DW N° 04 (Central Memory)

Exercise 01:

A/

What do the terms RAM and ROM mean?

What are the main differences between RAM and ROM? Where is ROM used?

B/ Answer true or false, and justify your answers:

a- RAM is non-volatile memory.

b- ROM is characterized by long access times compared to other types of memory.

C/ Given an SSD/MLC memory card with 80GB capacity and the following speeds:

220.0 MB/s in read;

472.0 Mbits/s in write.

Is it:

a) Faster in reading than writing?

b) Faster in writing than reading?

c) The information provided does not allow us to determine.

D/ Suppose a computer has 3 memory slots, one of which is occupied by a 128MB memory module. We want to increase the RAM capacity to 1GB. The supplier has offered memory modules of 128MB, 256MB, and 512MB.

a- Can we keep our existing module and add more? Why?

b- What combinations of memory modules can we use to achieve 1GB?

Exercise 02:

1. Why is main memory referred to as "volatile"?
2. What is the unit of measurement for memory capacity?
3. If my computer is 32-bit, what does that mean?
4. 256 GB = ? MB = ? KB; 64 GB = ? KB; 4096 GB = ? TB; 2048 * 280 Petabytes = ? Zettabytes; 1024 * 2120 Gigabytes = ? Yottabytes..

Exercise 03:

Suppose a computer has a main memory of 500 MB (megabyte) and uses 64-bit word lengths. How many words can this computer store in main memory?

- If a page of a novel occupies 1 KB (kilobyte), how many pages of the novel can this computer store?

- And if a photo occupies 1 MB, how many photos can it store?

- Why do we need both main memory and auxiliary memory in a computer?

- Can we use only auxiliary memory without main memory? Explain why.

Exercise 04:

A/

Associate the elements in the left column with 2 characteristics from the right column using arrows. Each element in the left column should have 2 arrows, but elements from the right column can be used multiple times or not at all.

A) PROM		1	Requires refreshing
		2	Programmable only once
		3	Is the fastest memory
B) SRAM		4	Electrically erasable with a voltage different from the power supply.
		5	Loses its content when not powered
C) DRAM		6	Retains its content even when not powered
		7	Used for cache memory

B/

Examples of memory buses (comparing memory buses): calculate the following transfer rates:

	EDO	SDRAM	SDRAM PC100	SDRAM PC2100(DDR)
Bus width (bits)	32	64	64	64
Bus frequency (MHz)	66	66	100	133
Transfer rate (MB/s)				

Examples of peripheral buses (comparing peripheral buses): calculate the following transfer rates:

	ISA	EISA	PCI	AGP	AGP 4x
Bus width (bits) (bits)	16	32	32	32	32
Bus frequency (MHz)	8.33	8.33	33.33	66.66	66.66
Transfer rate (MB/s)					

Exercise 05 (Memory Speed):

A- Consider DDR21066 memory. This memory can communicate on the FSB at a frequency of 533MHz. It can perform 2 memory transfers per clock tick, with a 64-bit bus.

1/ Calculate the maximum throughput (in MB/s) of this memory.

B- Choose the correct answer (and justify your choice):

1/ What is the size of a memory with 15 address inputs and 8 bits of data?

      a) 32 Kilobytes

      b) 64 Kilobytes

      c) 16 Kilobytes

2/ What is the capacity of a memory chip with a 14-bit address bus and an 8-bit data bus?

    a) 8 Kilobytes
    b) 16 Kilobytes
    c) 32 Kilobytes

3/ How many 10 MB files can be stored in a 1 GB space?

    a) Around 1000
    b) Around 100
    c) Around 10

Exercise 06:

Consider a computer motherboard with a microprocessor consisting of an ALU, a 16-bit ordinal counter, and an instruction register. This microprocessor is connected via a data bus with a frequency of 200 MHz to main memory with a 16-bit address space. The word size of the memory is 32 bits.

1/ What is the role and size of each of the registers (IR, PC, MAR, MIR)?

2/ What are the sizes of the data and address buses?

3/ Calculate the size of the main memory in Mega Bytes. What happens to its size if the memory address is one byte?

4/ How many memory words can be stored in this memory?

5/ Calculate the data transfer rate in MB/s offered by the data bus.