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8085

FULL SYSTEM DESIGNING

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Important Rules for designing 8085 based systems:

1> **Always map EPROM from location 0000H onwards.** This is the reset vector address of 8085. On reset PC becomes 0000H. Now 8085 executes the "Monitor program" from this address hence we should have permanent (non-volatile) memory at this address.

2> **RAM should start from the next address after EPROM ends**, unless specified otherwise.

3> **I/O chips such as 8255, 8259 etc should be mapped using I/O mapped I/O by default** unless the questions says to use memory mapped I/O.

4> If memory chip number is given instead of chip size then the chip size can be calculated as follows:

1> Chip No: 2764 Chip Size: 27 $\frac{64}{8}$ = 8 KB

2> Chip No: 17128 Chip Size: 17 $\frac{128}{8}$ = 16 KB

3> Chip No: 62256 Chip Size: 62 $\frac{256}{8}$ = 32 KB

5> If the Chip Size is mentioned as (16K x 8) then it means it is a chip of 16K locations and each location has 8-bits making it a 16 KB chip.
Therefore …

1> (16K x 8) Chip means 16 KB.
2> (8K x 8) Chip means 8 KB.
3> (4K x 8) Chip means 4 KB.

6> EPROM is also called Monitor Program Memory or Firmware Memory. RAM is also called Data Storage Memory.

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Q1) Design an 8085 based system working at 3 MHZ having the following…
16 KB EPROM using 8 KB Chips
32 KB RAM using 16 KB Chips
One 8259 in Memory Mapped I/O.
One 8255 in I/O Mapped I/O. {12/15/20 marks}

Soln: As 8085 is working at 3 MHz, we must connect a crystal of 6 MHz (2 x desired frequency)

Memory Calculations

EPROM:

Required = 16 KB
Available = 8 KB
No of Chips = 2 chips.

Size of a **"Single"** EPROM chip = 8 KB
= 8 x 1 KB
= $2^3 \times 2^{10}$
= 2^{13}
∴ **Each EPROM chip requires 13 address lines (A12 – A0)**

RAM:

Required = 32 KB
Available = 16 KB
No of Chips = 2 chips.

Size of a **"Single"** RAM chip = 16 KB
= 16 x 1 KB
= $2^4 \times 2^{10}$
= 2^{14}
∴ **Each EPROM chip requires 14 address lines (A13 – A0)**

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Memory Map

Memory Chip	Address Bus																Memory Address
	A15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	A0	
EPROM1 Begins	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0000 H
EPROM1 Ends	0	0	0	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	1FFF H
EPROM2 Begins	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2000 H
EPROM2 Ends	0	0	1	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	3FFF H
RAM1 Begins	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4000 H
RAM1 Ends	0	1	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	7FFF H
RAM2 Begins	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8000 H
RAM2 Ends	1	0	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	BFFF H
8259 ICW1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	C000 H
8259 ICW2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	C001 H

I/O Map

I/O Chip	Address Bus								I/O port Address
	A7	A6	A5	A4	A3	A2	A1	A0	
8255 PA	1	0	0	0	0	0	**0**	**0**	**80 H**
8255 PB	1	0	0	0	0	0	**0**	**1**	**81 H**
8255 PC	1	0	0	0	0	0	**1**	**0**	**82 H**
8255 CW	1	0	0	0	0	0	**1**	**1**	**83 H**

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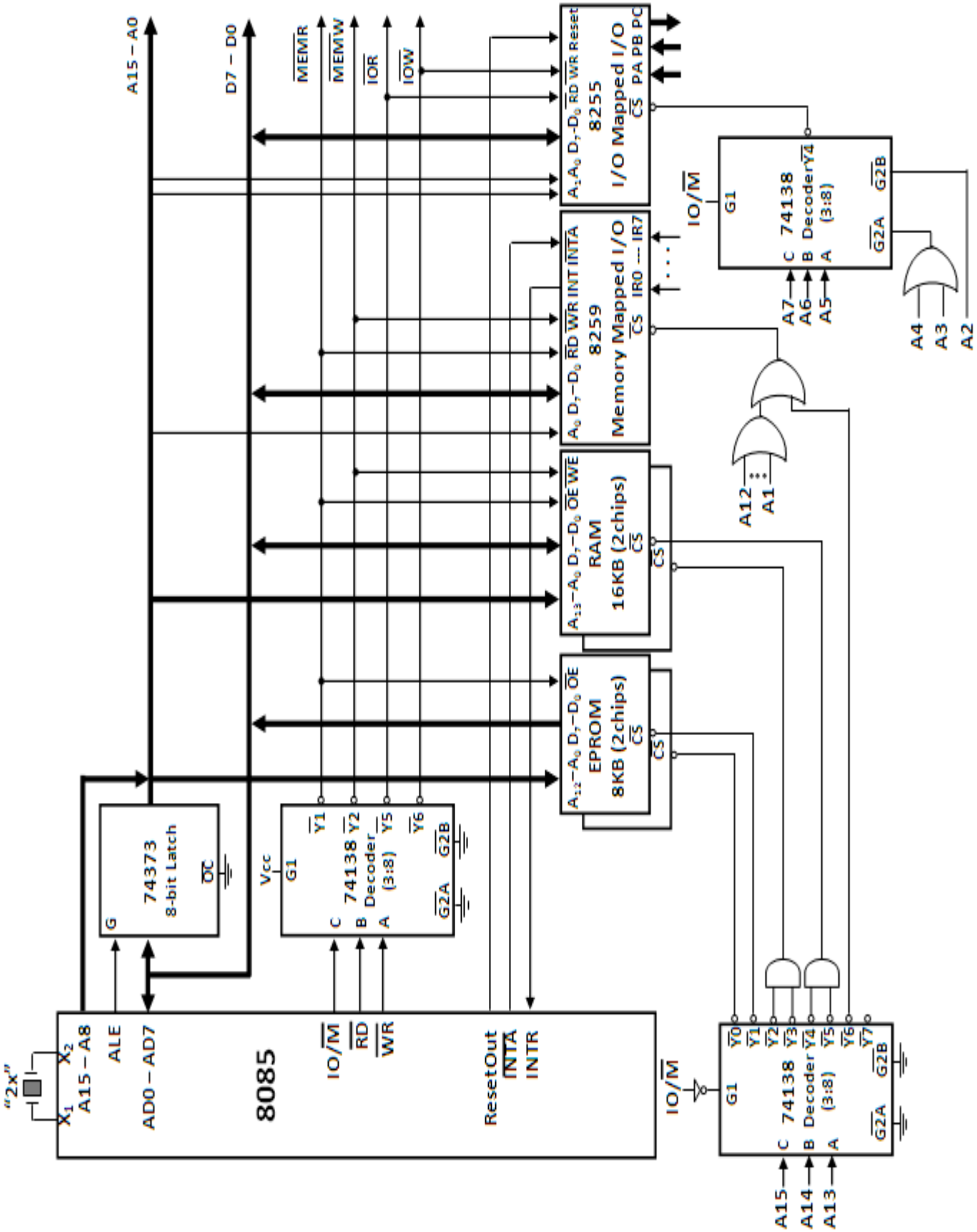

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Q2) Design an 8085 based system working at 3 MHZ having the following…
8 KB EPROM using 4 KB Chips
16 KB RAM using 8 KB Chips

Soln: As 8085 is working at 3 MHz, we must connect a crystal of 6 MHz (2 x desired frequency)

Memory Calculations

EPROM:

Required = 8 KB

Available = 4 KB

No of Chips = 2 chips.

Size of a **"Single"** EPROM chip = 4 KB

$= 4 \times 1 \text{ KB}$

$= 2^2 \times 2^{10}$

$= \mathbf{2^{12}}$

∴ **Each EPROM chip requires 12 address lines (A11 – A0)**

RAM:

Required = 16 KB

Available = 8 KB

No of Chips = 2 chips.

Size of a **"Single"** RAM chip = 8 KB

$= 8 \times 1 \text{ KB}$

$= 2^3 \times 2^{10}$

$= \mathbf{2^{13}}$

∴ **Each RAM chip requires 13 address lines (A12 – A0)**

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Memory Map

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EPROM1 Begins	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0000 H
EPROM1 Ends	0	0	0	0	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	0FFF H
EPROM2 Begins	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1000 H
EPROM2 Ends	0	0	0	1	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	1FFF H
RAM1 Begins	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2000 H
RAM1 Ends	0	0	1	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	3FFF H
RAM2 Begins	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4000 H
RAM2 Ends	0	1	0	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	5FFF H

Solution method 1: