UNIT I
BASIC STRUCTURE OF COMPUTERS

Functional units – Basic operational concepts – Bus Structures – Performance – Memory locations and addresses – Memory operations – Instruction and Instruction sequencing — Addressing modes – Assembly language – Case study : RISC and CISC Architecture.

Recall the prior Knowledge

Computer ?

Storage units

IONOS

Decimal		Binary
	Bit	
= 4 Bit	Nibble	= 4 Bit
= 2 Nibble	Byte	= 2 Nibble
= 1,000 Byte	Kilobyte	= 1,024 Byte
= 1,000 Kilobyte	Megabyte	= 1,024 Kilobyte
= 1,000 Megabyte	Gigabyte	= 1,024 Megabyte
= 1,000 Gigabyte	Terabyte	= 1,024 Gigabyte
= 1,000 Terabyte	Petabyte	= 1,024 Terabyte
= 1,000 Petabyte	Exabyte	= 1,024 Petabyte
= 1,000 Exabyte	Zettabyte	= 1,024 Exabyte
= 1,000 Zettabyte	Yottabyte	= 1,024 Zettabyte
= 1,000 Yottabyte	Brontobyte	= 1,024 Yottabyte

Why to study computer Architecture?

Structure an internal component of a computer

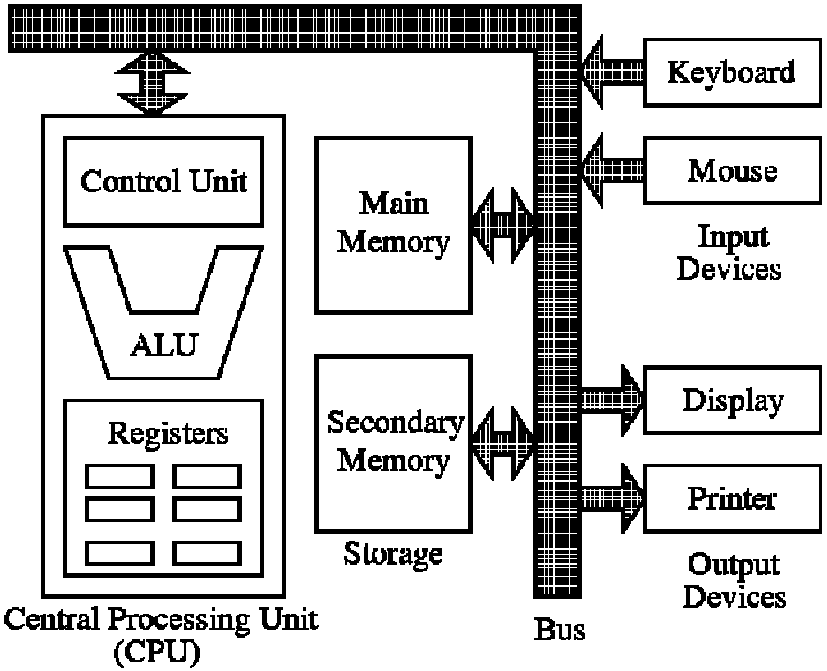
Program to realize the logics

Runs more efficiently on a real time machine

Introduction

Computer

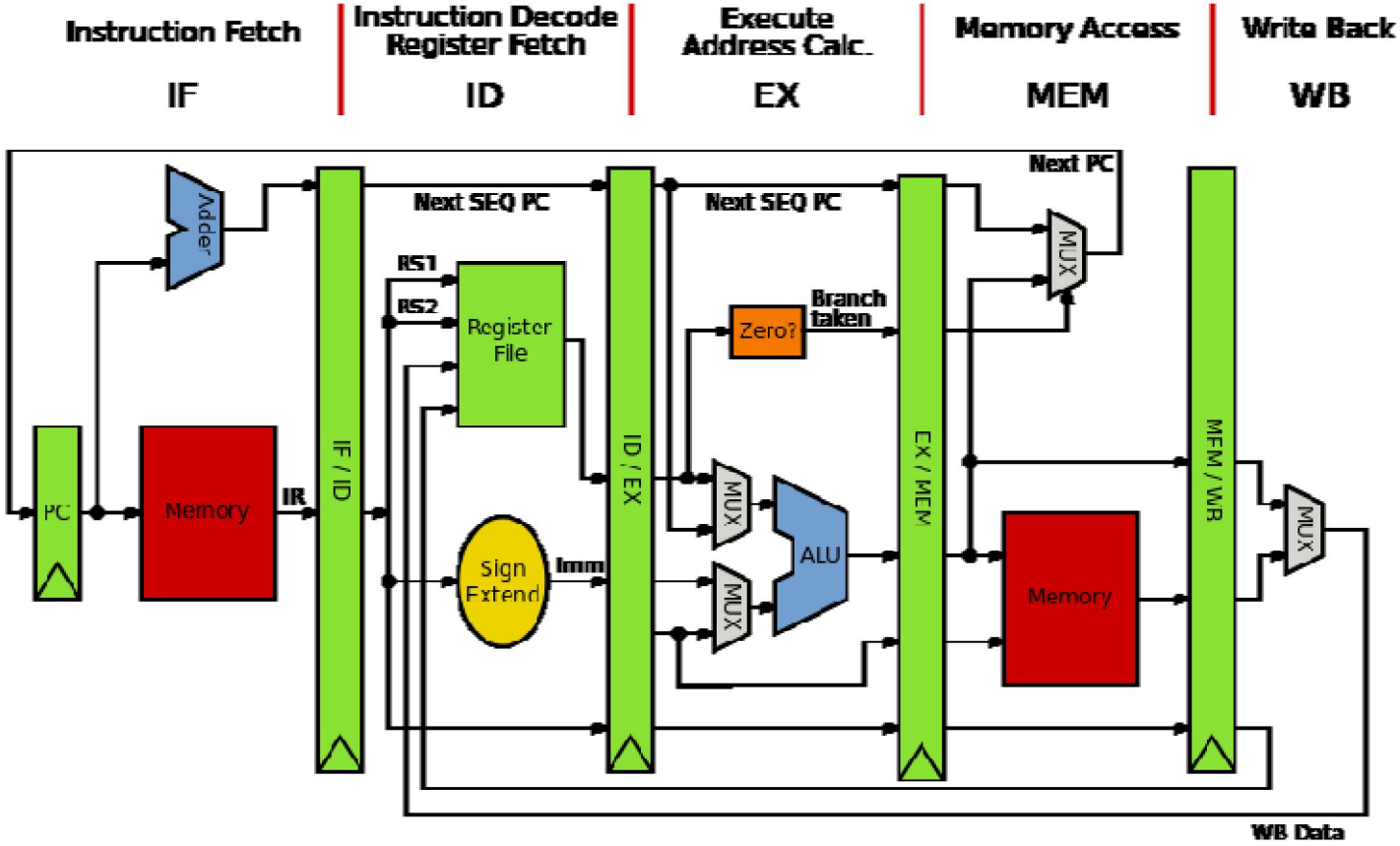
Architecture



Introduction

Computer

Architecture



Definition

- Concerned with the structure and behavior of the various functional modules computer and how they interact to provide the processing needs of the user.
- Refers to the operational units and their interconnections
- Computer is a fast electronic calculating machine which accepts digital input, processes it according to the internally stored instructions (Programs) and produces the result on the output device.

Language Conversion

High-level language program (in C)

```
swap(int v[], int k)
{int temp;
   temp = v[k];
   v[k] = v[k+1];
   v[k+1] = temp;
}
```

Compiler

Assembly language program (for MIPS)

```
swap:
        multi  $2, $5,4
        add    $2, $4,$2
        lw     $15, 0($2)
        lw     $16, 4($2)
        sw     $16, 0($2)
        sw     $15, 4($2)
        jr     $31
```

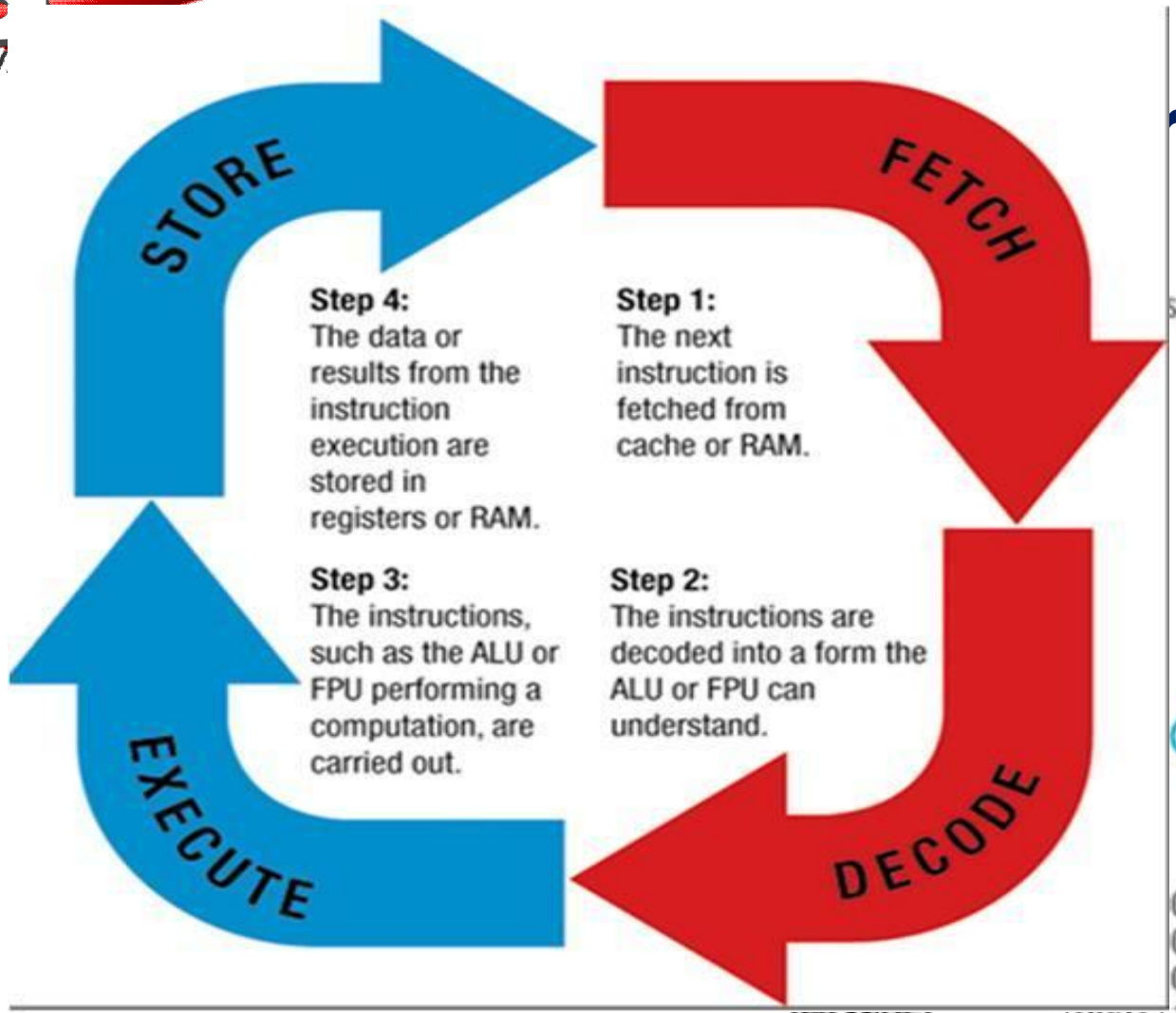
Assembler

Binary machine language program (for MIPS)

```
00000000101000100000000100011000
00000000100000100001100000100001
10001101111000100000000000000000
10001111000010010000000000000100
10101111000010010000000000000000
10101101111000100000000000000100
00000011111000000000000000001000
```

rsion

High-level language program (in C)




```
swap:
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        lw      $15, 0($2)
        lw      $16, 4($2)
        sw      $16, 0($2)
        sw      $15, 4($2)
        jr      $31
```

Assembler

```
00010001000000000100011000
00100000100001000000100001
01111000100000000000000000
10001110000100100000000000000100
10101110000100100000000000000000
10101101111000100000000000000100
00000011111000000000000000001000
```

(for MIPS)

Types of Computer

Based On Size

- ✓ Super
- ✓ Mainframe
- ✓ Mini
- ✓ Micro
  - Desktop
  - Laptop
  - Palmtop

Based On Mechanism

- ✓ Analog
- ✓ Digital
- ✓ Hybrid

Based On Purpose

- ✓ General Purpose
- ✓ Special Purpose

Computer Types

Mainframe Computer	• high capacity and costly computer • largely used by big organizations where many people can use it simultaneously.
Super Computer	• fastest and also very expensive. • can solve up to ten trillion individual calculations per second.
Workstation Computer	• high-end and expensive one. • It is exclusively made for complex work purpose.

Computer Types

Mainframe
omputer

many

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omputer

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Vorkstatio
omputer

k purpose.

Personal Computer (PC)

It is a low capacity computer developed for single users.

Apple Macintosh (Mac)

It is a sort of personal computer manufactured by Apple company.

Laptop computer (notebook)

It is a handy computer that can be easily carried anywhere.

Tablet and Smartphone

Modern technology has advanced further. It has helped develop computers that are pocket-friendly.

Personal Computer (PC)

It is a low cap

Apple Macin

It is a sort of p y.

Tablet

Laptop comp

It is a handy c

Tablet and S

Smartphone

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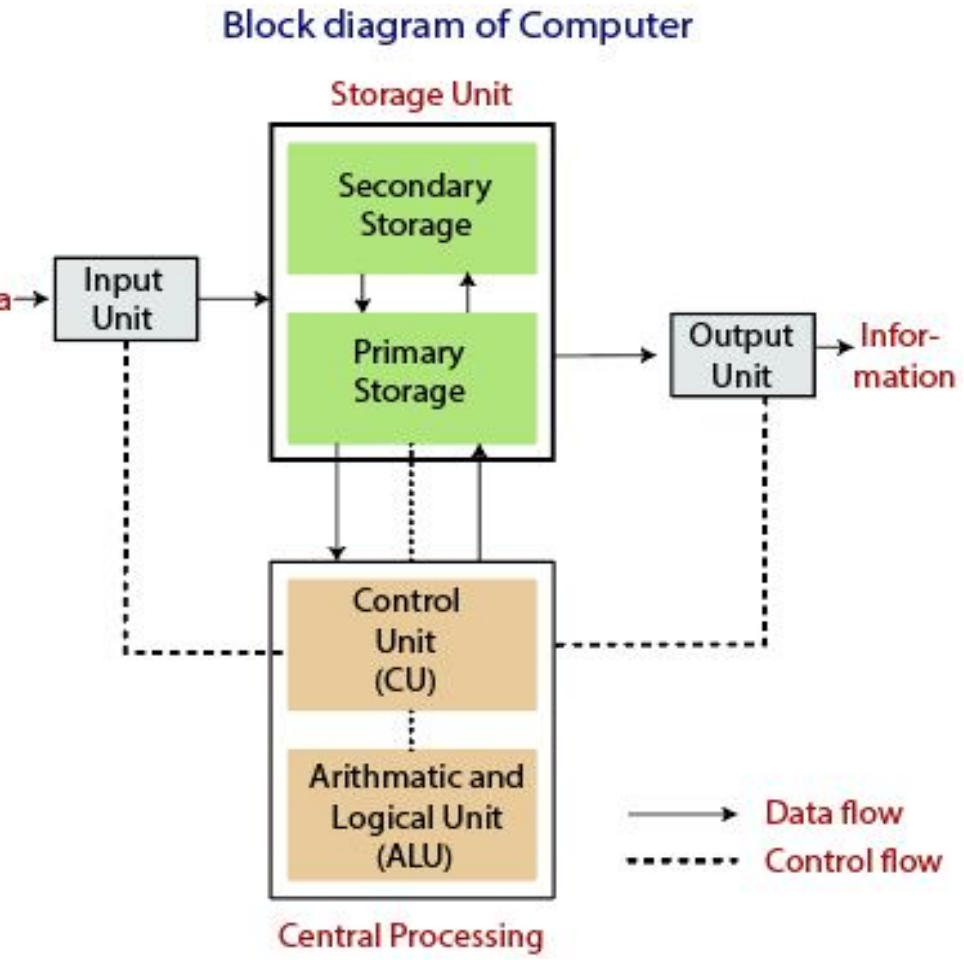
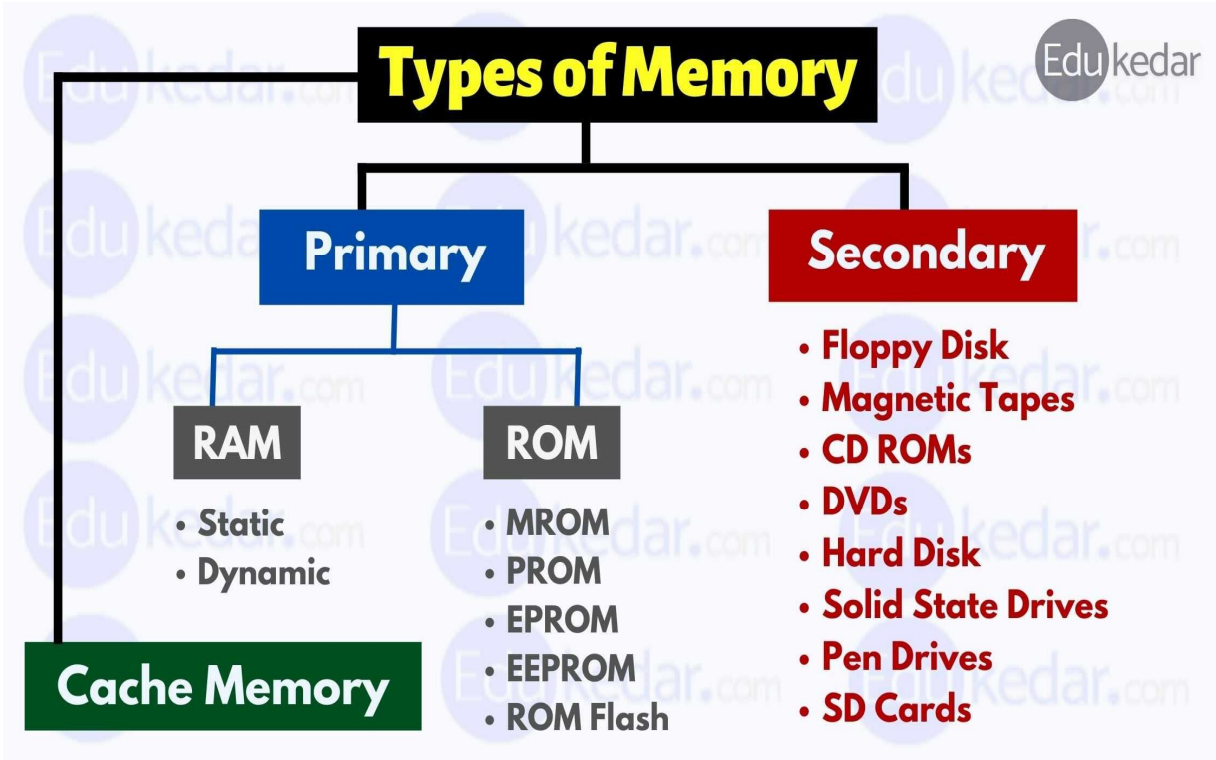
Generations of computers	Generations timeline	Evolving hardware
First generation	1940s-1950s	Vacuum tube based
Second generation	1950s-1960s	Transistor based
Third generation	1960s-1970s	Integrated circuit based
Fourth generation	1970s-present	Microprocessor based
Fifth generation	The present and the future	Artificial intelligence based

Functional Unit





Basic Operational Concepts

- Instruction consists of 2 parts

- Example

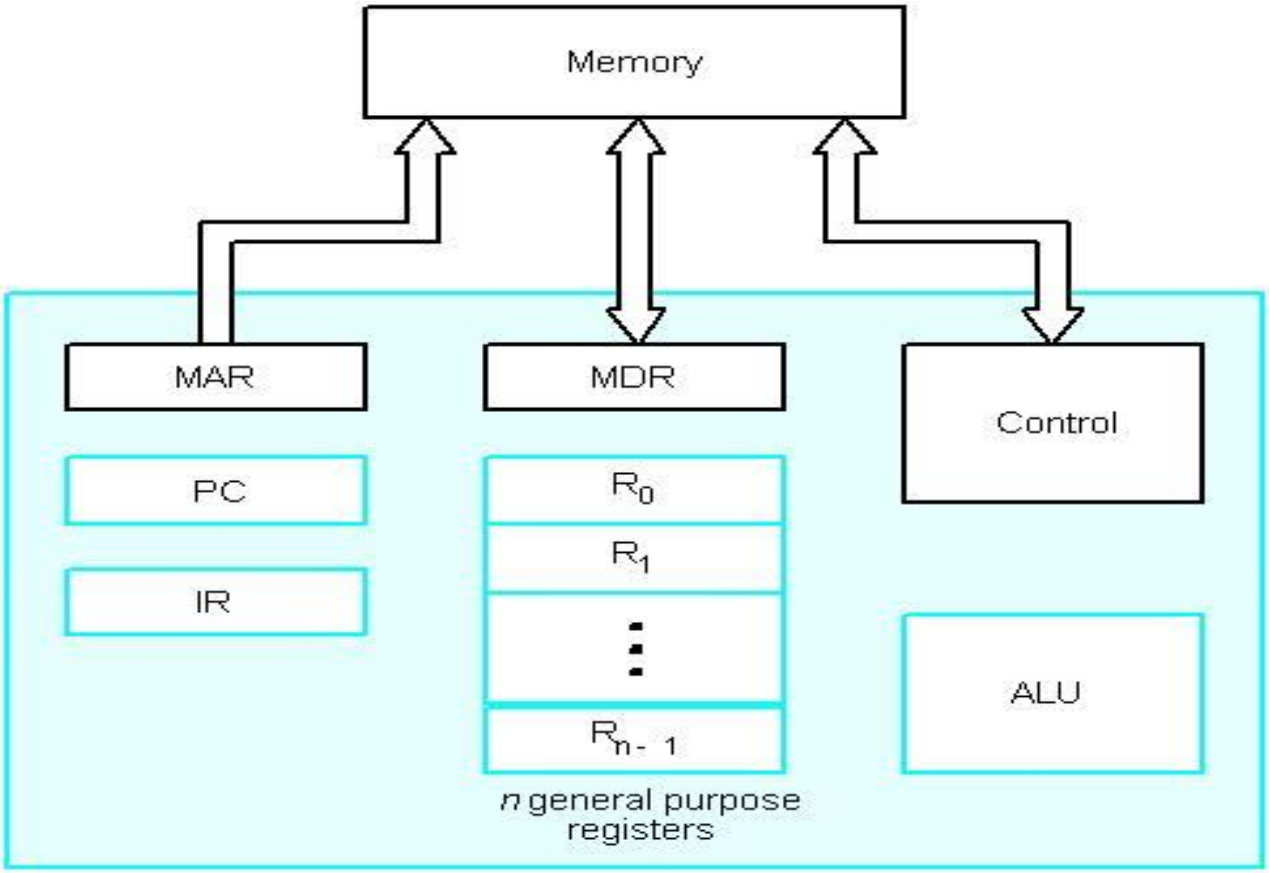
```
ADD   LOCA, R0
```

```
Load LOCA, R1
Add R1, R0
```

Basic Operational Concepts

- Instructio
- Example

ADD



TEXT BOOK

Carl Hamacher, Zvonko Vranesic and Safwat Zaky, “Computer Organization”, McGraw-Hill, 6th Edition 2012.

REFERENCES

1. David A. Patterson and John L. Hennessey, “Computer organization and design”, MorganKauffman ,Elsevier, 5th edition, 2014.
2. William Stallings, “Computer Organization and Architecture designing for Performance”, Pearson Education 8th Edition, 2010
3. John P.Hayes, “Computer Architecture and Organization”, McGraw Hill, 3rd Edition, 2002
4. M. Morris R. Mano “Computer System Architecture” 3rd Edition 2007
5. David A. Patterson “Computer Architecture: A Quantitative Approach”, Morgan Kaufmann; 5th edition 2011

THANK YOU