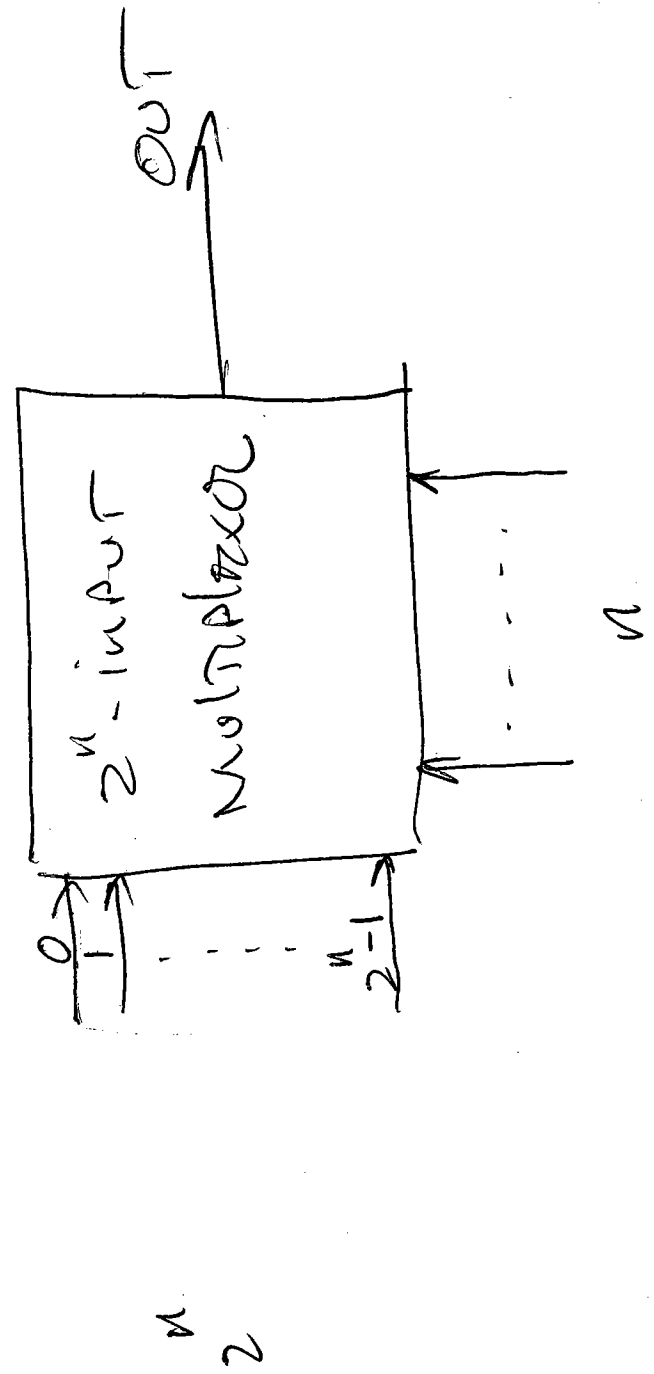


CMS 10 2-26-08



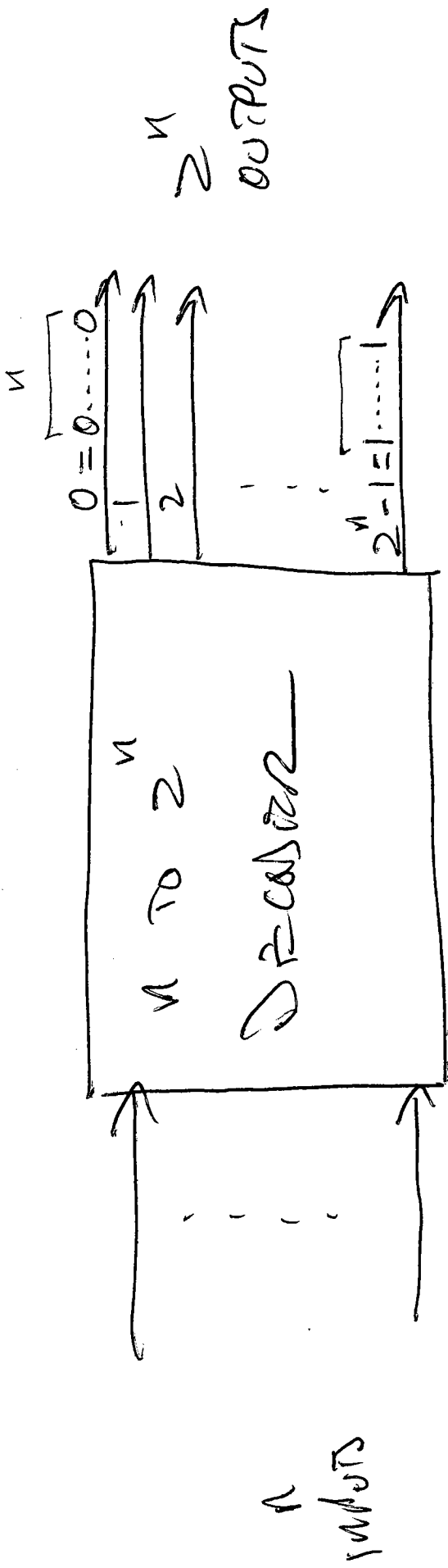
Control Circuits

Multiplexor:



DECODER

HAS n INPUTS & 2^n OUTPUTS



Ex. $n=2$, $2^2=4$ OUTPUTS

$$a=0, b=1 \Rightarrow \begin{cases} c_0=0 \\ c_1=1 \\ c_2=0 \\ c_3=0 \end{cases}$$



$$a=1, b=1 \Rightarrow \begin{cases} c_0=0 \\ c_1=0 \\ c_2=0 \\ c_3=1 \end{cases}$$

[3]

a	b	c_0	c_1	c_2	c_3
0	0	1	0	0	0
0	1	0	1	0	0
1	0	0	0	1	0
1	1	0	0	0	1

$$0 = 00$$

$$1 = 01$$

$$2 = 10$$

$$3 = 11$$

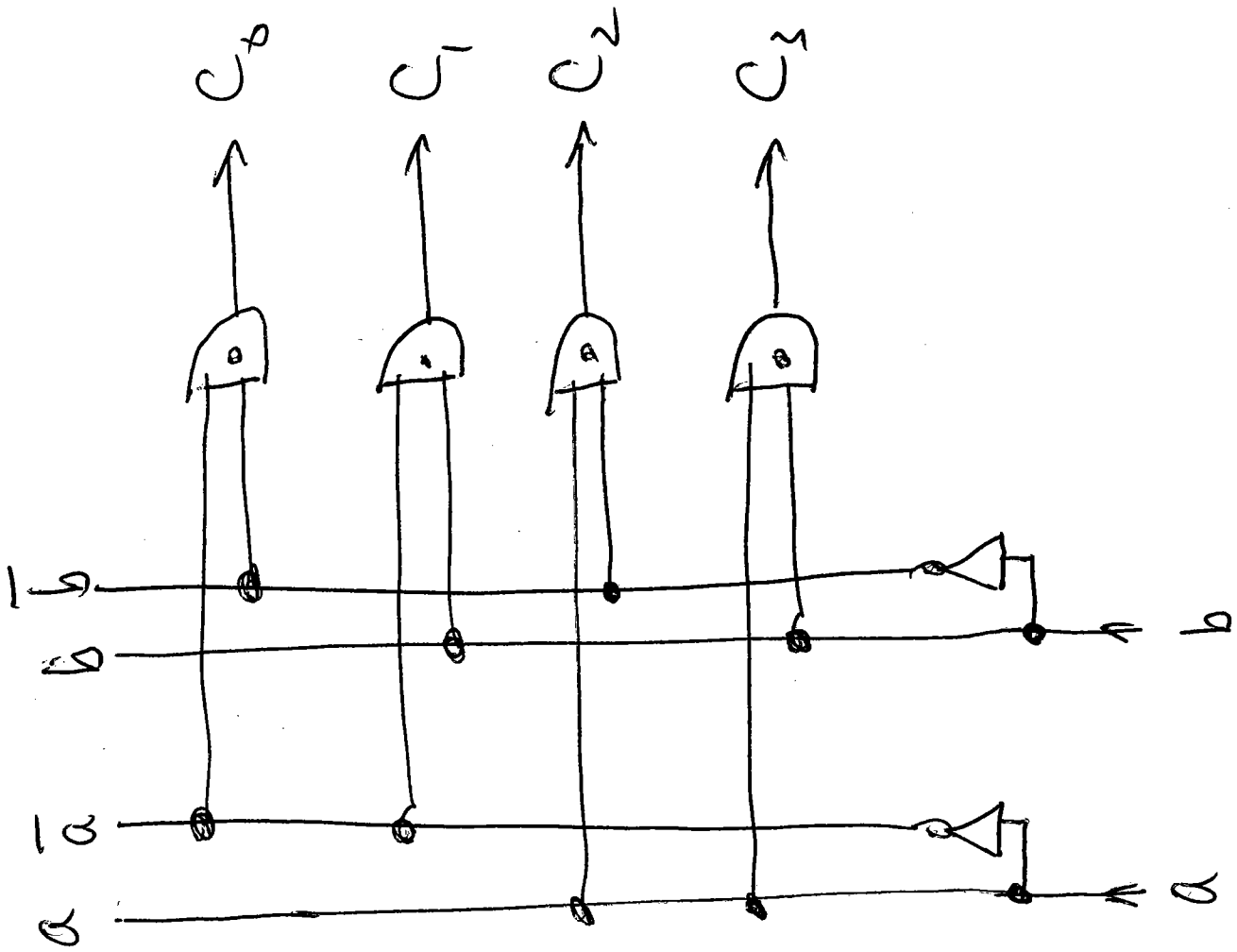
$$c_0 = \bar{a} \cdot \bar{b}$$

$$c_1 = \bar{a} \cdot b$$

$$c_2 = a \cdot \bar{b}$$

$$c_3 = a \cdot b$$

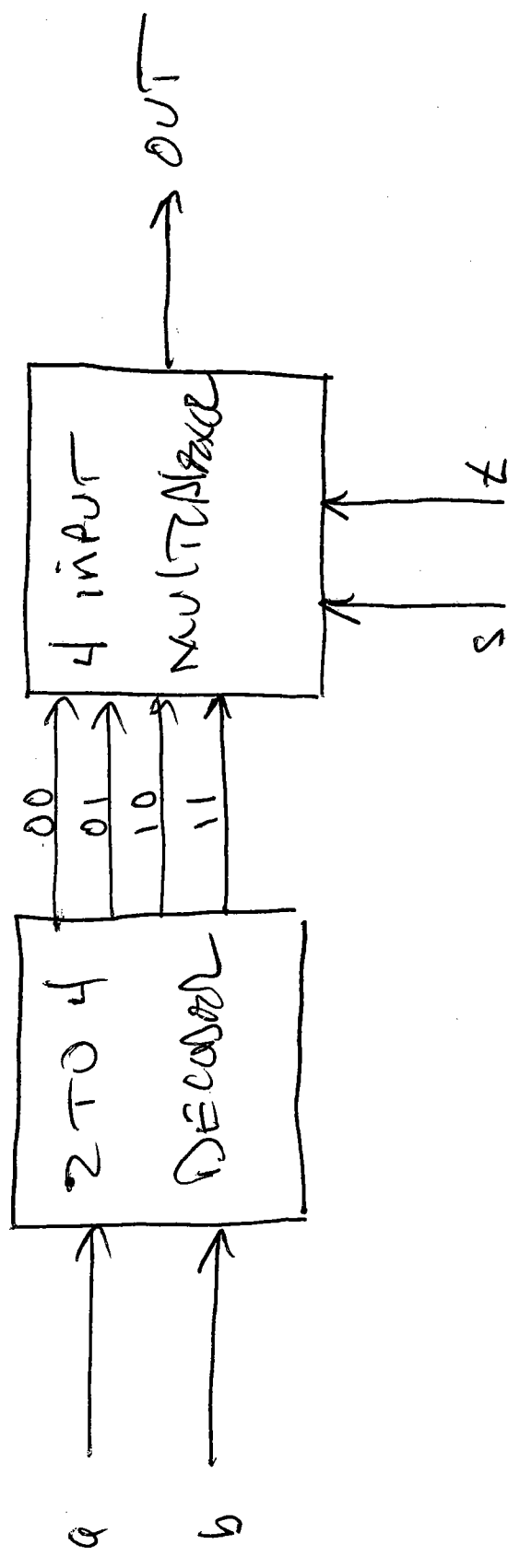
14



Exercise : Design a 3 to 8 Decoder

15

Exercise :



- (a) Fill in Truth Table
- (b) Explain it in words.

CHAP 5VON NEUMANN ARCHITECTURE

(SEE 'THE PRISONER'S DILEMMA' BY
WILLIAM FOUNDESTONE.)

3 CHARACTERISTICS :

I. FOUR MAJOR SUBSYSTEMS

- 1.) MEMORY ✓
- 2.) I/O
- 3.) ARITHMETIC/LOGIC ✓
- 4.) CONTROL UNIT ✓

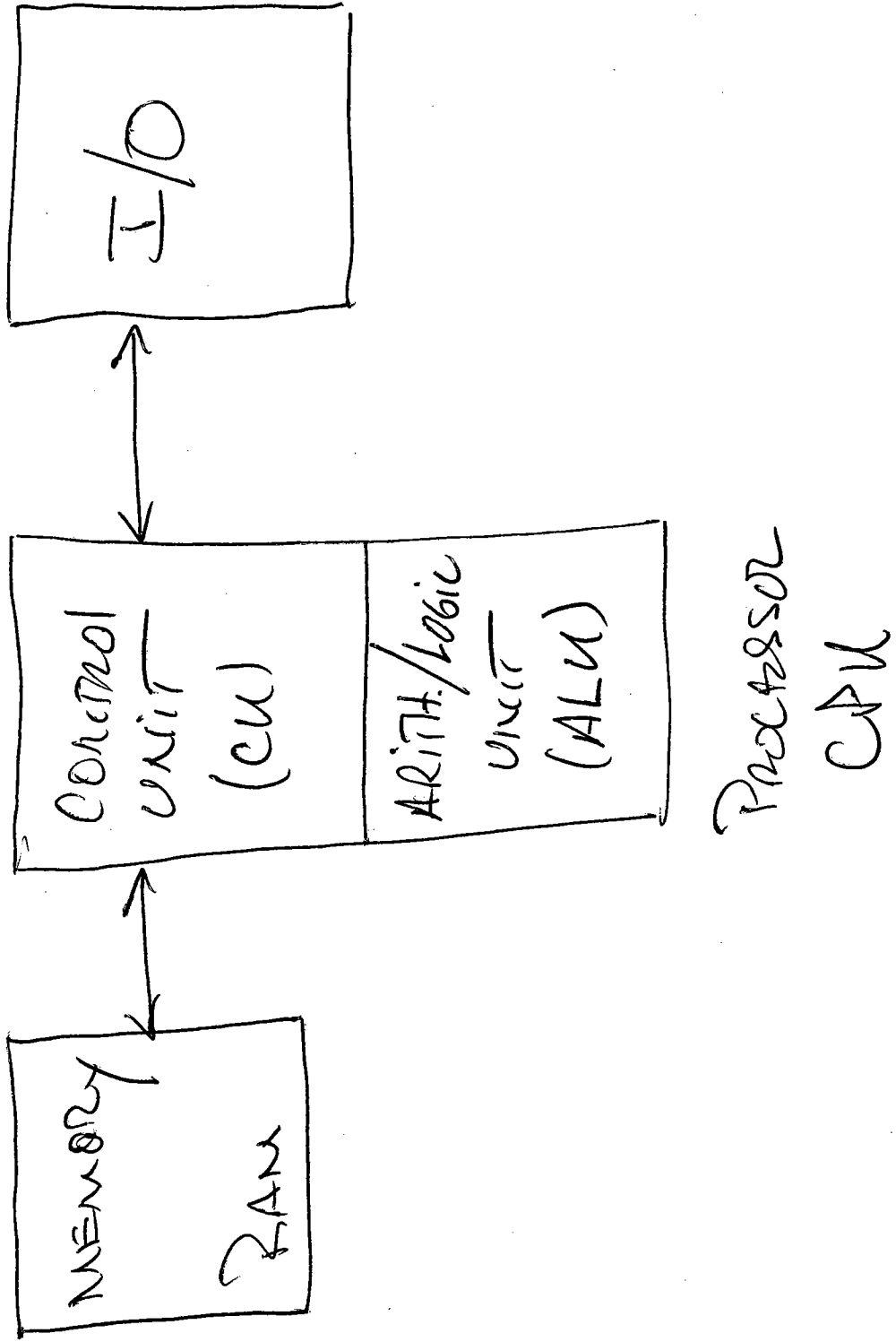
7

II. STORED PROGRAM CONCEPT.

INSTRUCTIONS ARE STORED IN MEMORY
EXECUTED IN BINARY.

III. SEQUENTIAL EXECUTION OF INSTRUCTIONS

INSTRUCTIONS ARE FETCHED FROM MEMORY
ONE AT A TIME, TO CONTROL UNIT
WHERE THEY ARE DECODED & EXECUTED.



Memory

- Divided into cells of fixed size (i.e. # of bits)
Each cell has a unique address.

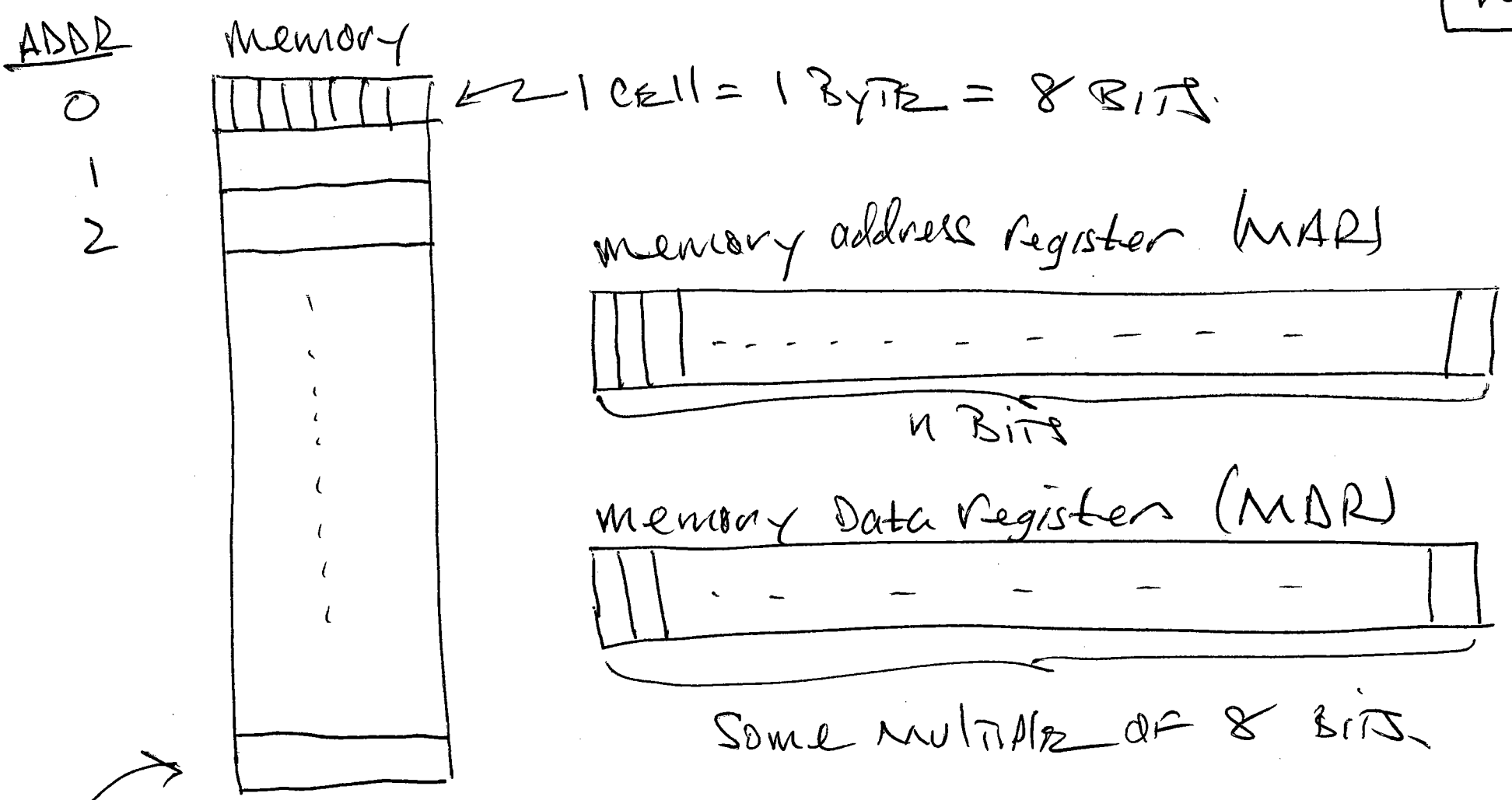
The fixed cell size is called cell width

universally address as 8 bits or 1 byte.

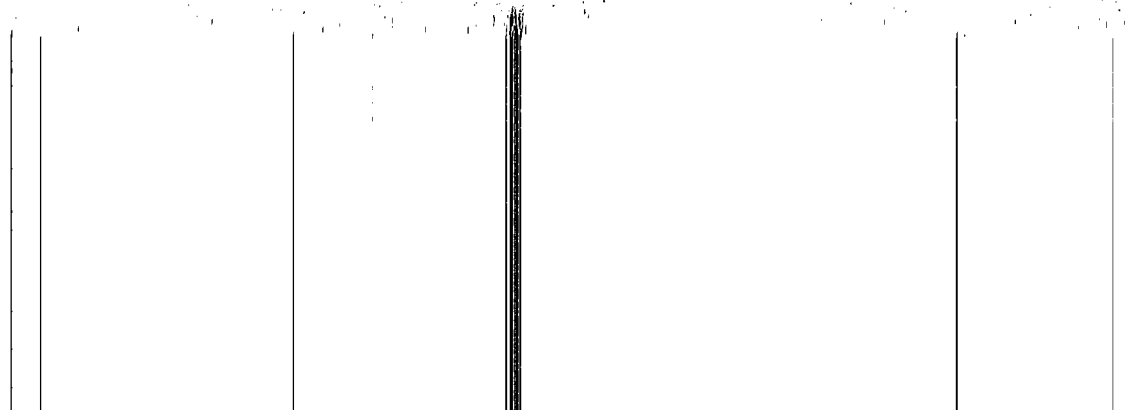
Addressor starts at 0

- Two basic memory operations: Fetch & Store
performed on an entire cell.

- Time to access a cell is the same
for all cells.



LAST CELL ADDRESS $\leq 2^n - 1$

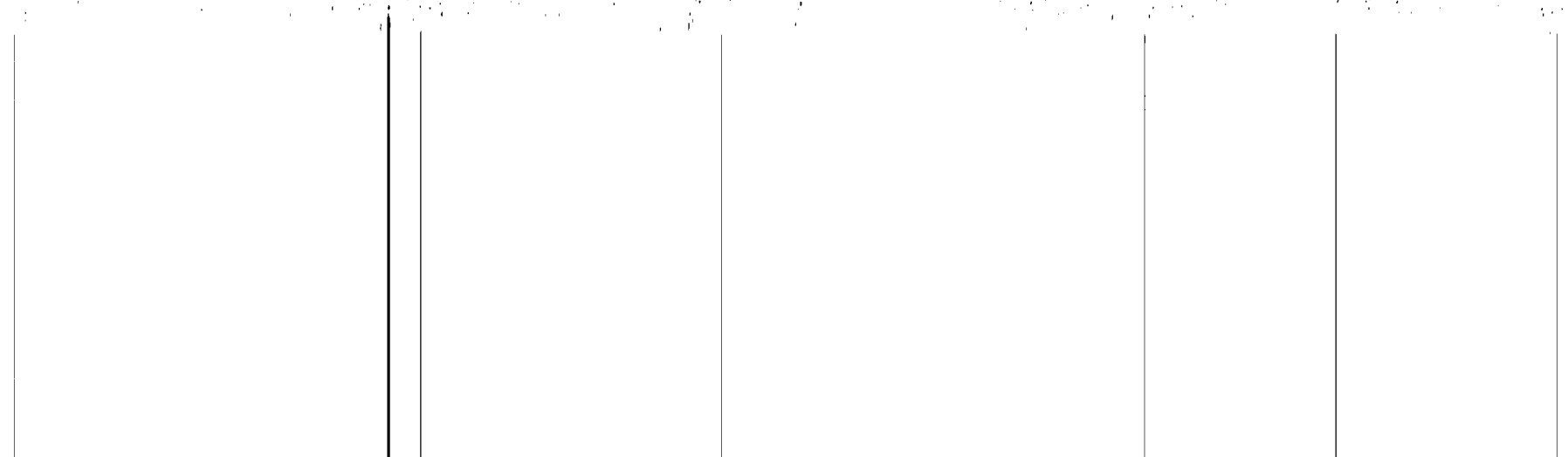


TYPICAL STORAGE REQUIREMENTS

- CHARACTER { ASCII: 1 BYTE
UNICODE: 2 BYTES
- INTEGER 2 OR 4 BYTES
- FLOATING POINT # 4 OR 8 BYTES

UNITS:

- 1 BYTE = 8 BITS
- 1 KB = 2^{10} BYTES = 1,024 BYTES
- 1 MB = 2^{20} BYTES = 1,048,576 BYTES
- 1 GB = 2^{30} BYTES
- 1 TB = 2^{40} BYTES



Ex. Suppose memory unit has
a MAR 14 bits wide.

What is largest possible size
of memory? (in KB)

~~work~~

$$\begin{aligned}
 \# \text{ cells} &\leq \text{max \# addresses} = 2^{14} = 2^4 \cdot 2^{10} \\
 &= 16 \cdot 2^{10} \text{ cells} \\
 &= \boxed{16 \text{ KB}}
 \end{aligned}$$