Farhan Sir

Lecture - 1

DAY: Monday

TOPIC NAME: Introduction

TIME:

DATE: 7 / 8 / 23

* Microcontroller → for Specific tasks.
* Microprocessor → for all range purposes.

Difference of μprocessor & μcontroller.

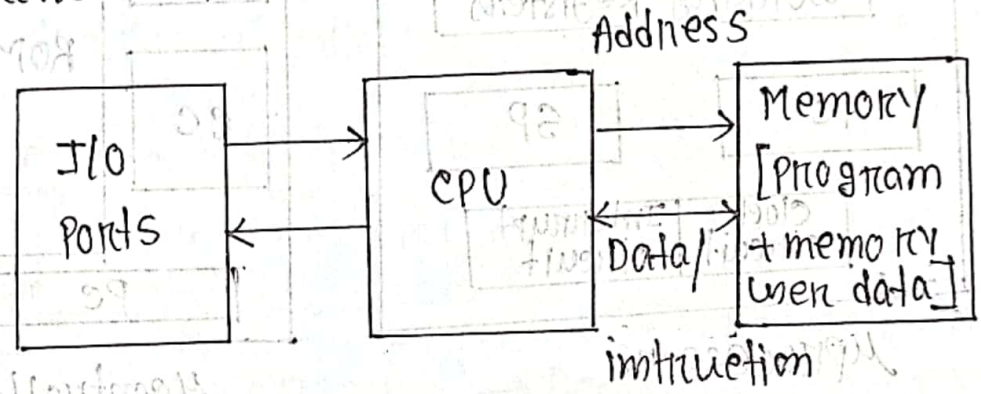
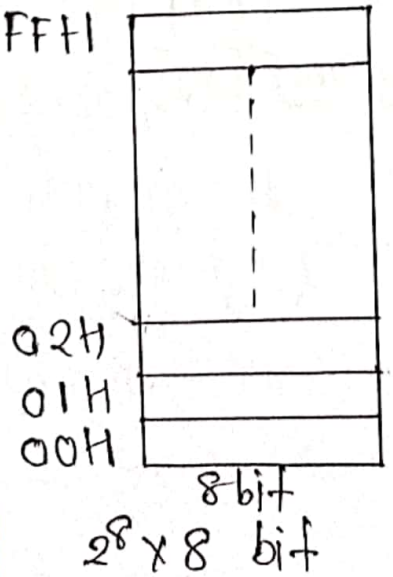


Fig: Von Neuman Architecture.

* Harvard Architecture replaced Von neuman.

*** For Specific task perform which one should be use μprocessor or μcontroller and why?



GOOD LUCK

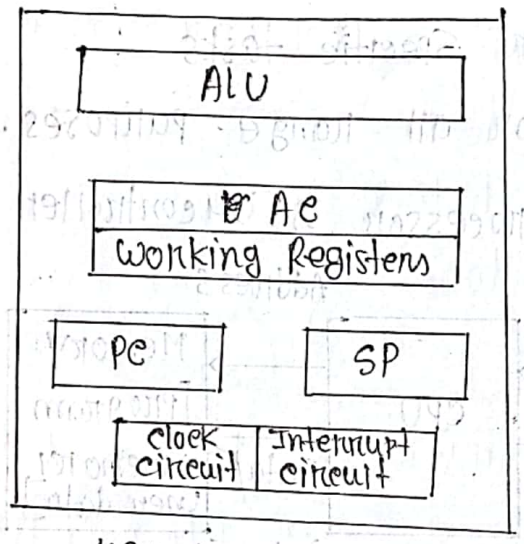
TOPIC NAME : _____ DAY : _____

TIME : DATE : /

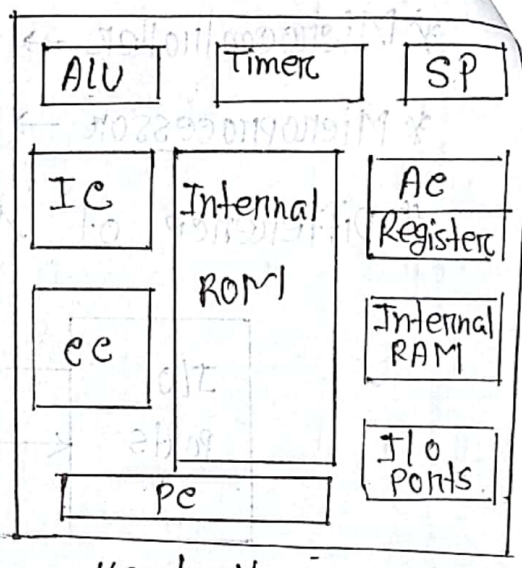
TOPIC

Coprocess

→ To



μprocessor



μcontroller

→ all component packed in a small chip

GOOD LUCK

Lecture-2

TOPIC NAME: Math Coprocessor

DAY: Thursday

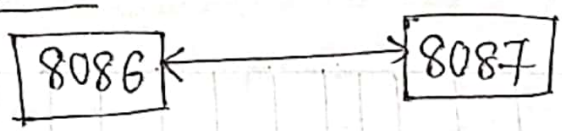
TIME: DATE: 10/8/23

* Coprocessor → supplement the functions of the Primary processor (the CPU).
  → To help main Processor.
  → works Parallel with "".

Math coprocessor: 8087

Working of 8087:

1. MOV AX, 0F32H → Decode → check opcode → execute
2. MOV BX, 00F8H
3. MUL BX
4. FMUL BX → 8087 এর instruction



11011

opcode ↔ এই opcode দেখলে 8087 এর instruction.

1.	✓	✗
2.	✓	✗
3.	✓	✗
4.	✗	✓

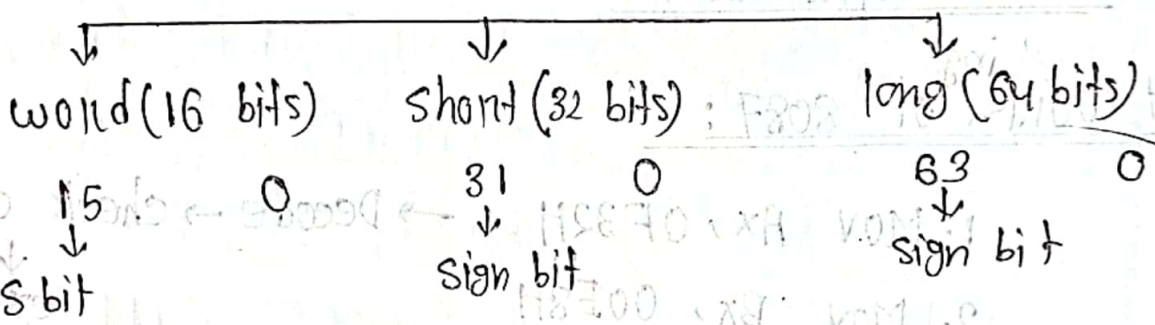
GOOD LUCK

TOPIC NAME : _____ DAY : _____
TIME : DATE : /

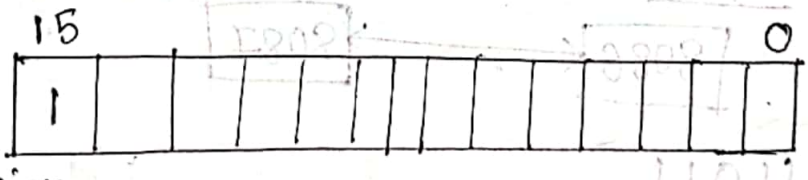
8087 Data types :

1. Binary integers
2. Packed decimal numbers
3. Real numbers.

① Binary integer



-10, word int



Magnitude = 2's complement

② Packed Decimal Number :

→ 18-digit packed integer

→ 80 bits memory

→

GOOD LUCK

TOPIC NAME : _____ DAY : _____

TIME : DATE : / /

③ Real Number :

→ বাম পাশে 0

* +5.2 = 0.52 × 10 ①
  → +ve ✓
* +0.0052 = 0.52 × 10 -✓
  -ve ←

Real value normalise
* • বামে কোনো +ve
  • ডানে " -ve

Term: ① Sign ② exponent ③ Mantissa

Single →	(1 bit)	(8 bit)	(Rest bit)
Double →	"	(11 bit)	(52 bit)
Double extended →	"	(16 bits)	(63 bits)

Binary value normalise :

* 01100100.001 → 1.1001000 1 × 2^+6
  ✓ (বাম পাশে 1)

* 0.0011 → 1.1 × 2^-3

32 bit = 1 bit sign
26 bit exponent
5 bit

GOOD LUCK

TOPIC NAME : _____ DAY : _____

TIME : DATE : / /

Biased exponent :

$*.0.00101 = +1.01 \times 2^{3}$ → exponent

Mantissa

Bias + expotent = ☐ → দেহো stone বসাও

(Binary value)

Short : 127D + 3D = 130D (Binary value exponent

এ stone বসাও)

Fanhan Sir

Math Coprocessor

Lecture-3

Wednesday

16/8/23

Real Numbers :

① Short ② Long ③ Extended Real

Example-1 :

$(9.75)_{10}$

S1 : convert to Binary

$(9.75)_{10} = (1001.11)_2$

S2 : convert to Normalise

$1001.11 = +1 \cdot 00111 \times 2^{3}$

sign Mantissa exponent

S3 :

Sign → 1 bit (0)

Exponent → 8 bit ( )

Mantissa → 23 bit

BE = B + E = 130 D

Binary

(00111 00---0)

18

GOOD LUCK

TOPIC NAME : _____ DAY : _____

TIME : DATE : / /

*** Back track ও ও math আরও আছে।

8087 Architecture:

① control unit → Decode, execute, control

② Numeric execution unit → Mainly math operation করে।

↳ special = Microcode control unit

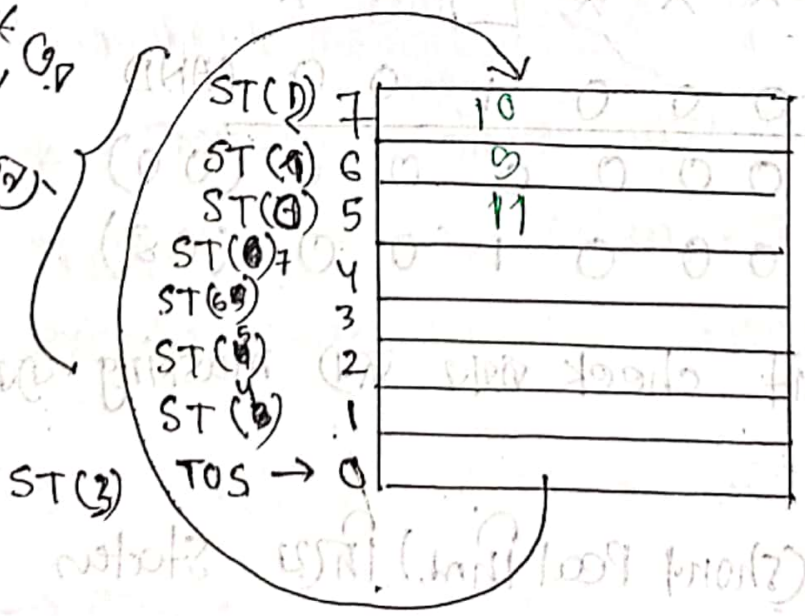
↓

কী কী control signal আসবে or যাবে।

8087 Register stack:

→ Circular stack.

Stack এর content যাবে।



Push:

TOS = TOS - 1

Pop:

TOS = TOS + 1

stack এর content যেখানে 10, 9, 11

আগে করবে, then insert 210। ←

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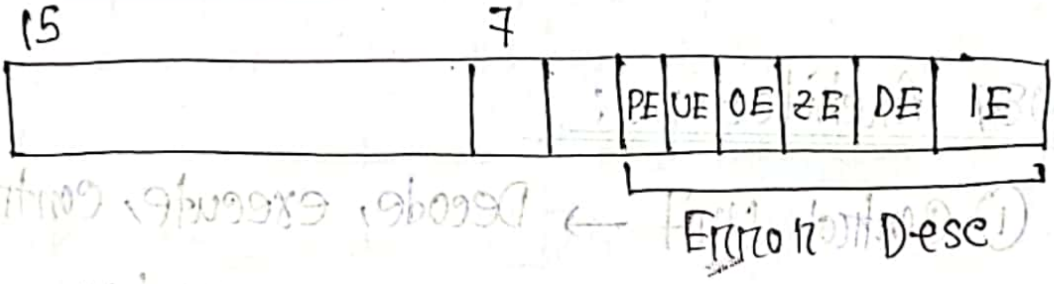
10) Status Register of 8087:



* Underflow → 30×10^{-37} বাইরে short এ

* ST → 3-bit → to show current stack top.

* C3 → বুঝার দরকার নাই।

Control Register of 8087:

	7	6	5	4	3	2	1	0	
AL =	x	x	x	x	x	□	x	x	
	0	0	0	0	0	1	0	0	(AND)
	0	0	0	0	0	0	0	0	(00)
	0	0	0	0	0	1	0	0	(08)

* Specific bit check করার জন্য masking ব্যবহার করা হয়।

*** operation (Short Real form) নিয়ে Status Register এ অবস্থা দেখানো হলো।

TOPIC NAME : _____ DAY : _____

TIME : DATE : / /

Tag Register :

Next Generation :

80287 → 80387 → 82786

Lecture-4

Farhan Sir

Thursday
17/8/23

Programmable interval Timer

8254

Delay : → 10ms

```
MOV CX, OFFFEH ; 2CP
NEXT : NOP     ; 0CP
       LOOP NEXT ; 3CP
```

* 5MHz এর time মানে তা Processor dependent.
* 5MHz CP তে assign করে প্রোগ্রাম instruction execute করতে কত time লাগতে তা দেখা যাবে।

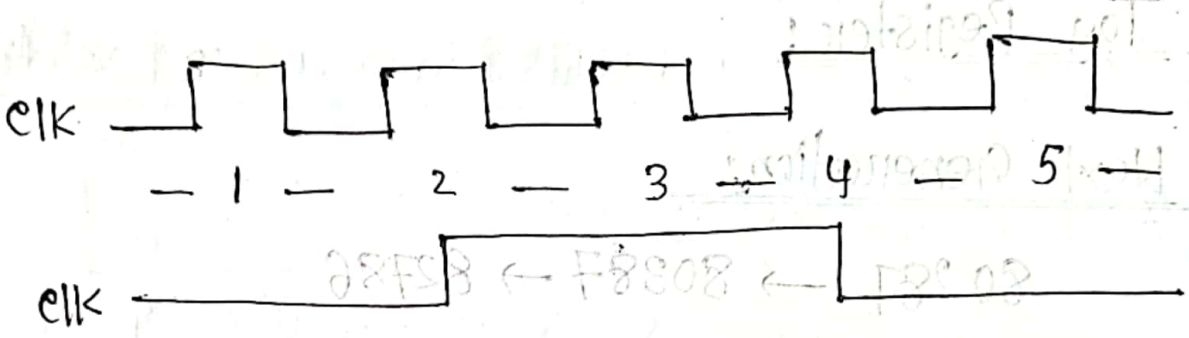
⇒ To achieve desired delay → 8254 used.

→ counter (D, Bin, BCD)

GOOD LUCK

TOPIC NAME : _____ DAY : _____

TIME : DATE : / /



→ Basically time ie/ counter.

Internal Block Diagram:

→ 3 independent counter. → Down counter (16 bits)

↓ control করে

control word register

→ CPU + Dat Bus Buffer + Read/write logic

→ count করার আগে –

① control word register এ বলা লাগবে যে count করব

② Then count করবে।

GOOD LUCK

TOPIC NAME : _____ DAY : _____

TIME : DATE : / /

Modes of operation :

Mode-0 : interrupt and terminal count

Mode-1 : Handware Retrigger

Internal Block Diagram :

* control word register common (একটাই)।

CR_M = MSB → CE → O_{LM} (MSB) 8 bit

CR_L = LSB → (16b) → O_{LL} (LSB) 8 bit

control logic

Status Register = প্রতিটা counter এর status জানাতে।

⇒ defined value CE → latch এ আসে বসে থাকে Read না করা পর্যন্ত। CE change হতে পারে, undefined value ও আসতে পারে। Read করার দরকার নাই।

GOOD LUCK

TOPIC NAME : _____ DAY : _____

TIME : DATE : / /

Interfacing with the system Bus:

Address Bus

↓

Control Bus

↓

Data Bus

↓

8254

*** 8254 কীভাবে 8086 এর সাথে connect থাকে ?

Operation:

① CWR select

② Mode select

③ কোথায় থেকে count করবে তা বলে দেয়া।

*** 8254 কী ? কীভাবে কাজ করে ?

*** operation describe

***

GOOD LUCK

TOPIC NAME : _____ DAY : _____

TIME : DATE : / /

Control word Register:

D_7	D_6	D_5	D_4	D_3	D_2	D_1	D_0

D_0: 0 = Binary

1 = BCD

D_4, D_5: কোন কোন বাস কয়ত তা ঠিক করে।

D_7, D_6: counter select

Write operation:

→ LSB/ MSB read কয় তা বলে দেয়া।

→ then write কয়ত।

Read operation:

GOOD LUCK™

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Lecture-5

TOPIC NAME : Interval Time 8254

DAY : Monday

TIME : DATE : 28/8

Mode of operations:

CW = 10 (LSB)

= 00 01 000 0 (×)

Counter-0 | RW | Mode | BCD

Mode-0:

*last count ও interrupt দিবে।

Mode-1:

0001 001

Mode-2: Mode-0 এর মত

*** Square wave generate এর জন্য count এর value কত দিতে হবে ?.

*** Mode related math (out of syllabus but exam ও আসবে।)

Read Operation

① Simple Read

② Counter Latch command

③ Read Back command

GOOD LUCK

TOPIC NAME : _____ DAY : _____

TIME : DATE : / /

Read Back Command

D_7 D_6 D_5 D_4 D_3 D_2 D_1 D_0

*** Why 8254 need, compare to loop.

*** Internal Block Diagram

*** control word formal দিয়ে বলতে কীভাবে কাজ করবে/ কী কাজ করবে ?

GOOD LUCK

Lecture-6

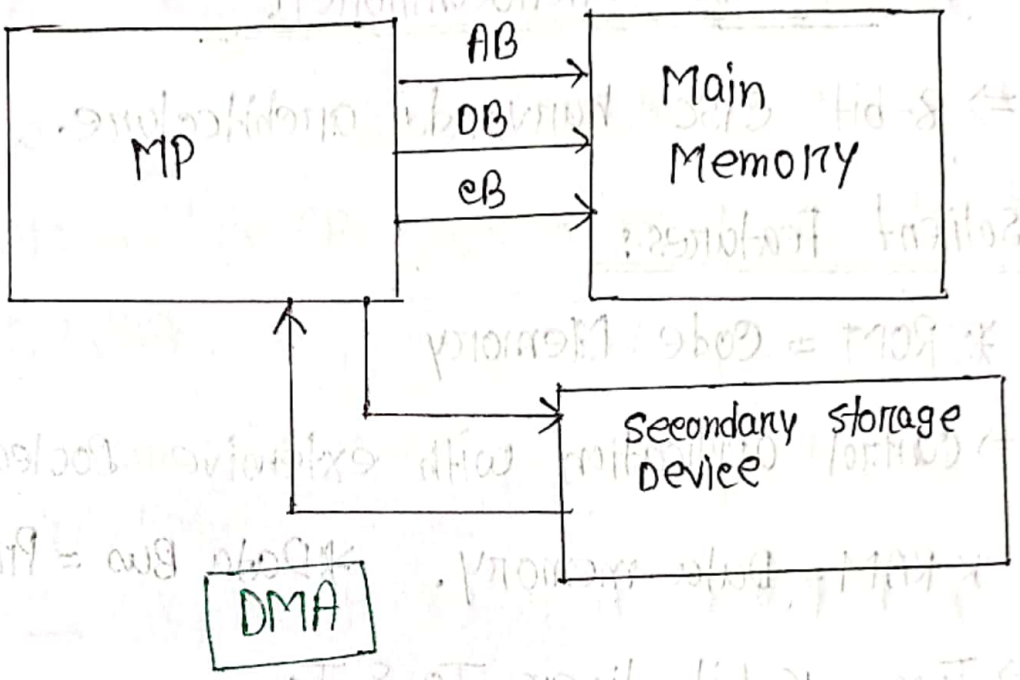
Sir

TOPIC NAME : Direct Memory Access

DAY : Thursday

TIME :

DATE : 31/8/23



DMA IC → 8237

*DMA Timing Diagram (***)

chp-11 (DV Hall)

Lecture - 7

Monday

4/9/23

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DMA

⇒ Block Diagram

⇒ Impo Registers → CAR, CWCR, CR, BA & BWC, BR

↓

মুখস্থ না করলেও

হবে।

MRSR, SR

GOOD LUCK

TOPIC NAME : DAY :
TIME : DATE : /

8051 Microcontroller

⇒ 8-bit CISC harvard architecture.

Salient Features:

* ROM = Code Memory

⇒ Control application with extensive Boolean operation.

* RAM = Data memory. * Data Bus = Processor bit.

⇒ Two - 16 bit timer T0 & T1

⇒ Five interrupts (fixed)

8051 Architecture:

50/76

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Lecture-8

11/9/23
Monday

8051 Microcontroller

Bus:

① Address Bus ② Data Bus

Oseillator:

Provides clockpulse.

GOOD LUCK

TOPIC NAME : _____ DAY : _____

TIME : DATE : / /

8051 Block Diagram :

PSW : Current status কে hold করে।

RAM : 128 byte (By default) → Extend করা যায়।

ROM : 4KB

A = Accumulator → general * General purpose Register → R Register → Auxiliary register.

B = Div / Mul

PC →

DPTR →

Stack Pointer Register (SP) :

→ Power ON করে 07 হয়।

→ 1 বাড়ায়/কমায়।

→ 6 instruction - PUSH, POP, ACALL, LCALL, RET, RETI

Pushing into the stack :

MOV R6, #25H

↳ intermediate value.

Popping from stack :

*** PUSH, POP এর এর stack/stack pointer এর অবস্থা।

GOOD LUCK

TOPIC NAME : _____ DAY : _____

TIME : DATE : / /

Register Banks: → impo topic

Program status Register (PSW):

→ Flag Register

*** PSW এর current state, stack pointer এর value থাকে, Now stack condition, Register Bank এর কোথায়। Push, Pop এর তথ্য।

P 6 6=0F3H

P 3 3=01H

P0 2

GOOD LUCK

Lecture-9

TOPIC NAME: 8051 Memory Organization DAY: Thursday

TIME: DATE: 14/9/23

=> Highest $\frac{64KB}{2^{16}}$, but $\frac{4KB}{ROM}$ use হচ্ছে, বাকিটা কোথায়?

= Extend করা যাবে পরে।

↳ বেশি code store করা লাগলে তখন ROM বেশি থাকবে।

Internal RAM OF 8051:

128 = Total

RB-3 → 8

RB-2 → 8

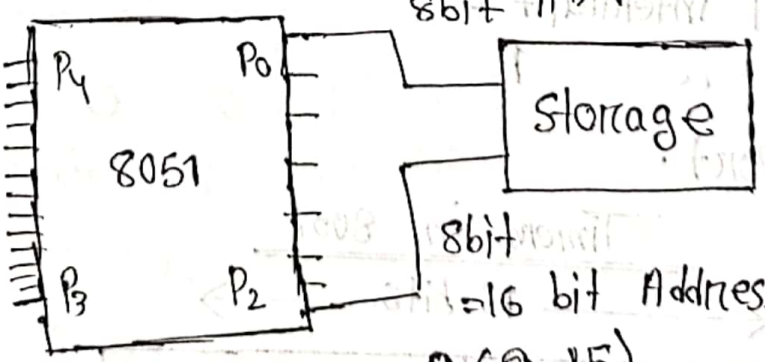
RB-1 → 8

RB-0 → 8

*** 8051 কে কীভাবে extend / অন্য external Devie এর সাথে conneet করা হয়?

Internal ROM:

8051 i/O Ports



128 Byte RAM

4Byte ROM

"GOOD LUCK"

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Lecture- 10

TOPIC NAME: Spot Test

DAY: Thursday

TIME: DATE: 21 / 9 /

Q. 2007XYZ

P_0 ← 1st & 2nd as input

configure xth point as follows -

(yth and zth) no. 8 pin as input and rest as output.

write neeessary Assembly Program for this.

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Lecture- 11

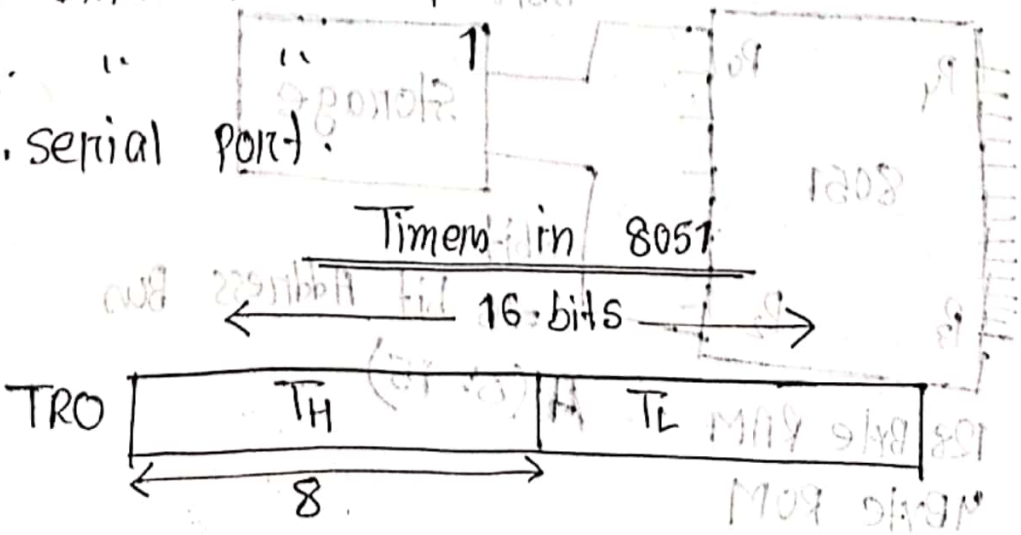
Monday

2/10/23

8051 Microcontroller Interrupt, Timer and addressing modes

Interrupt Structure -

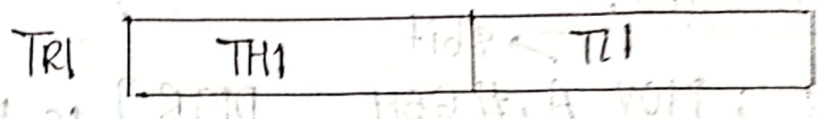
1. Timer 0
2. Timer 1
3. External interrupt 0
4. " " 1
5. Serial port.



GOOD LUCK

TOPIC NAME : _____ DAY : 2

TIME : DATE : / /



Timer mode operation:

① Time mode 0
② " " 1
③ " " 2
④ " " 3

→ Detail from book, que আসে না।

TMOD Register:

* Design a time to count 1-10, write exact instruction or code.

⇒ Timer-1, count 1-10 বারবার / Timer-0 এর Higher portion দিয়ে বারবার 100 count করা

① Mod select

Tmod register:

0	0	1	0	X	X	X	X
Gate	C/T	M1	M0				

```
10 EP ←  MOV  TMOD, #20
         MOV  TH1, #0A
         SETB TR1
EXT1 ↩
```

→ MOV IE, #84

"GOOD LUCK"

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Lecture - 12

TOPIC NAME : 8051 : Addressing Modes

DAY : Monday

TIME :

DATE : 16 / 10 / 2

TOPIC N

Mainly 5 types:

1. Immediate ; MOV A, #65H → 8bit
   DPTR, P1 } 16 bit
2. Register AM ; MOV Rn, A (n=0-7)
   * At a time 32 ta we can use.
3. Direct AM ; MOV R0, 40H
   (Direct move)
4. Register indirect ; MOV A, @R0
   * Register is used as a pointer to the data.
5. Indexed AM ; Move A, @A+DPTR

GOOD LUCK

TOPIC NAME : _____ DAY : _____

TIME : DATE : / /

*** 8051 এবং Bluetooth module: এর সাথে connect করার আগে, data tramfer এর জন্য code লিখা লাগবে।

=> Ti, Ri ফ্লাগ নিবে।

REN ও byte করা লাগবে।

*** Data tramfer + Receive এর জন্য code

*** Half Duplex / walkie Talkie এর জন্য দুইটা 8051 এর code?

Farhan Sir

Mainly Prev Year এর ques দেখা লাগবে।

8086 → 80186

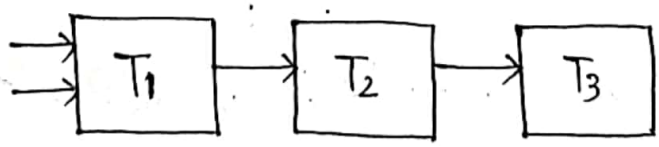
80186

Lecture-13

Wednesday

18/10/23

Multiuser / Multitasking OS :



→ T1, T2, T3

Memory Management :

① Overlay (***)

② Bank switching (***)

GOOD LUCK

DAY :

TOPIC NAME : TIME : DATE : /

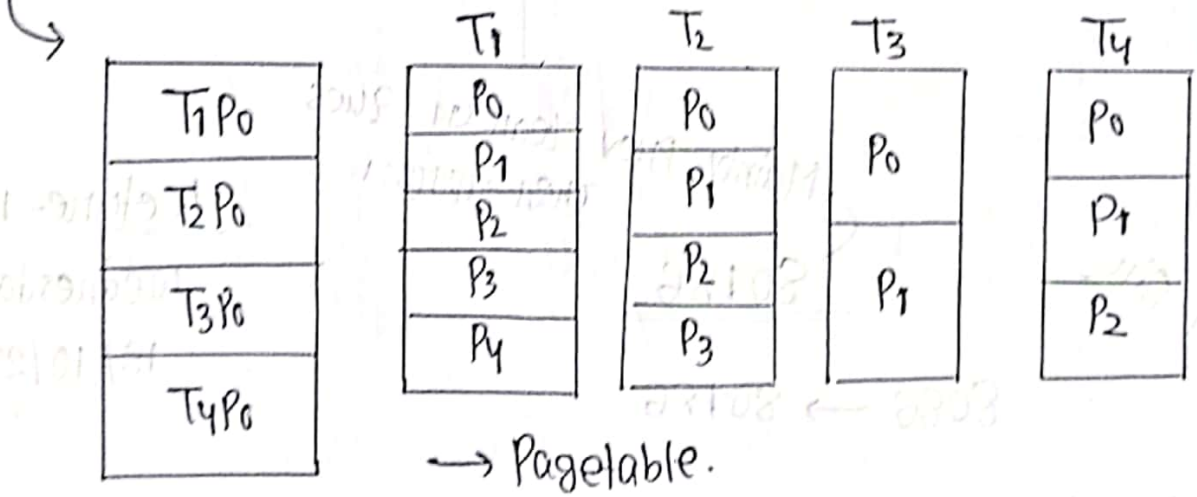
Virtual Memory :

⇒ Memory mapping (***)

80186 ⟶ Virtual memory support করে না।

Implementation :

① Demand Paging ② Demand Segmentation



⟶ Pagetable.

Lecture-14

TOPIC NAME : 80186 DAY : Monday

TIME : DATE : 6 / 10 / 23

Virtual Memory

① Demand Paging :

⇒ Program → segment → Frame

⇒ 80186 uses Deman segmentation.

⇒ Logical address → the address we work with in a program.

⇒ Logical address in not physical address, have to convert it.

② Demand segmentation :

Base 3000H
offset 0002H

3000 0
0002
30002H
20 bit

2^{16}

segment size = 64K

× 16 → segment

2^{20} → 1 MByte

16K access

Selector

14 bit

2bit

↳ Descriptor table

16 bit segment Base

Total memory = 16K × 64K

= 1 GByte

GOOD LUCK

TOPIC NAME : DAY :
TIME : DATE : / /

→ যেই segment দরকার হবে, তা Description table থেকে আনবে, then physical address এ convert করে, use করবে।

⇒ We use Demand Paging / current Processors why use demand Paging ? (***)

80286

New concept :

1. Integrate virtual memory
2. User protection.
3. Task switches.

Functional Part : 4 Parts

1. AU → 3. IU → Decoder
2. BU (Prefetch Queue) 4. EU

Logical Ad → Physical Ad

*** Block Diagram Pinpoint মনে রাখার দরকার নাই, Actual impo গুলা তাহলেই হবে।

GOOD LUCK

TOPIC NAME : _____ DAY : _____

TIME : DATE : / /

Operating modes:

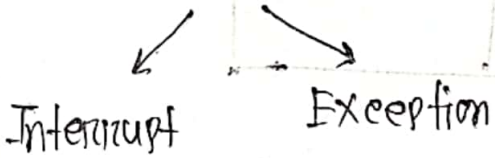
1. Real Ad. mode
2. Protected Virtual ad. mode

=> 80286 Pin impo না।

Real Ad. mode operation:

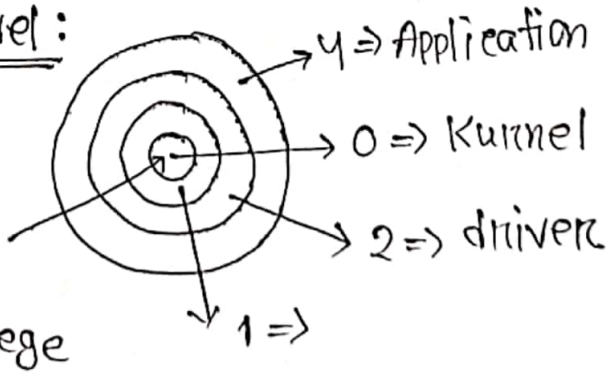
→ By Default real ad. mode

→ 80286, new interrupt → exception; Run time ও error আসবে।



=> Real mode —msw [PE set]→ Protected mode

Previlege level:



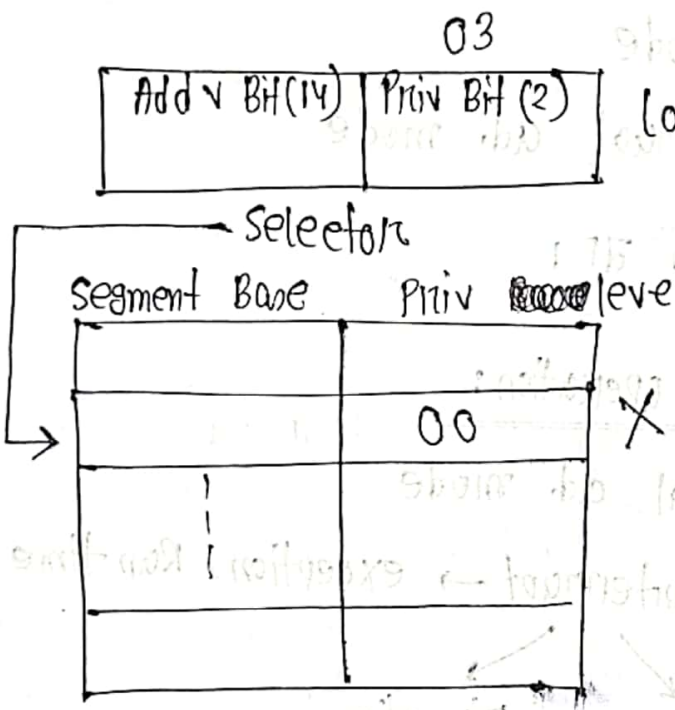
=> level যত বাড়বে, Privilege কমবে।

GOOD LUCK

TOPIC NAME : _____ DAY : _____

TIME : DATE : /

Privilege level যেভাবে নির্ণয় করে -



(24 bit) Segment Base → 300000 H

(16 bit) 0002

300002H

GOOD LUCK

Lecture-15

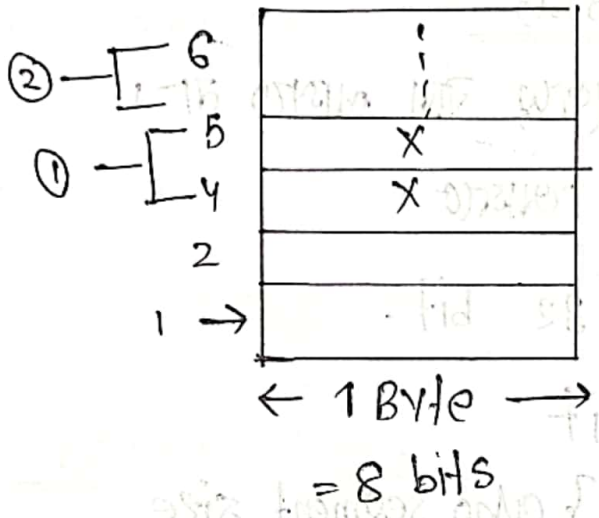
TOPIC NAME: Memory Banking

DAY: Monday

TIME: DATE: 13/11/23

Address Bus = 20 Bit

Data Bus = 16 Bit



⇒ 1 cycle ও Just 8 bit access, বাকি 8 bit waste। তাই Banking concept আসছে।

① ODD Band

② Even Bank

A_{0-19}

A_0

even 4 = 0000 0000 0000 0000 0100 ⇒ even এর জন্য $A_0 = 0$

ODD 5 = 0000 - - - - - - - - - - 0101 ⇒ ODD এর জন্য $A_0 = 1$ + $\overline{BHE} = 0$

A_{1-19} = Actual address

A_0 = For selection

(***) Even = 1 cycle, ODD = 2 cycle Why ?

⇒ এক cycle ও 4, 5 access করে যে A_{1-19} same.

GOOD LUCK

TOPIC NAME : DAY : TIME : DATE : / /

5, 6

0000 ---- 0110

80386

→ প্রথম slide মুখস্থ করা লাগবে না।

→ Ques ও কম আসবে।

→ ALU এর size 32 bit.

→ Address = 32 bit

2^{32} = 4 GByte } ans segment size

(16) = 16K × Segment

64TByte → extend

Selector | Offset

Selector → 2 bit Protection → 4 level Protection

Selector → 14 bit desc table = 2^{14} = 16K

Offset → 2^{16} = 4GB

16K × 4GB = 64TByte

=> But unit → Details দরকার নাই।

GOOD LUCK

TOPIC NAME : _____ DAY : _____

TIME : DATE : / /

=> Page : 30 এর শেষ থেকে impo হবে না।

Addressing mode:

*** Mainly ques আসবে Addressing mode থেকে।

Lecture-16

16/11/23
Thursday

80386

Sir

Real Address Mode:

1600 : 0002

1600 [0]
+ 0002
16002

* 80386 কীভাবে real mode এ কাজ করে, কোন কাজ করে?

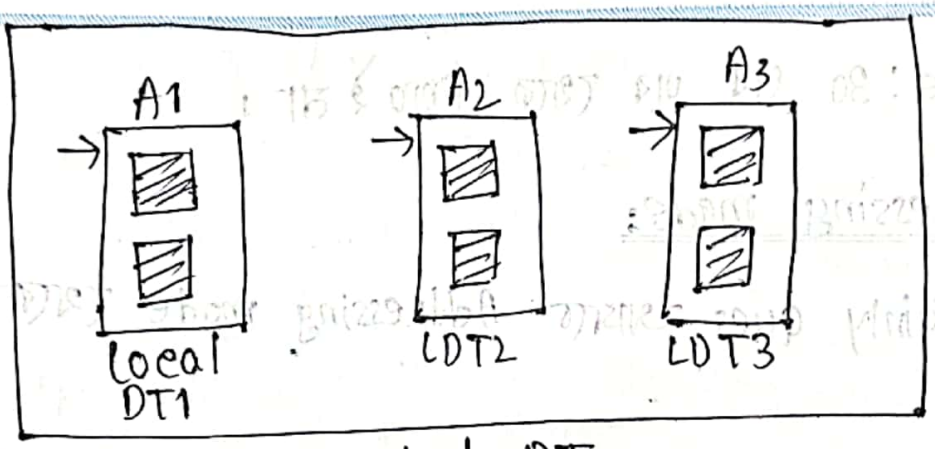
Protected mode:

*** Protected mode কেন use করা হয় → Virtualization.
*** Real vs protected
*** why we Read address mode?

Global Description table

TOPIC NAME : _____ DAY : _____

TIME : DATE : / /



*** Task বীজগণে isolate করা যায়?

CT-2 Question :

Mov PSW, #12 → কে Binary তে নিয়ে যাবে।
Then RS1, RS0 অনুযায়ী Bank select করা যাবে।

Selected Bank এর
- Push 5 → আগে R5 এর content SP তে যাবে।
- POP 0 → " SP এর value R0 তে আসবে। তার value remove হয়ে যাবে।

GOOD LUCK

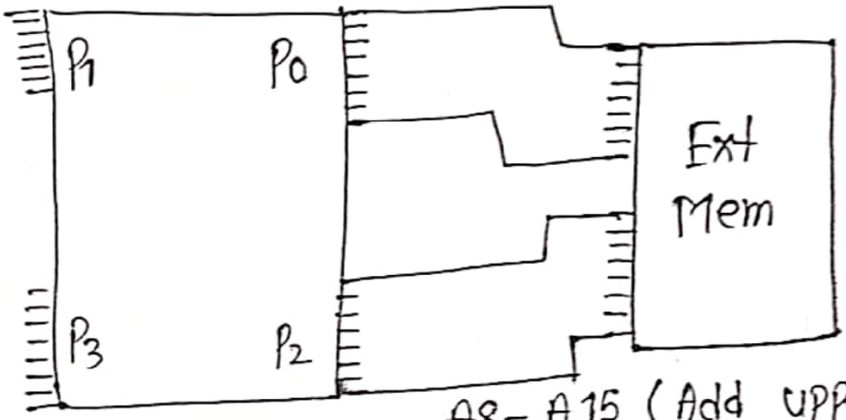
TOPIC NAME : _____ DAY : _____

TIME : DATE : / /

ALE=0 (D0-D7)

ALE=1 (A0-A7)

AD0-AD7 (Lower 8 bit)



A8-A15 (Add upper 8 bit)

16 bit AB

8 bit DB

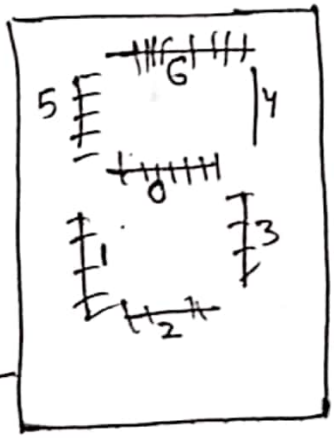
⇒ L1, L2, L3 } 1 টা set (Divide) → Math

⇒ L4 → sadi sir que করাবে।

⇒ L5, L6, L7 → 2 set → creative type

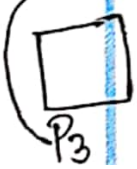
⇒ L8, L9, L10 → 1 set → Explanation type

#



16KB extended, এটা 6 তম্বার

	7	6	5	4	3	2	1	0
P3 :	X	1	1	0	1	1	1	1



#littleGiant_34

GOOD LUCK