

Computer Architecture & Organization (CSE2003)

(Fall 2019-20)

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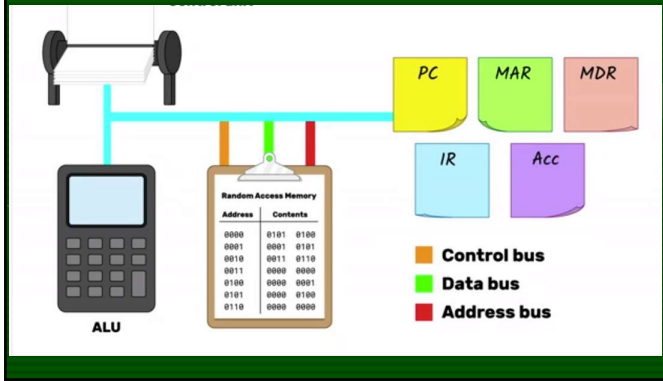
Contents

- Instruction execution / Instruction cycle
(Phases of Instruction cycle)
- Numerical Problems
- Quiz

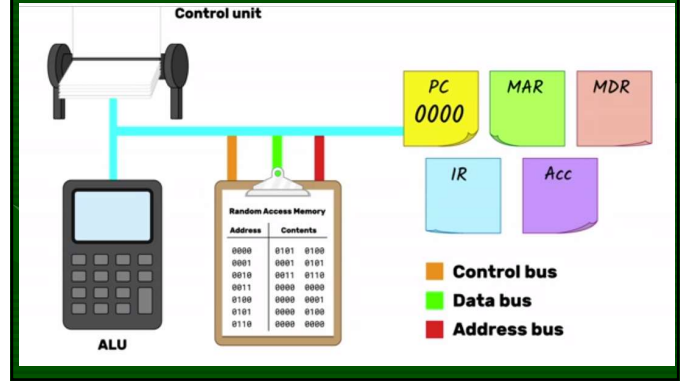
Session Objectives

- At the end of this session student will understand:
- Instruction execution through instruction cycles and also interrupt handling

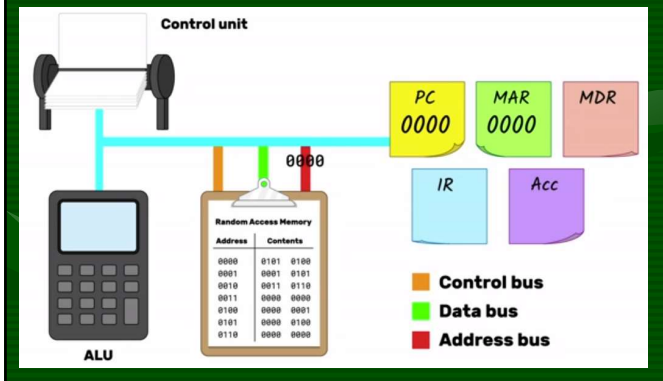
Instruction Cycle: Fetch



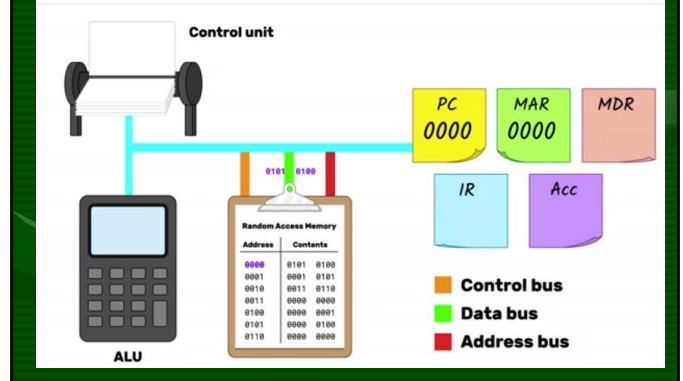
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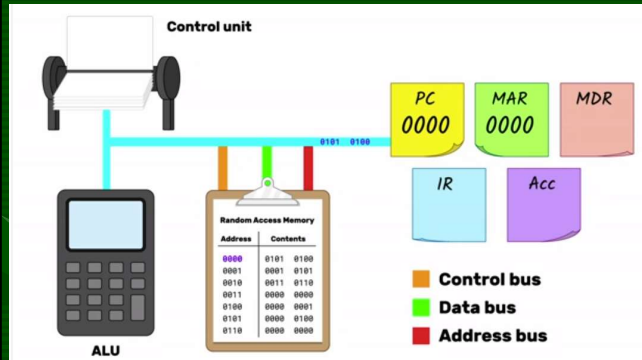
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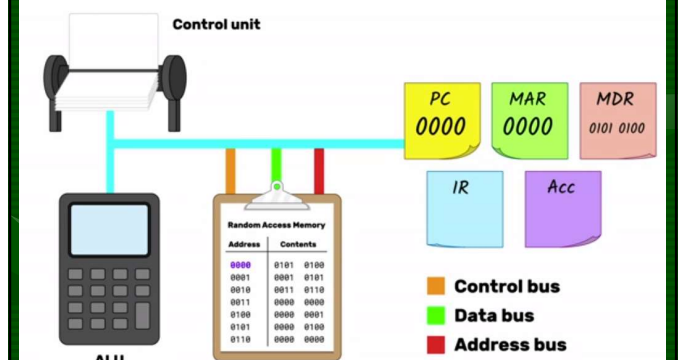
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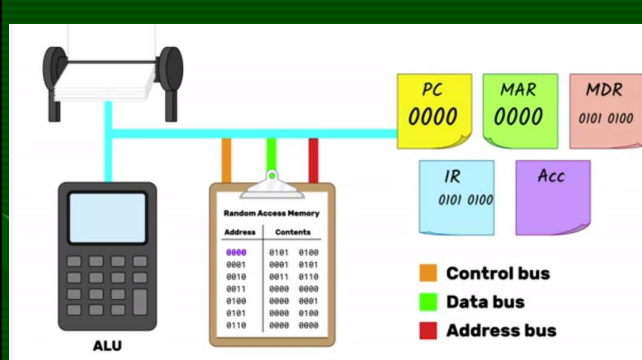
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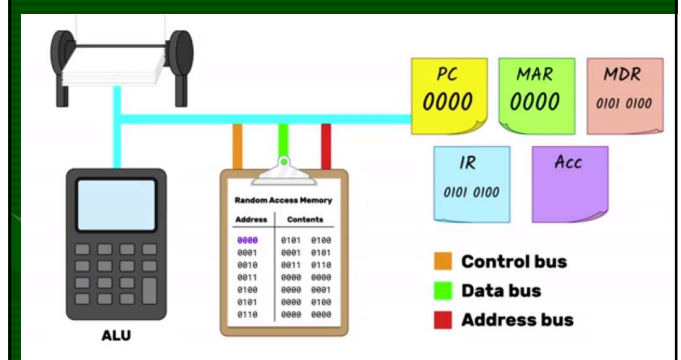
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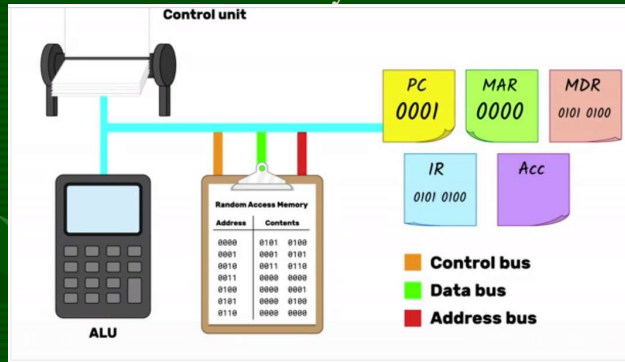
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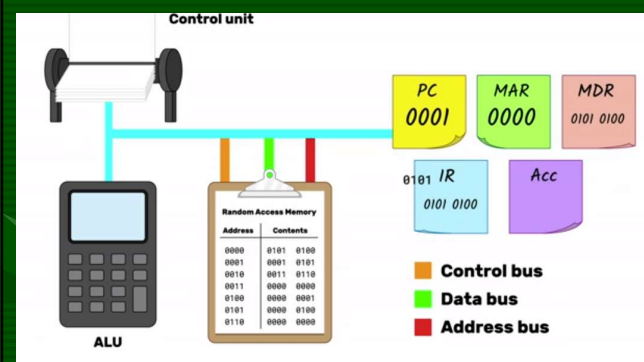
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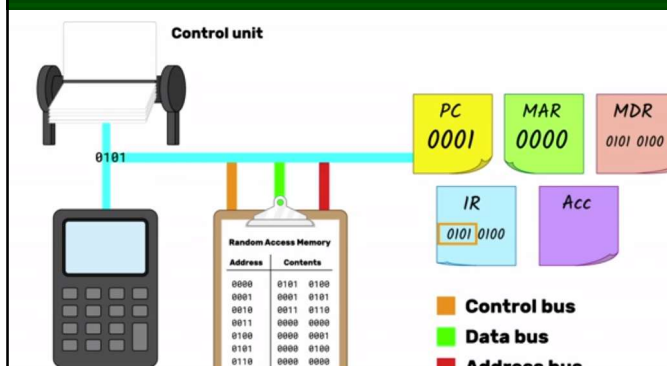
Instruction Cycle: Decode



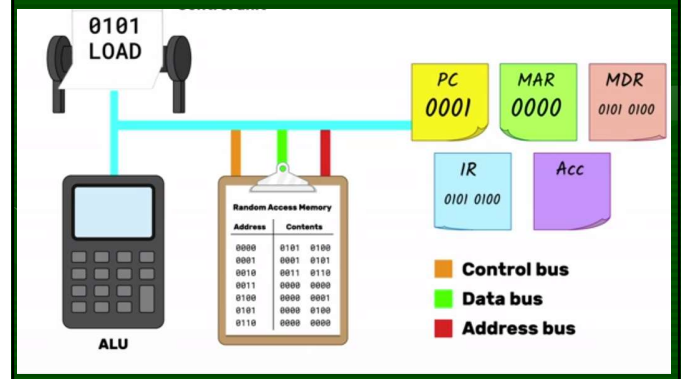
Decode



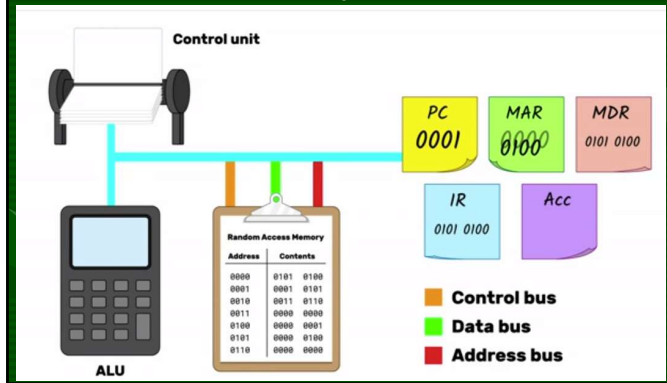
Decode



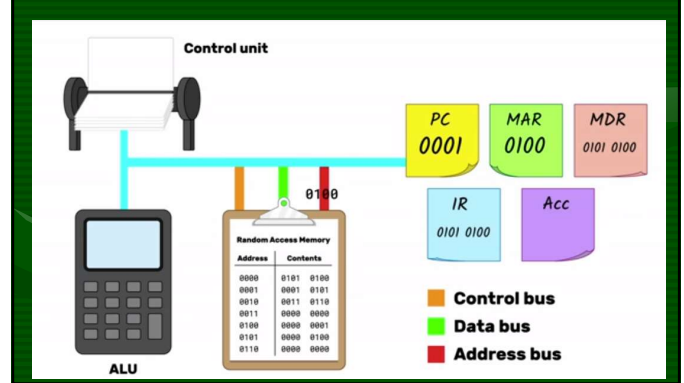
Decode



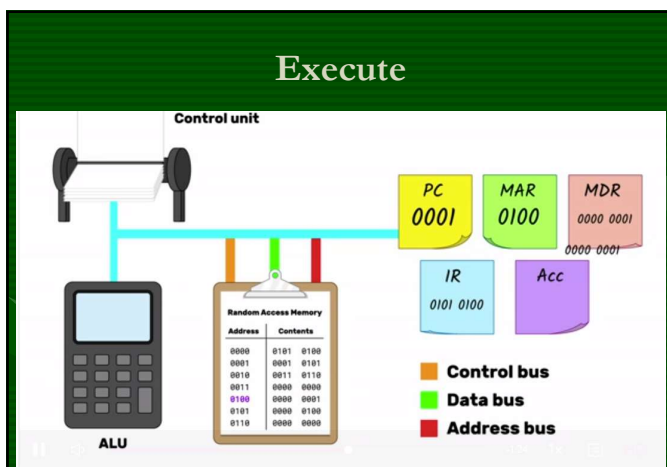
Instruction Cycle: Execute



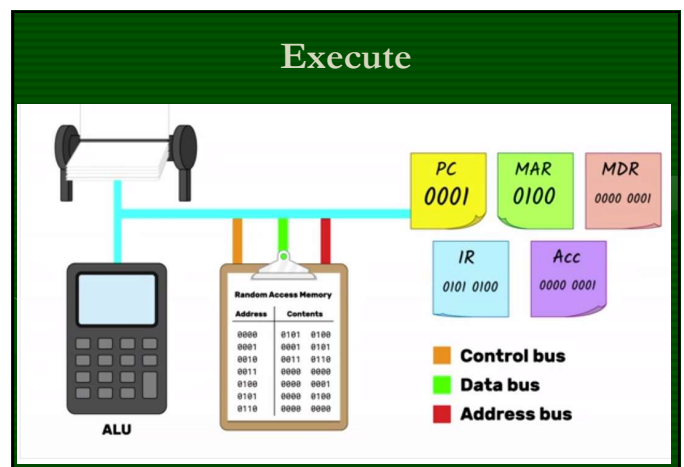
Execute



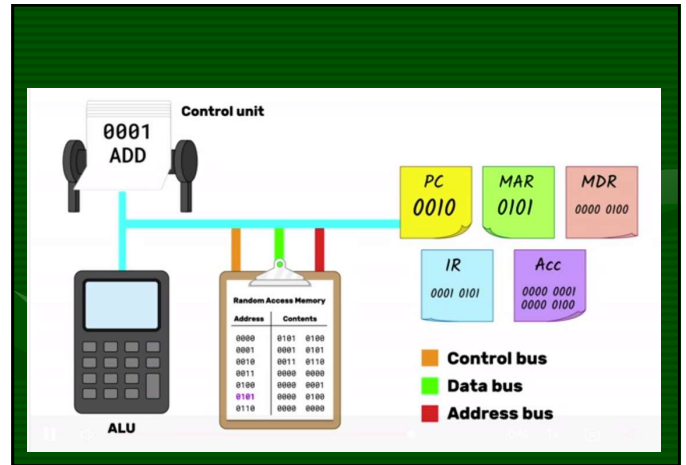
Execute



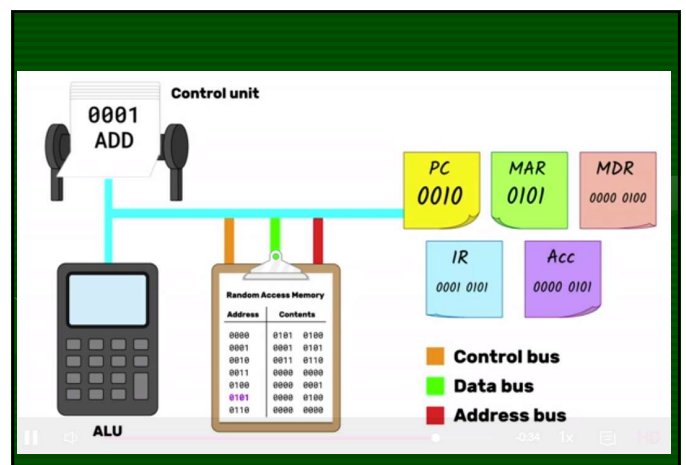
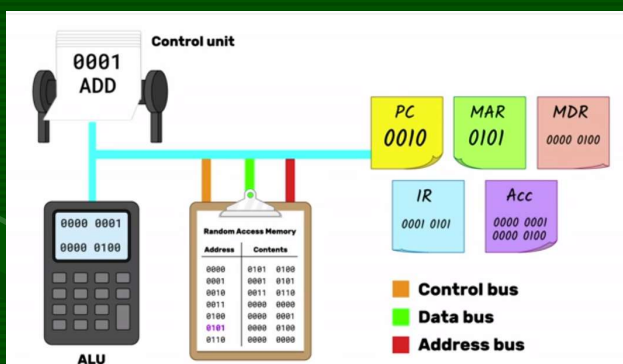
Execute



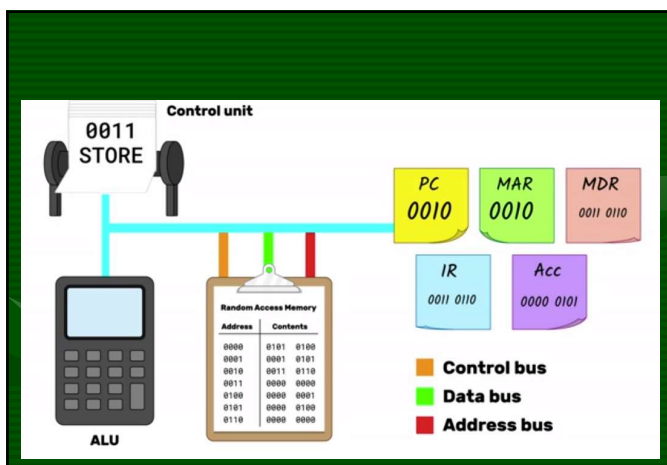
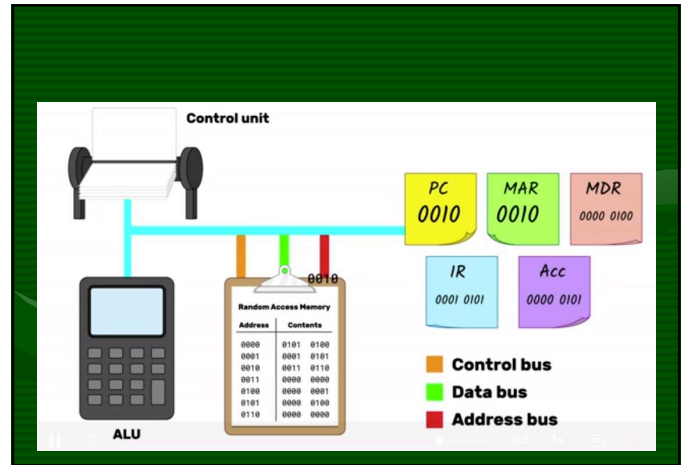
- This is one complete cycle of instruction
- Fetch – Decode - Execute



To finish the operation



- Completion of 2nd cycle



- After completion of 1 fetch cycle:
- PC = 0001

Numerical Problem

1. Write the three address instruction for the following

- $X = (A+B) \times (C+D)$

Numerical Problem

2. Write a sequence of instructions that will compute the value of $y = x^2 + 2x + 3$ for a given x using

- three-address instructions
- two-address instructions
- one-address instructions

Solution - 2

One-address instructions

- Move x
- Mult x
- Store z
- Move x
- Mult 2
- Add z
- Add 3
- Store y

Three-address instructions

- Mult z, x, x
- Mult y, 2, x
- Add y, y, z
- Add y, y, 3

Two address instructions

- Move z, x
- Mult z, x
- Move y, 3
- Add y, z
- Move z, x
- Mult z, 2
- Add y, z

3. Numerical Problem

3. A computer has 32 bit instruction and 12 bit address. If there are 250 two address instructions.

- Draw instruction format.
- How many one address instructions can be formed?
- Solution on next slide

Solution - 3

- Instruction is two address instruction format

8 bit Opcode	12 bit Address	12 bit Address
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- Answer: One address instructions = 6

4. The most appropriate matching for the following pairs is

- X: Indirect addressing
- Y: Immediate addressing
- Z: Auto decrement addressing
- 1. Loops
- 2. Pointers
- 3. Constants

- A. X-3, Y-2, Z-1
- B. X-1, Y-3, Z-2
- C. X-2, Y-3, Z-1
- D. X-3, Y-1, Z-2

Numerical Problem

- 5. A processor uses a fixed length 32-bit instruction format. The processor has 98 instructions. Instructions can have 0, 1, 2 or 3 operands.
- Assume there are 10 addressing modes.
- Opcode bits = ?
- Mode bits = ?

Contents

- Before Class Activity
- Entry Ticket
- Activity
- Lecture
- Tutorial
- Lab Exercise (Optional)
- Exit Ticket