instruction size is reduced but more instructions are required to perform an operation



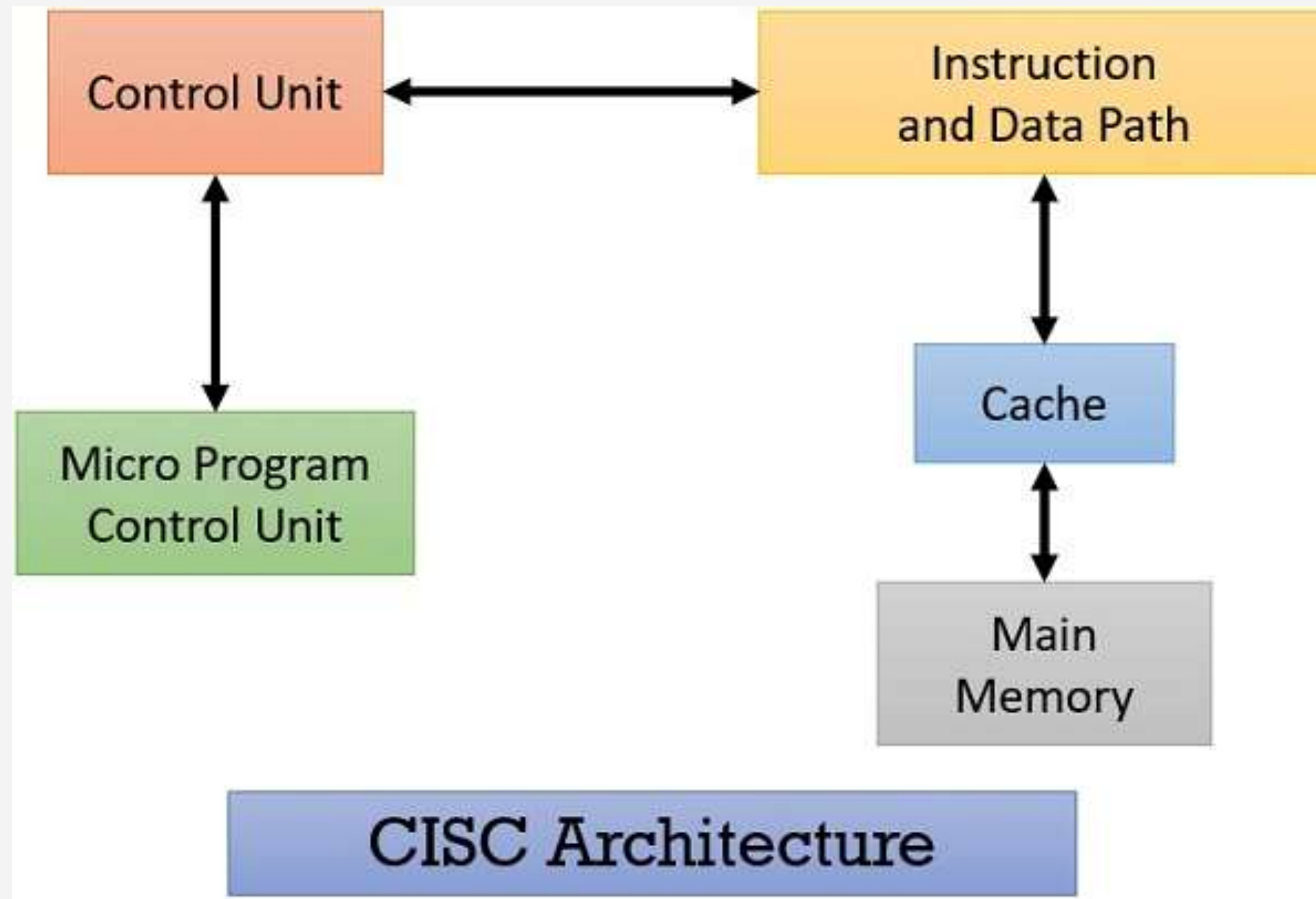
# CISC

- CISC(Complex Instruction Set Computer) processor architecture completes the task by reducing the number of instructions in a program
- Since program/software is simplified, hardware is complex to perform complex tasks

## Features of CISC Architecture

- More number of predefined instructions which makes high level languages easy to design and implement.
- Less number of registers and more number of addressing modes, generally 5 to 20.
- Takes varying cycle time for execution of instructions – multi-clock cycles.
- Complex instruction set make the pipelining technique difficult.
- CISC consists generally from 100 to 250 instructions

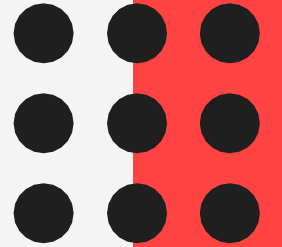




Microprogram control unit uses a series of microinstructions of the microprogram (instructions are like small programs) and generate the control signals.

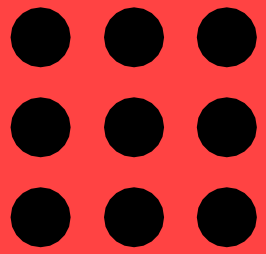


# Example



Examples of CISC Processors are:

IBM 370/168, VAX 11/780, Intel 80486.



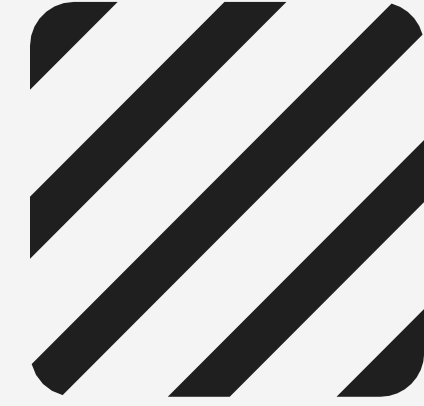
# Advantages



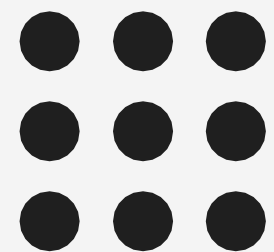
- The code size is comparatively shorter which minimizes the memory requirement.
- Execution of a single instruction accomplishes several low-level tasks.
- Complex addressing mode makes the memory access flexible.
- CISC instruction can directly access memory locations.

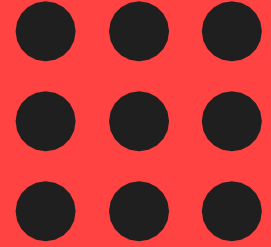


# Disadvantages of CISC



- Though the code size is minimized but it **requires several clock cycles** to execute a single instruction
- The hardware structure needs to be more complex to simplify software implementation.





# RISC vs CISC



- To perform a complex task, multiple small instructions are used together in RISC, whereas only a few instructions are required to do the same task using CISC – as it is capable of performing complex tasks
- CISC is typically used for computers while RISC is used for smartphones, tablets and other electronic devices.





# Assessment



1. The computer architecture aimed at reducing the time of execution of instructions is \_\_\_\_\_

- a) CISC
- b) RISC
- c) ISA
- d) IANA

2. The RISC processor has a more complicated design than CISC.

- a) True
- b) False



# Assessment



3. Pipe-lining is a unique feature of \_\_\_\_\_

- a) RISC
- b) CISC
- c) ISA
- d) IANA

4. Out of the following which is not a CISC machine.

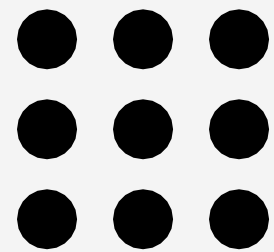
- a) IBM 370/168
- b) VAX 11/780
- c) Intel 80486
- d) Motorola A567



# Answers



1. b
2. b
3. a
4. d







Thank You