Department of Computer Science
2nd Year Bachelor's Degree
Computer Architecture

Tutorial Series N°1

Exercise 1 : Match the following terms to their respective definitions

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1. Control Unit	8. Assembler
2. Transistor	9. Cache
3. Embedded System	10. DRAM
4. Digital Video Disk (DVD)	11. Abstraction
5. Instruction Set Architecture	12. Datapath
6. Server	13. Integrated Circuit
7. Cache	14. Chip

a) Approach to hardware or software design. The system consists of layers, with each lower layer hiding details from the upper level.
b) Computer inside another device used to run a predetermined application or collection of software.
c) Interface that the hardware provides to low-level software.
d) Integrated circuit commonly used to build main memory.
e) Small, fast memory that acts as a buffer for the main memory.
f) Component of the processor that performs arithmetic operations.
g) Component of the processor that tells the datapath what to do according to the instructions of the program.
h) On/Off switch controlled by electricity.
i) Computer used to run large programs for multiple users simultaneously and typically accessed only via a network.
j) Optical storage medium with a storage capacity of more than 4.7 GB.
k) Program that converts symbolic versions of instructions into their binary formats.
l) Specialized circuit with a small amount of ultra-fast memory to make frequently requested information immediately accessible to the processor.
m) Integrated circuit commonly used to build central memory.
n) Set of circuits etched onto a silicon wafer.

Exercise 2 : Find the word or phrase that best matches the following descriptions:
a) Program that manages the resources of a computer for the benefit of the programs that run on that machine.
b) Program that translates from a high-level notation to assembly language.
c) Component of the processor that tells what to do according to the instructions.
d) Interface that the hardware provides to the software.
e) Computer inside another device used for running one predetermined application or collection of software.

Exercise 3 :
1. Explain the main differences between high-level languages, assembly language, and machine language.
2. Name the main components of a computer and describe their role in data processing.
3. Explain the role of the bus in communication between these components.
4. Identify and explain two major improvements in computer technology over the past decades.
5. How do these improvements affect the performance of programs written in assembly language?
6. What is the width of a processor that has 64 bits for the data buses and 32 bits for its internal registers?
7. Complete the following diagram - Von Neumann machine ? (fill in the empty boxes)
8.
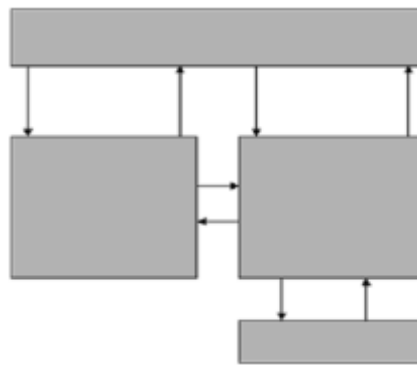
9. Complete the following text: **Von Neumann Architecture vs. Harvard Architecture**
   The Von Neumann architecture is similar to the Harvard architecture, with the difference that it uses ▮▮▮▮▮ to perform both instruction fetches and data ▮▮▮▮▮. Therefore, operations must be ▮▮▮▮▮. The Harvard architecture, on the other hand, uses ▮▮▮▮▮ memory addresses for data and ▮▮▮▮▮, allowing data to be fed ▮▮▮▮▮ into both buses. However, the ▮▮▮▮▮ architecture only adds to the development cost of the control unit compared to the lower development ▮▮▮ of the less complex Von Neumann architecture, which uses a single unified cache.

Exercice 4 :
Given a magnetic disk with the following properties: Rotation speed = 7200 RPM (rotations per minute), Average seek = 8 ms, Sector = 512 bytes, Track = 200 sectors. Calculate the following:
   a) Time of one rotation (in milliseconds).
   b) Average time to access a block of 32 consecutive sectors.

Exercice 5 :
Perform the following operations and indicate if there is an overflow or a carry.
   1. Binary addition: 11010010 + 10111101
   2. Hexadecimal addition: A1CF + B2D3
   3. Binary subtraction: 11010010 - 10111101
   4. Hexadecimal subtraction: 71CF - B2D3