Computer Peripheral and Interfacing (ICT-3205)

22.10.24 (1st class)

* Peripheral device → Input and output device

Q. what is embeded system?

Q. What is micro-controller? → Arduino

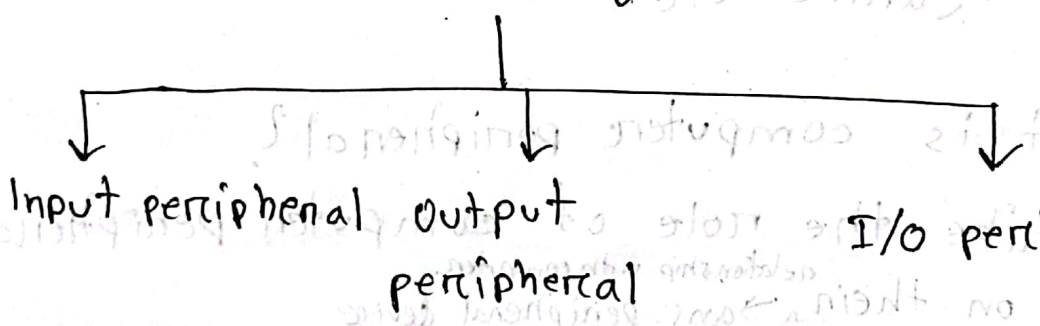
* Interfacing → Peripheral device connect ~~data~~ process.

wmic (os)

(e) * Computer ~~Interfacing~~ peripheral: Computer peripherals are any computer component that expand system functionality.

Ex: keyboard, mouse, printer etc.

three types



(e) * Peripheral Device: Peripheral device is a device that connect to computer but, not the core part of a computer architecture.

ex:

P.to

① Input device: An input device sends data or instructions to the computer such as mouse, key board, image scanner, barcode reader, webcam etc.

② Output device: An output device provides output from the computer such as computer moniton, projector, printer, speaker etc.

③ I/O device: An I/O device is a device that works as both Input and output device such as toven screen, pendrive, flash drive etc.

ⓔ Q. What is computer peripheral?

ⓔ Q. Describe the role of computer peripheral based on their relationship with computer. → ans: peripheral device

ⓔ *Printer: It is a peripheral device that accept text file or images from a computer and transfer them to a medium such as papers.

→ It is an output device.

→ It connect to computer directly or by network (wifi or LAN connection).

27.10.24 (2nd)

(e) * There are two main types of printers:

1) Impact printer
2) Non-Impact printer

1) Impact printer: ..... with .....

→ makes contact with the paper.

→ It prints text or images by pressing an inked ribbon by using pin.

ex:
a. Dot matrix printer
b. Line printer
c. Daisy wheel printer
d. chain printer
e. Drum printer etc.

2) Non-impact printer: This printer prints text or images without direct physical contact between printing mechanism and paper.

→ It is more faster than impact printer.

ex: a) Laser printer
b) Ink jet printer

c) Electrostatic printers

d) Thermal printers, etc.

(e) * **Dot matrix printers:**

→ It is an impact printers

→ It uses patterns of dot to print text or images.

→ It has some printing pin or head.

→ Number of pin 9 or 24.

→ Printing speed = 30-550 character/sec

Working principles:

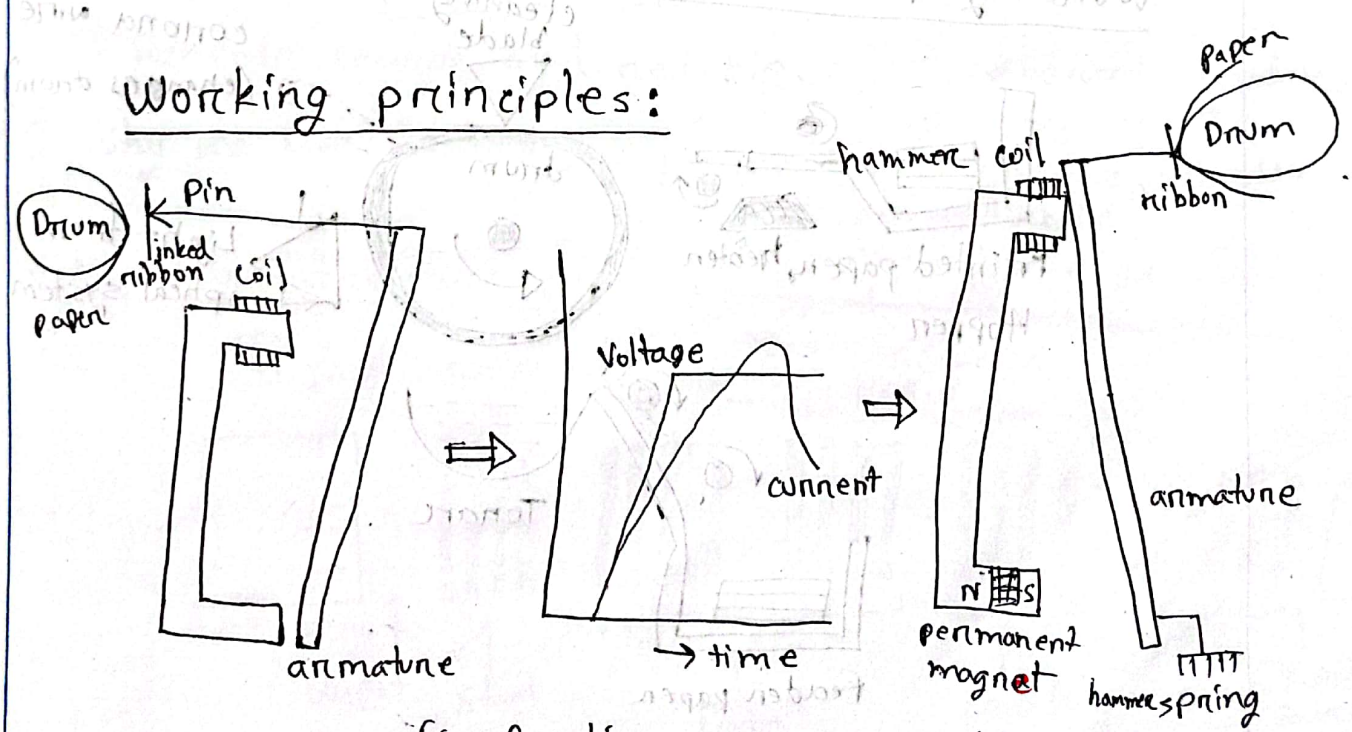


Fig: Printing mechanism of dot matrix printer

(e) Q. Working principle for details → see note (page-6)

(e) Q. Advantages / Disadvantages of dot matrix printer

less ink wastage

Diff: Print quality: Low / high
Speed: slow / fast
Noise: Loud / Quiet
cost: Low / high
Paper type: multi layer / standard
color Print: low quality color print / high paper quality color print

(e) *Laser printer:

→ It is non-impact printer

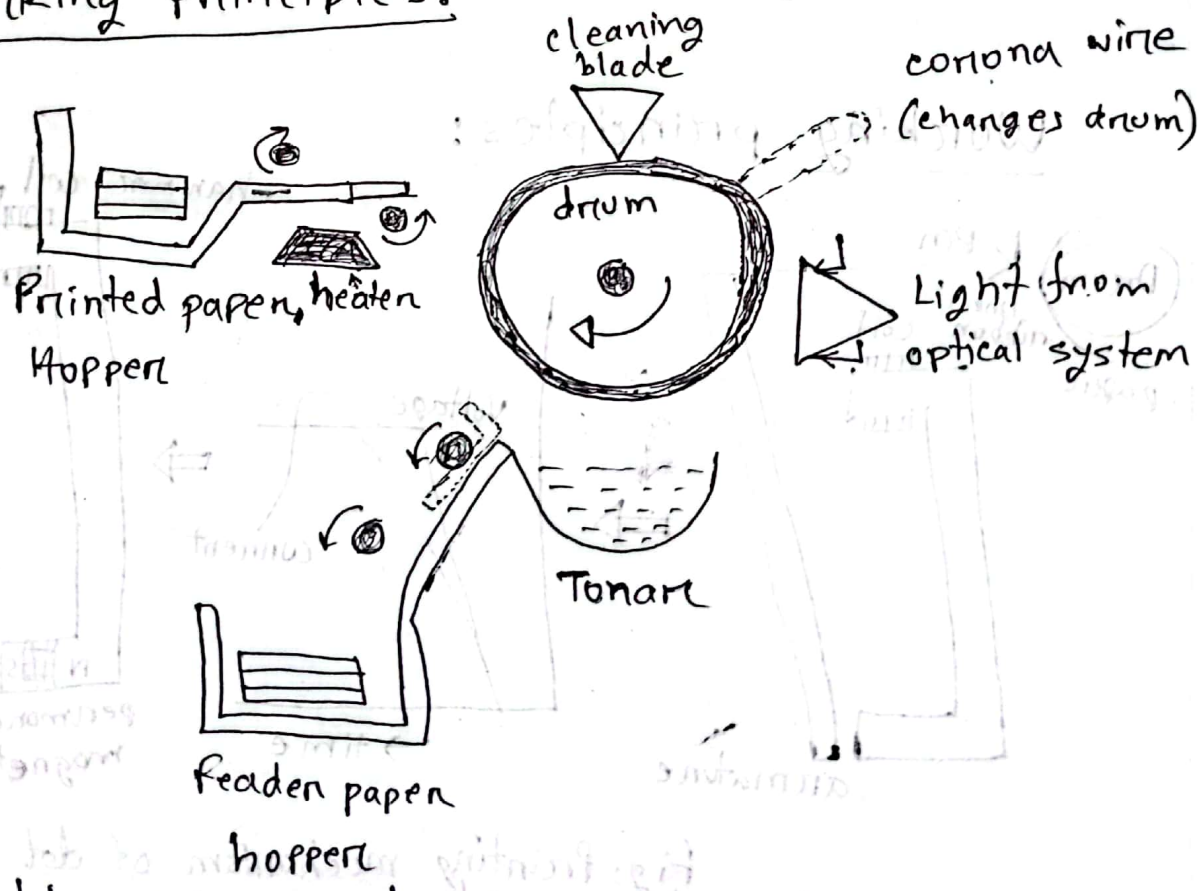
→ It uses a laser beam and dry powered ink to produce a fine dot matrix pattern.

→ Speed = 4-100 page/minute

→ ~~High~~ It produce high resolution image/text.

→ Color print + black-white print

Working principles:



H.w: Working details, advantages, dis-advantages.

29.10.24

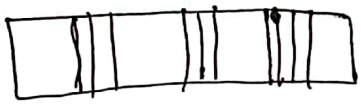
H.W:

1. Difference between dot matrix and laser printer.

* Barcode: A barcode is a machine readable representation of information in a visual format on a surface.

Difference between Barcode and QR code

→ A barcode consists of a series of ~~probab~~ parallels and adjacent bars and space.

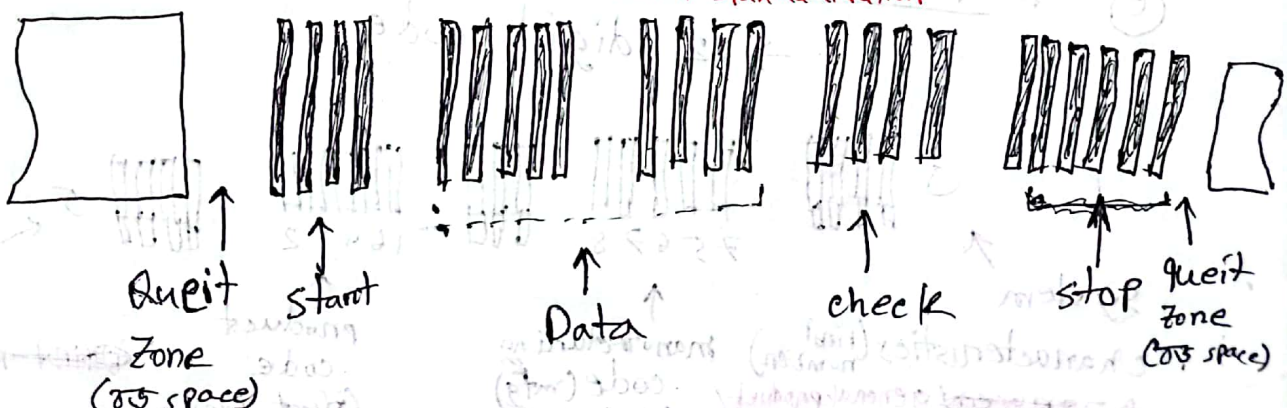


→ Barcode secure and reliable.

Q: Why we use barcode in product?

→ Differentiate product
→ Efficient data capture
→ ~~Speed and convenience~~ secure and reliable
→ Error reduction
→ Cost effective
→ Global standardization

* Barcode structure:



barcode reader app.

QR code generator website.

i) Quiet zone: clear space.
→ stop reading barcode while scanning
→ It helps to start and read code.

ii) start code: Indicate start of barcode

iii) Data: Actual data/information

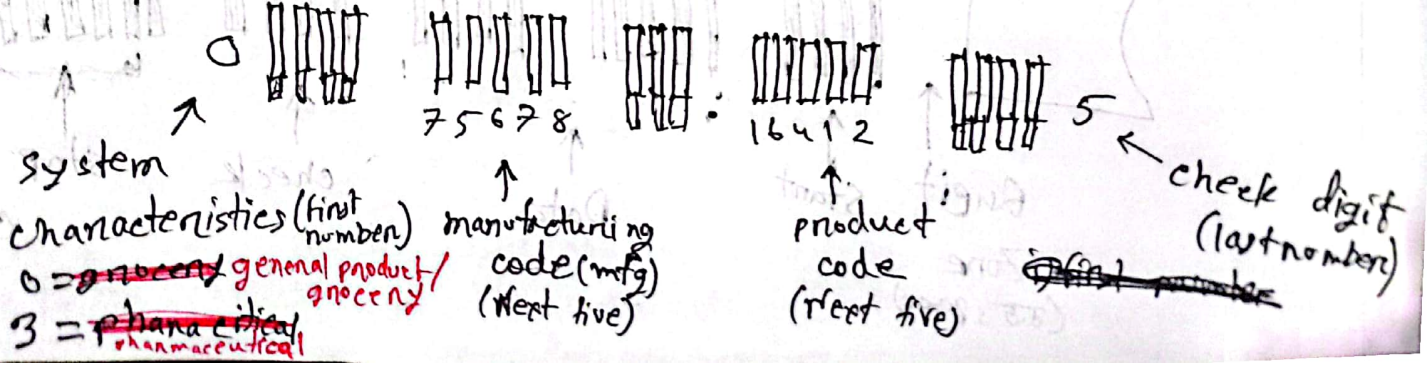
iv) Stop code: Indicate end of barcode.

v) check digit: Contain number to detect error

Barcode symbologies:

i) UPC-A
ii) EAN-13
iii) EAN-8
iv) code_39
v) PDF-417
vi) ISBN
vii) ISSN

e) i) UPC-A: Universal product code.
→ 12 digit code



(e) ii) EAN-13:

→ European Article number

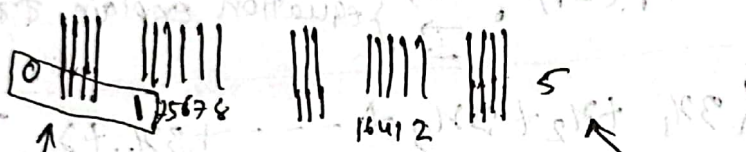
→ 13 digit code

→ First two digit = system characteristics

→ Next five digit = mfg

→ next five digit = product code

→ Last = check digit



0 = grocery

3 = phamacitical

X iii) code 39: linear barcode that contains,

→ Number + letters

→ word length flexible

→ Numbers, symbol, Alphabet, character
(0-9) (%.$# (A-Z)

start and end

check digit and math

03.11.24

* How barcode scanner works : Error check

① LED/Laser : Light emmitting diode

② Barcode

③ CCD sensor/photo diode : Carge-coupled Device

* check digit: Error detection

* check digit UPC-A : → } equation explain.

$$R = 10 - [\{3x_1 + x_2 + 3x_3 + \dots + 3x_{11} + x_{12}\} \% 10]$$

UPC-A : 0 3 6 0 0 0 2 9 1 4 5 2

$$R = 10 - [\{0 + 3 + 1 8 + \dots + 4 + 1 5\} \% 10]$$

$$= 2$$

Since $x_{12} = 2$ { R ; R<10, 0 ; R=10 } ∴ check digit $x_{12} = 2$

so the encoded data is: 036000291452

*check digit: check digit is a single digit that is located on the far right side of a barcode.

→ It is used to find error

05.11.24

(e) *check digit:

EAN-13:

check digit, $R = 10 - [\{x_{12} + 3x_{11} + \cdots + 3x_3 + x_2 + 3x_1\}] \% 10$

EAN-13: 1 2 3 4 5 6 7 8 9 0 1 2 ?

$R = 10 - [\{1+6+3+2+5+1+8+7+2+9+0+1+6\}] \%$

$= 8$

$\therefore x_{13} = \begin{cases} R \,;\, R<10 \\ 0 \,;\, R=10 \end{cases}$

*EAN-8: 7 3 5 1 3 5 3 ?

$R = 10 - [\{3x_7 + \cdots + 3x_3 + x_2 + 3x_1\}] \%$

$= 7$

$\therefore$ check digit $= x_{13} = 8$

So, the encoded data is: 1 2 3 4 5 6 7 8 9 0 1 2 8.

(e) *OMR:

→ Optical Mark Reader / Optical mark Recognition

→ OMR is a process of capturing human-marks data from documents forms such as survey or tests. It detects absence and presence of mark.

use:

- questionnaire
- survey
- multiple choice question (mcq), etc.

(e) *OCR:

→ Optical character recognition

→ It is a software that is designed to translate images of handwrite text into machine readable text.

use:

- cheque
- credit card
- magazine
- google lens, etc.

OCR main components:

i) Scanner

ii) Recognition component (pdf files, image files)

iii) OCR software

iv) Encoder

H.W: ~~Neceed~~ Neccessity of OCR, operation - How works

sir note (page-26)

(e)

(e) *MICR:

→ Magnatic Ink character recognition

→ character recognition system

→ Use specific ink and characters

use:

✓ Bank

NST
ICT pheloship

(e) H.W: Q. How does MICR read information from bank cheque?

Soln: → Special ink is used:

✓ number at the bottom of the cheque are printed using special magnetic ink (contains iron oxide).

→ Magnetic field is applied:

✓ When cheque passes through an MICR reader, it creates magnetic field around the printed characters.

→ Magnetic reaction is detected:

✓ Magnetic ink reacts with the magnetic fields and machine detects unique signal for each character

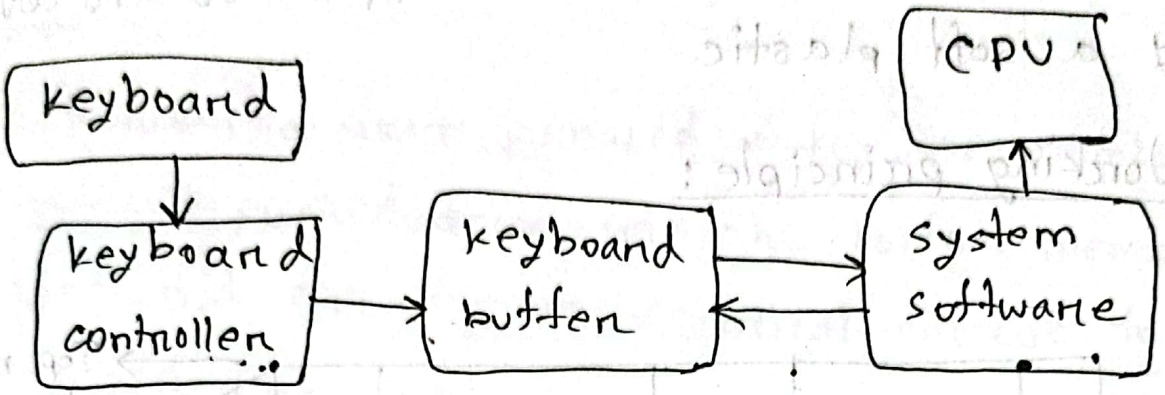
→ Conversion to digital data:

✓ MICR converts the unique magnetic signal into digital data and sends to computer system

→ Bank verifies the information:

✓ Bank system proces this data to verify cheque authentication and complete transaction.

(e) How keyboard works:



i) key is pressed on the keyboard

ii) The keyboard controller sends the scan code to the keyboard buffer.

iii) The keyboard ~~controller~~ buffer sends an interrupt and scan code request to the system software.

iv) The system software responds to the interrupt by reading the scan code from keyboard buffer.

v) The system software passes the scan code to the CPU.

* Membrane keyboard: Membrane keyboard is a keyboard where keys are not separated and covered by a soft plastic.

Working principle:

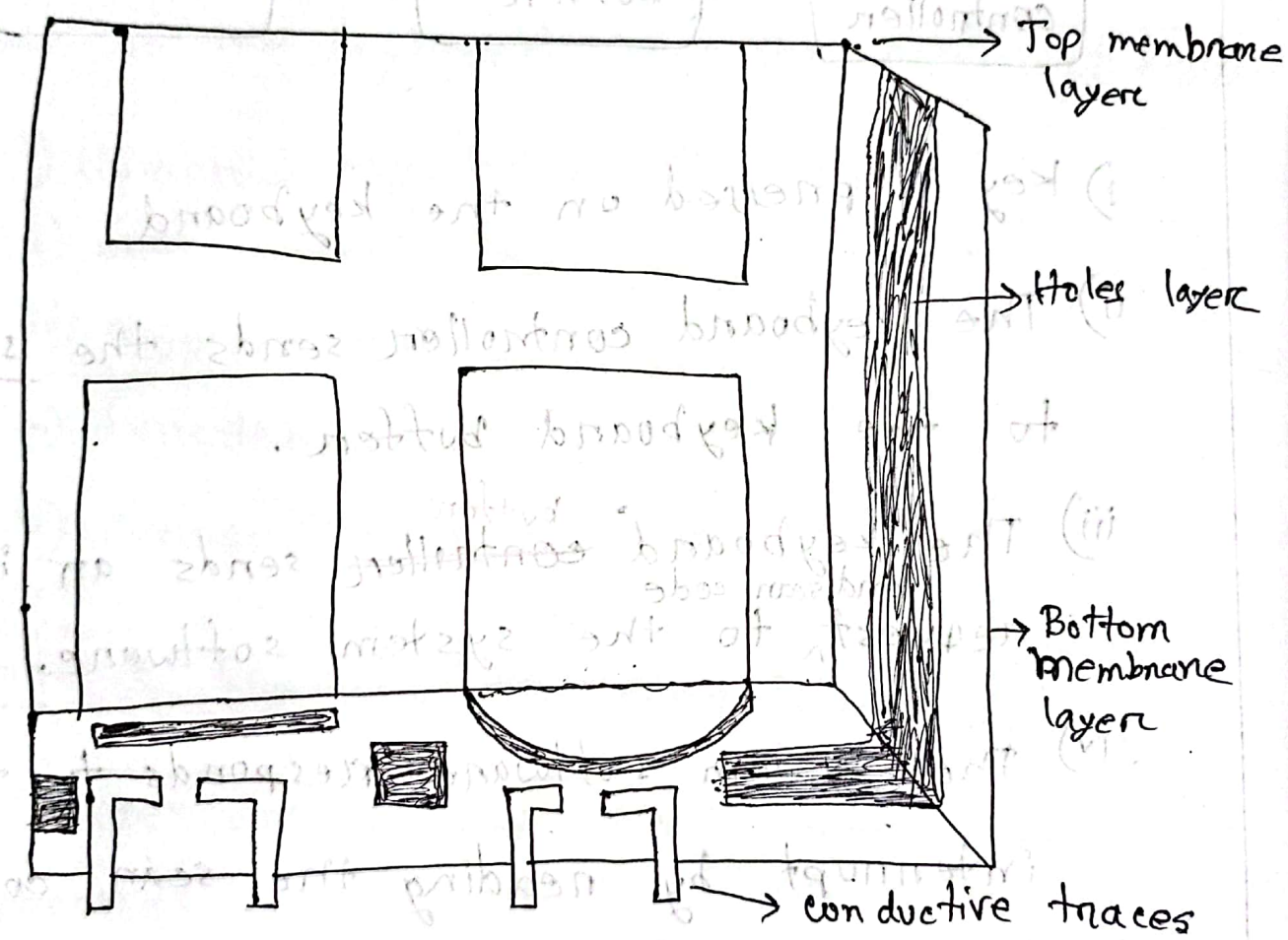


fig: Membrane keyboard

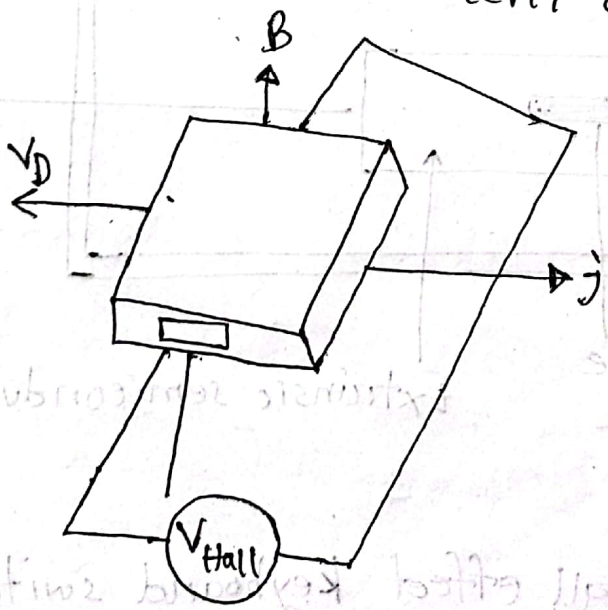
i) There are three layers of membrane keyboard; Top membrane layer
Bottom " "
Holes layer "

ii) In normal state, the electric circuit is broken because the current can not cross the non-conductive gap.

iii) But when a user pressed a key, top membrane ~~key~~ layer is pushed down into the bottom membrane layer and creating an electrical circuit to register the press.

*key switching mechanism:

*Hall effect switch: Hall effect is a mechanism of creating voltage difference across an electrical semiconductor and current and a magnetic field.



P.t.o.

*Working principle of hall effect keyboard switch:

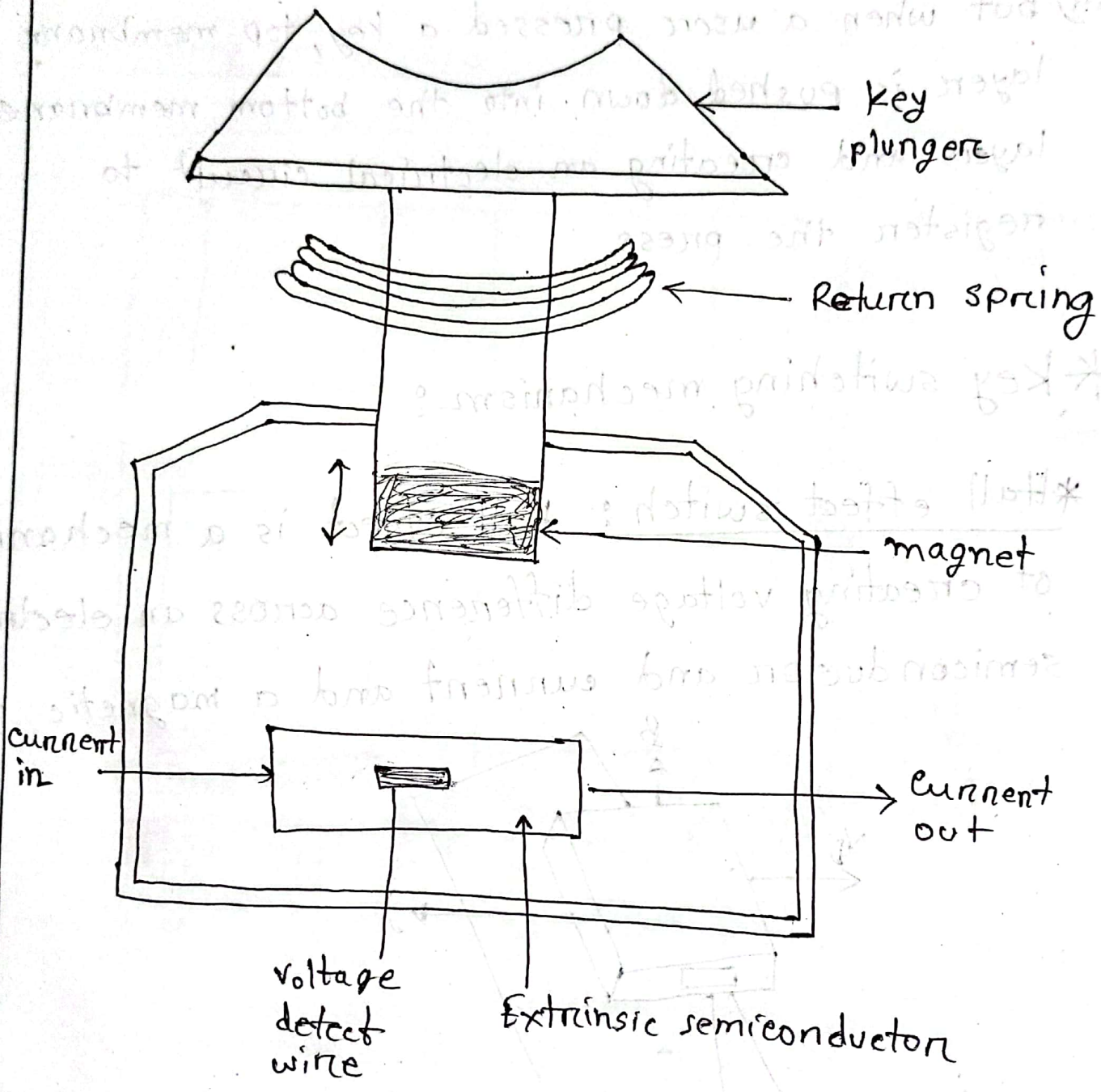


Fig: Hall effect keyboard switch

i) When a key is pressed, an magnetic field is produced.

ii) And an electric field is produced because electric field is perpendicular to the magnetic field.

iii) And current is produced.

iv) When magnet is touched the voltage detect wire, then the circuit is closed and the current flow is shorted.

v) When key is released, then circuit is opened and back to the initial condition.

01.12.24

(e) * Hard disk figure explanation ← PDF এবং এখান থেকে Figure: 13.1 আঁকুন

* 1 HDD

P = platter

1 P = 2 surface

1 surface = t track

1 track = s secton

1 secton = B Bytes

∴ Total capacity = P × 2 × t × s × B = 2Bst

* 2^{10} = 1kB

2^{20} = 1mB

2^{30} = 1GB

2^{40} = 1TB

* Math: problem-1
এর math

Pdf থেকে → আঁকুন figure: 13.1 and এর math

def. properties, example, Block diagram

(e)

Interfacing : start

* Difference between microprocessor & micro-controller.

microprocessor: core-i5
core-i7
core-i3

micro controller: Arduino uno
" mega 2560

* Difference between difference μP (intel 4000, intel 8086, ...)

*Interfacing/micro-controller → 8251
8259
8255

* μp of phone : Qualcom snapdragon
: Media tek
: NVIDIA etc

15.12.24

*8251A - Programmable Communication Interface (PCI):

Intel-8251A is a universal synchronous and asynchronous receiver/transmitter (USART).

→ 8251A PCI is designed to enable communication between microprocessor and peripheral devices.

→ It converts parallel to serial (P-S) for transmission and serial to parallel (S-P) for reception of data.

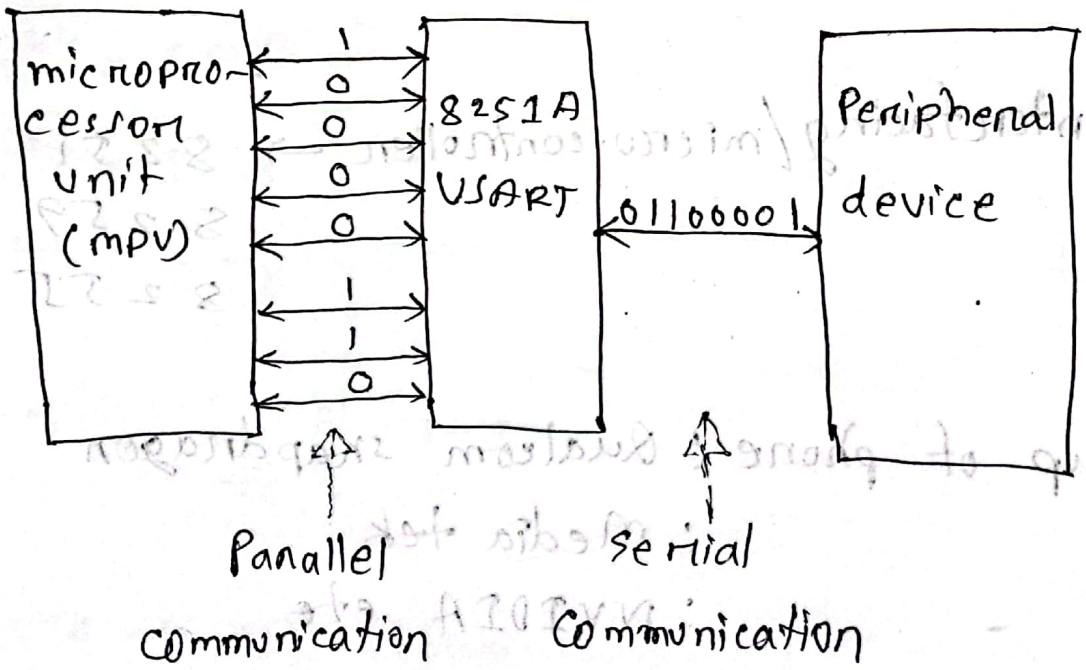


Fig: Communication among MP unit

55 → 28 Pin diagram

(e) *Architecture of 8251A:

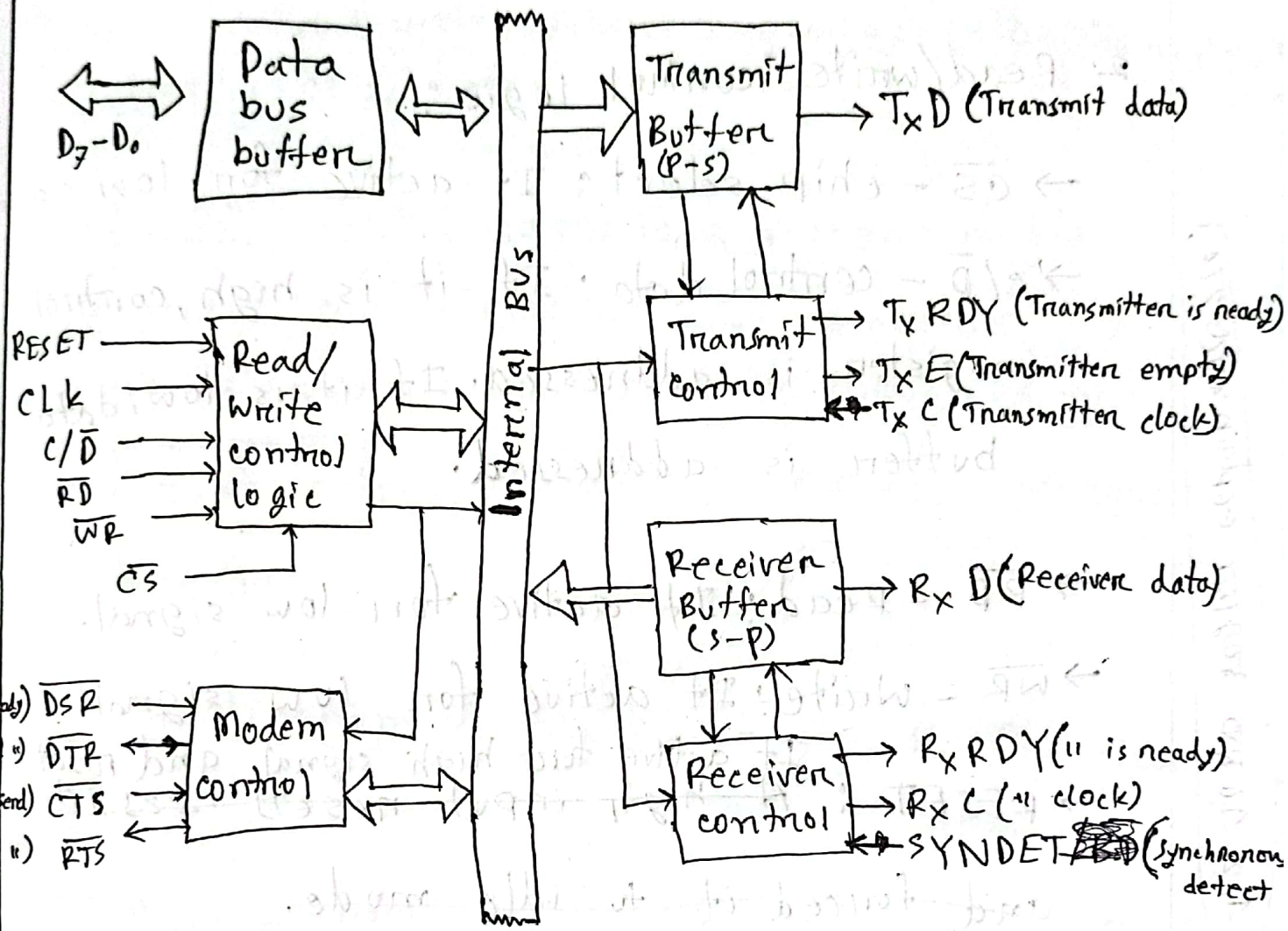


fig: Architecture of 8251A

Pin description of 8251A:

1. Data bus buffer: It is bidirectional 8 bi buffer used to interface 8251A with the system bus of the microprocessor. It has eight pin (D_7-D_0). It is used to transfer data

control word, command word, status information to the system bus.

2. Read/write control logic:

→ $\overline{CS}$ - chip select: It active for low signal.

→ $C/\overline{D}$ - control data: If it is high, control register is addressed. If it is low, data buffer is addressed.

→ $\overline{RD}$ - Read: It active for low signal.

→ $\overline{WR}$ - Write: It active for low signal.

→ RESET : It active for high signal and reset 8251 ~~A high input resets 8251A and forced it to idle mode.~~

→ CLK : If it is high, then clk signal is sent.

$\overline{CS}$	$C/\overline{D}$	$\overline{RD}$	$\overline{WR}$	Description
0	1	1	0	MPU writes instruction in control register.
0	1	0	1	MPU Reads instruction in control register.
0	0	1	0	MPU writes data to USART.
0	0	0	1	MPU reads data to USART
1	X	X	X	chip is not selected

1.2 প্রশ্ন এর চিত্র সহকারে explain করবে

07.01.2024

CT-3:

Topic: - 8255A

- Read-write Addressing → last class (all 8251A)

Date: 15.01.2025

* 8259A: Intel 8259A is a programmable interrupt controller (PIC). It combines the multi interrupt input sources into a single interrupt output source. It handles interrupt of hardware.

Block diagram & pin diagram: H.w (from classroom).

Q.1 How does intel 8259A handles interrupt?

Lab report-5: Introduction to IOT and blinking LED by using mobile App and internet servers.

14.01.2025

Q. Describe the function of the important registers available in 8259?

There are three types of registers available in 8259.

① IRR (Interrupt Request Register): IRR stores all the interrupt inputs that are requesting service. It is an 8 bit register. It keeps of which inputs are asking for service. It interrupt bit is unmasked, then IRR bit will be set.

② Interrupt mask register (IMR): The IMR is used to disable (mask) or enable (unmask) individual interrupt request inputs. This is also an 8 bit register. Each bit in this register corresponds to the interrupt with the same number. The IMR operates on the IRR.

③

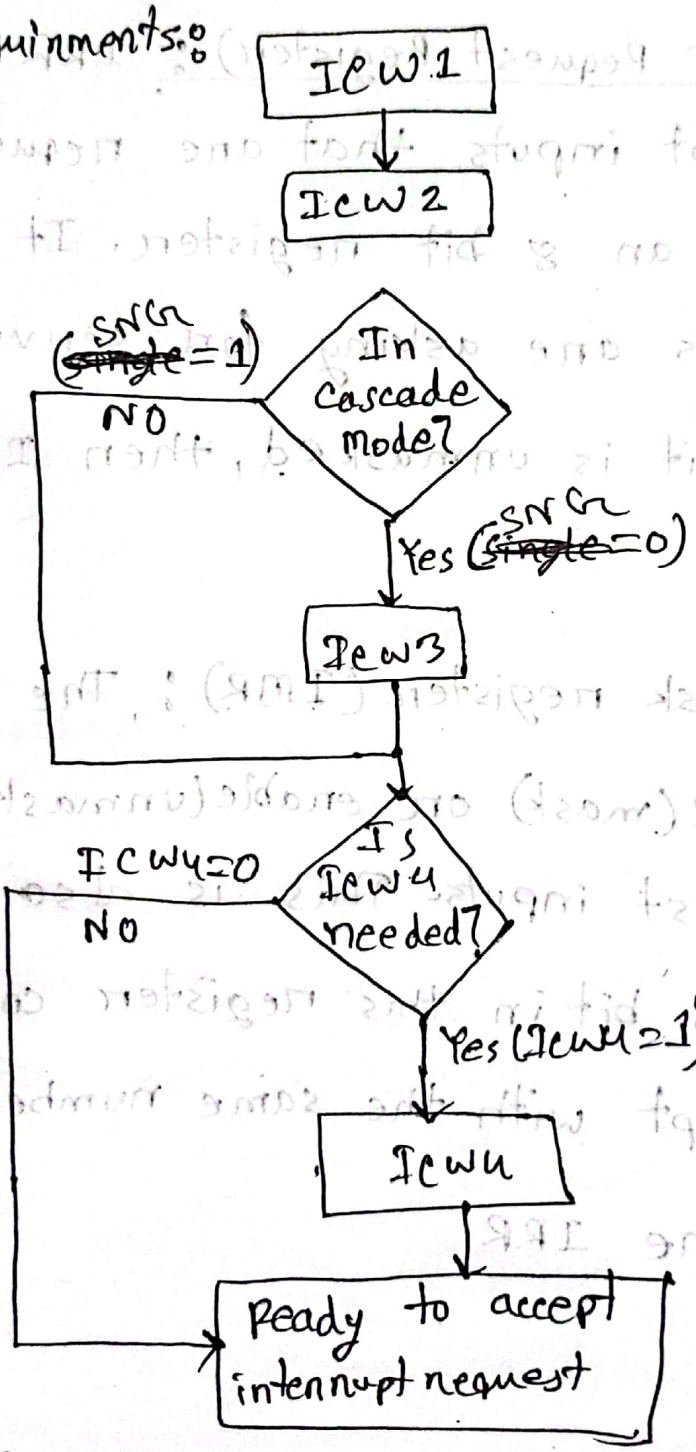
*8259 command word :

1) ICW (Initialization command word) → ICW1,

ICW2, ICW3, ICW4

2) Operating command word (OCW)

*8259 initialization command word sending order & requirments:



19.01.25

* 8259 Initialization command word 3 (ICW3) format:

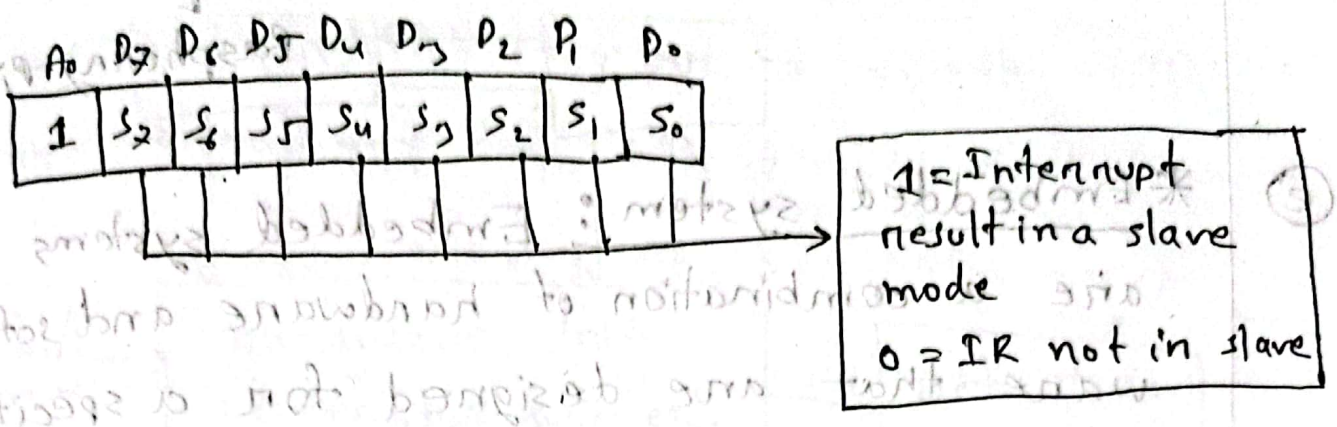


Fig: ICW3 (master device)

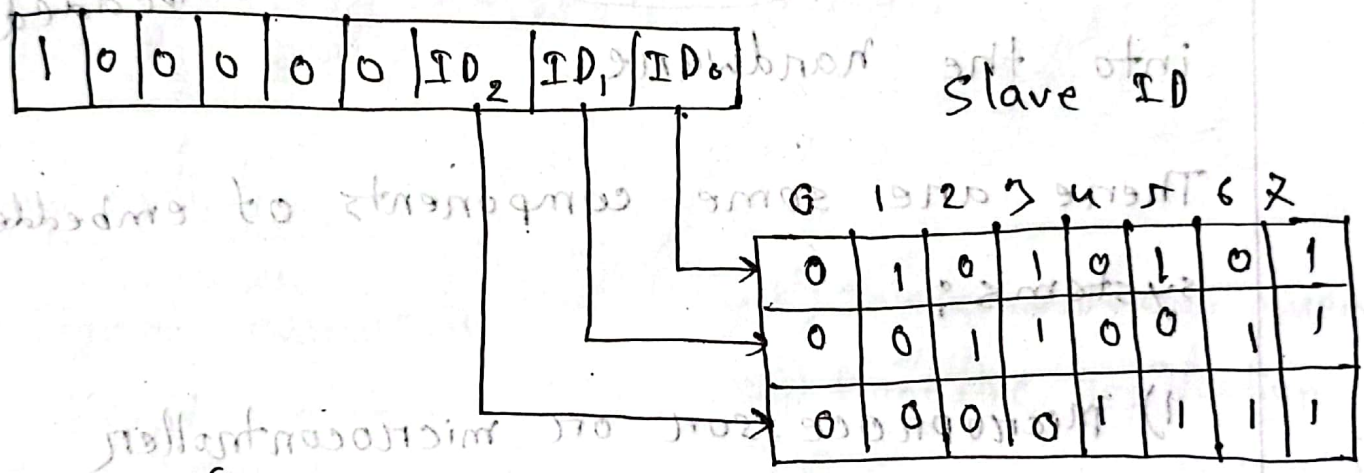


fig: ICW3 (slave device)

Q. Write down the function of initialization command word 3 (ICW3) of Intel-8259 in cascade mode.

Q. what is micro-controller with example?

↓

Raspberry Pi μc

(e) *Embedded system: Embedded systems are a combination of hardware and software that are designed for a specific function. Here, software is usually known as firmware that is embedded into the hardware.

There are some components of embedded systems:

i) Microprocessor or microcontroller
ii) I/o units (sensor, display, LED, touch, Actuator
iii) memory
iv) Power supply
v) ADC/DAC etc.

Block diagram of ES:

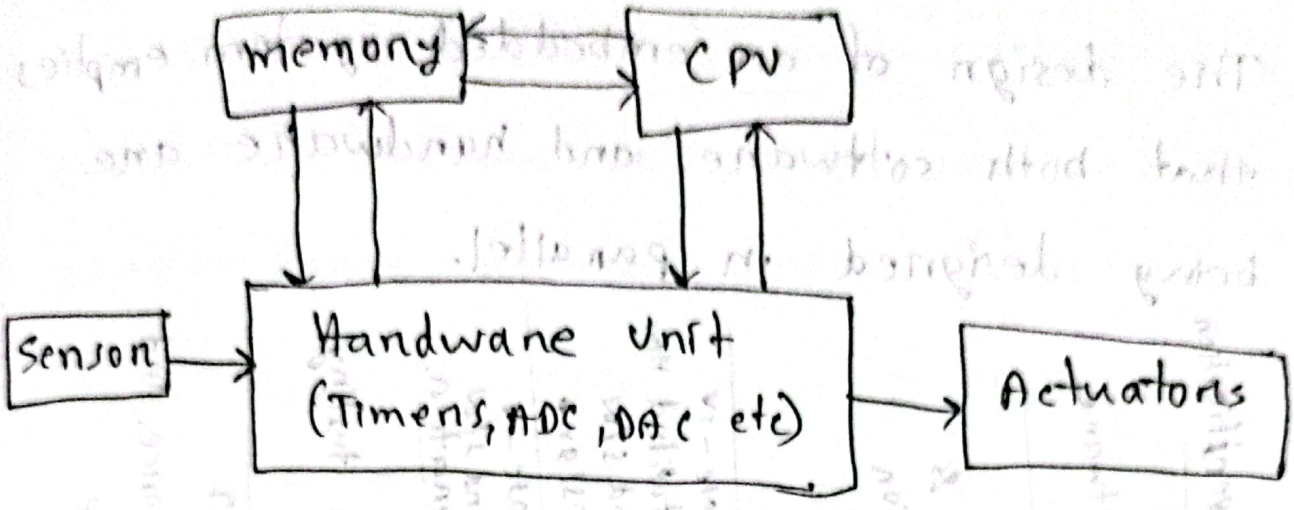


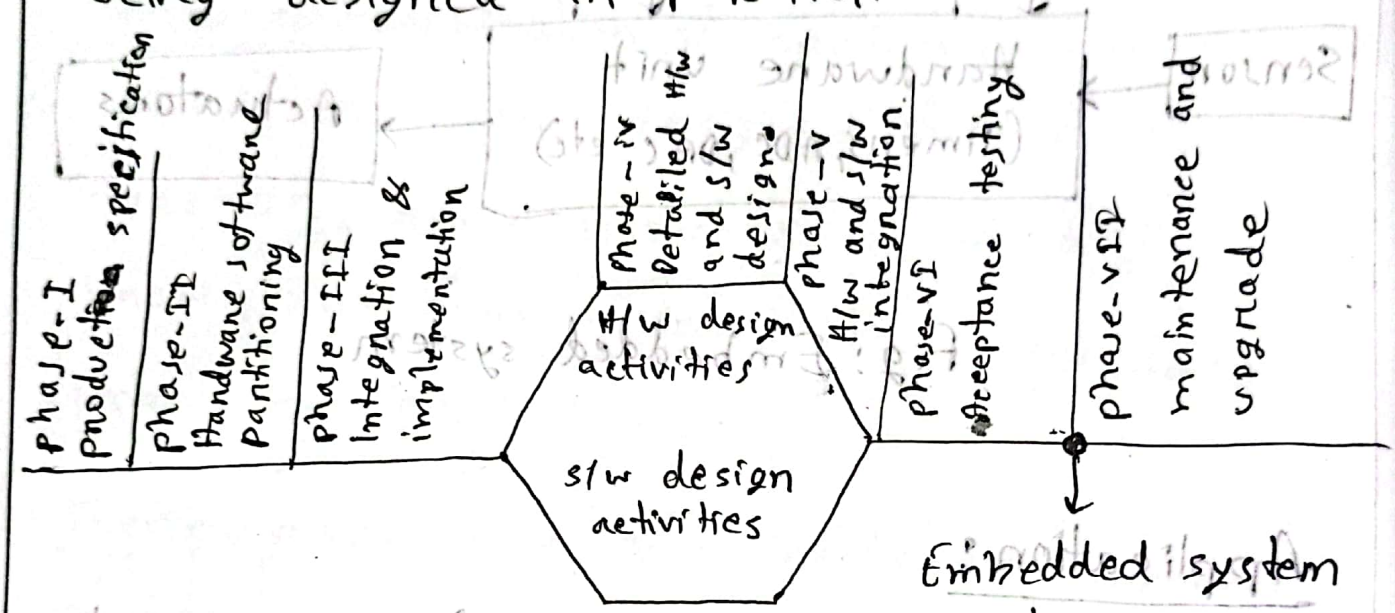
Fig: Embedded system

Application:

i) Digital camera
ii) Smart watch
iii) Fitness trackers
iv) Air conditioning system
v) Smart home
vi) Global positioning system (GPS)
vii) Pacemakers
viii) medical devices
ix) motion senson
x) manufacturing equipment
xi) Gaming
xii) Telecommunication equipme
xiii) Domestic application
xiv) Cars and vehicles etc

(d) * Embedded system design life cycle:

The design of an embedded system emplies that both software and handware are being designed in parallel.



Details: H.W

(e) * Models of computation for embedded system:

Types of models of computation for ES:

i) Data flow Graph (DFG) model
ii) Control Data flow Graph (CDFG) model
iii) State machine model
iv) sequential program model
v) Communication model
vi) Unified modeling language (UML) etc.

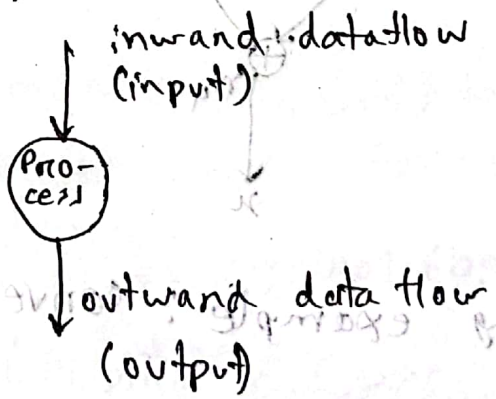
i) Data Flow Graph (DFG) model: This model is known as data driven model. Here data processing requirments are converted into graph. There are two types of DFG.

a. Cyclic DFG
b. Acyclic DFG

Main components of DFG is:

a. Process (which is expressed by cycle)
b. Data flow (which is expressed by arrows)

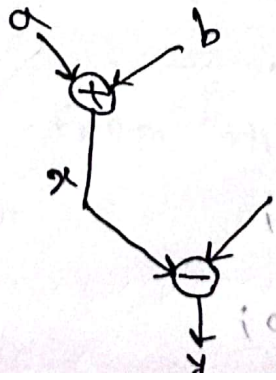
Example: Digital Signal Processing (DSP).



Example:
convert it into DFG:

i) $x = a + b$
$y = x - c$ ⇒

Fig: DSP



ii) ~~Example:~~

$n_1 = A + B$

$n_2 = C * D$

$n_3 = D + E$

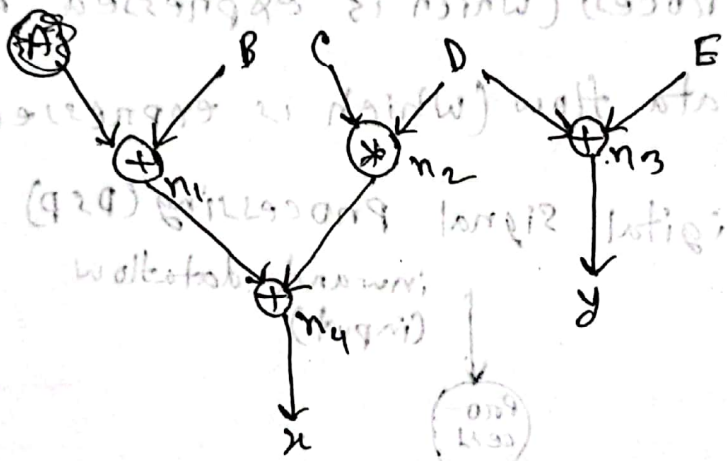
$n_4 = n_1 + n_2$

$x = n_4$

$y = n_3$

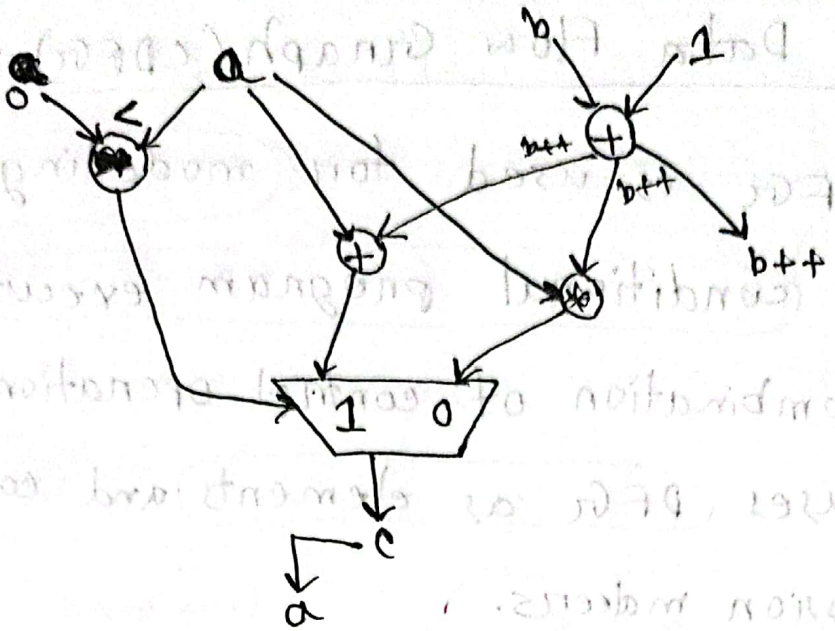
convert it into DFG.

ans:



iii) coding example: convert it into DFG

```
int a, b, c ;
void func() {
    b++;
    if (a>0)
        c = a+b;
    else
        c = a*b;
    a=c;
}
```



H.w:

Real life example of DFG:

Smart room temperature control system

i) sensor (Data mode)

ii) Process-I (compare current temperature with setpoint)

iii) Process-II (Fan/AC control (on/off))

iv) Process-III (Display Data (CRT display))

v) Fan/AC adjusts with room temperature. (Fan on)

Draw a DFG from the data set.

② Control Data Flow Graph (CDFG) model:

The CDFG is used for modelling application involving conditional program execution. It is ~~an~~ combination of control operation. The CDFG uses DFG as elements and conditional as decission makers.

Example: Digital camera

○ data/elements

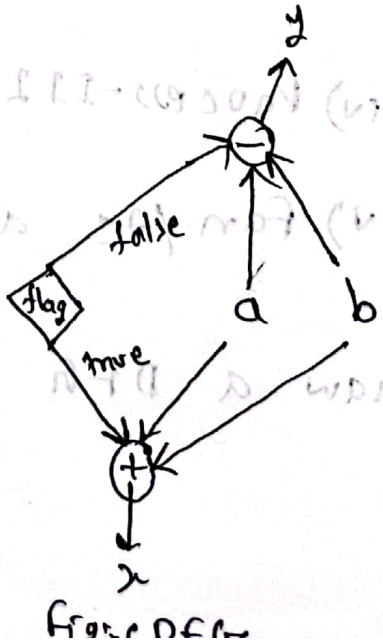
→ Inward/outward

◇ decission makers

i) convert it into CDFG.

```
if flag == 1
    x = a + b
else
    y = a - b
```

ans:



From DFG

6) State machine model : It is

*Hard Disk (HDD): An HDD (Hard Disk Drive) is a drive used to store data on computer like files, pictures, music and software. It is like a big storage box inside computer where all important information is saved.

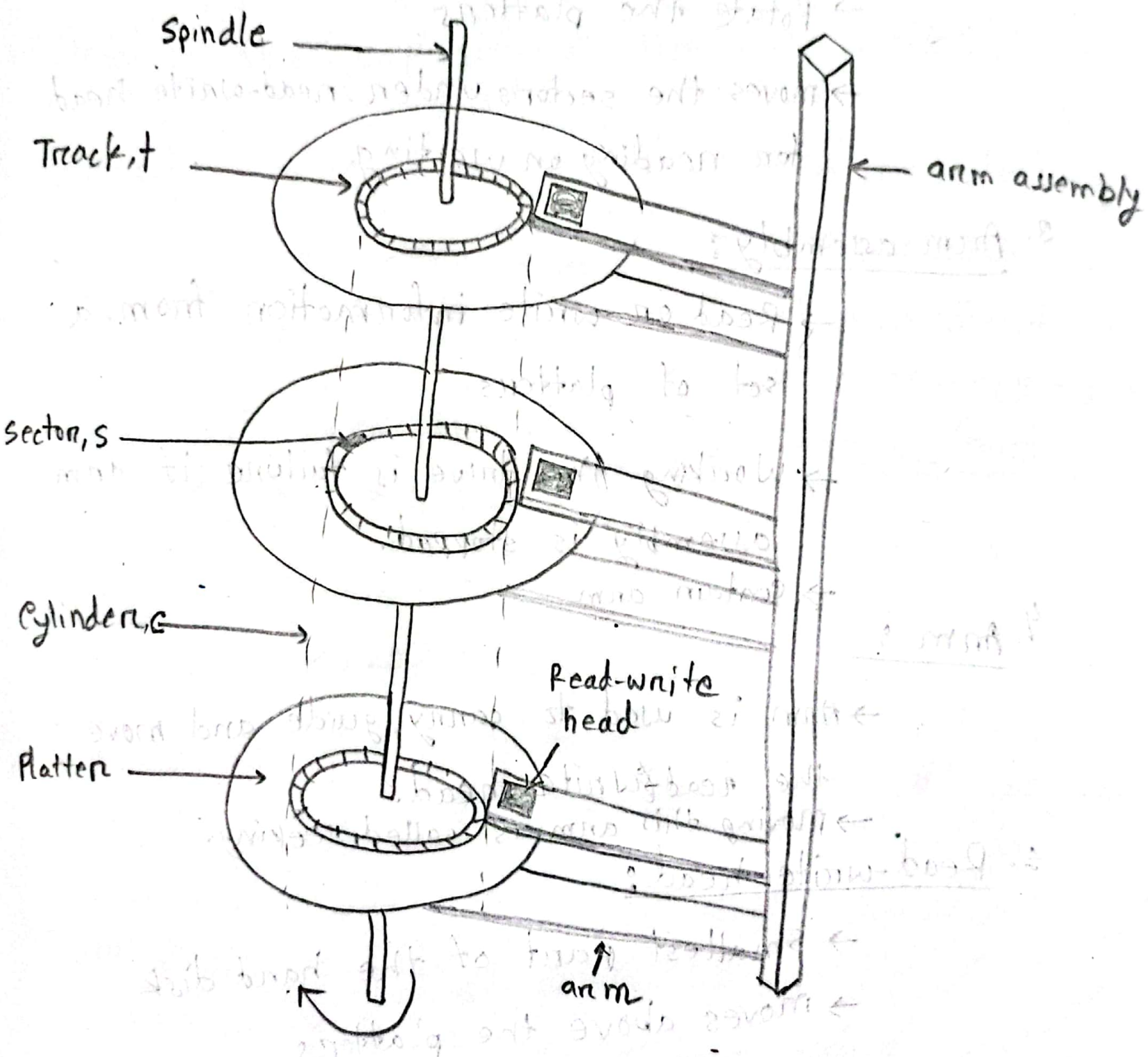


Fig: Hard disk drive

1. Platters:

→ circular disk.
→ made by metal on glass.
→ data is stored in magnetic form.

2. Spindle:-

→ Rotate the platters
→ moves the sectors under read-write head for reading on writing.

3. Arm assembly:

→ Read or write information from a set of platters.
→ Working the drive is failure if arm assembly is stopped.
→ Contain arm

4. Arm:

→ Arm is used to carry, guide and move the read/write head.
→ Moving this arm is called seeking.

5. Read-write head:

→ Smallest part of the hard disk
→ moves above the platters
→ moves to the track that contains data to be transferred
→ Each surface has own read-write

*Math:

Consider a disk with the following specification: 16 surfaces, 128 tracks, per surface, 256 sector per track and 512 byte per sector.

① What is the capacity of the disk pack?

$$\text{capacity} = 2BStP$$
$$= 2 \times 512 \times 256 \times 128 \times 8$$
$$= 2^1 \times 2^9 \times 2^8 \times 2^7 \times 2^3$$
$$= 2^{28} \text{ bytes}$$
$$= 2^{20} \cdot 2^8 \text{ bytes}$$
$$= 2^8 \text{ MB}$$
$$= 256 \text{ MB}$$

size per sector, $B = 512$ byte

~~surfaces, $s = 16$~~

track per surface, $t = 128$

sector " track, $S = 256$

platters, $P = \frac{\text{surface}}{2}$

$= 8$

② What is the number of bit required to address the sector?

$$\text{Total sector} = 2StP$$
$$= 2^1 \times 2^8 \times 2^7 \times 2^3$$
$$= 2^{19}$$

∴ Required bits = 19 bits.

③ If the format overhead is 32 bytes by sector, what is the formatted disk space?

formatting overhead $= 2B'stp$

$= 2 \times 32 \times 256 \times 128 \times 8$

$= 2^1 \times 2^5 \times 2^8 \times 2^7 \times 2^3$

$= 2^{24}$ bytes

$= 2^{20} \times 2^4$ bytes

$= 2^4$ mB

$= 16$ mB

B' = overhead per sector = 32 bytes

∴ formatted disk space = Total space − formatting overhead

$= (256 - 16)$ mB

$= 240$ mB

Format overhead includes with structures and metadata for the disk functionality.

④ If the format overhead is 64 bytes per sector, how much amount of byte is lost due to formatting.

formatting overhead $= 2B'stp$

$= 2^1 \times 2^6 \times 2^8 \times 2^7 \times 2^3$

$= 2^{25}$ bytes

$= 2^5$ mB

B' = 64 bytes $= 2^6$ bytes

$= 32 \text{ mB}$

$\therefore \text{lost} = 32 \text{ mB}$

⑤ If the diameter of inner most track is 21cm, what is the maximum recording density?

Capacity of track $= 256 \times 512$

$= 2^8 \times 2^9$

$= 2^{17}$ bytes

$= 2^{10} \times 2^7$ bytes

$= 2^7 \text{ kB}$

$= 128 \text{ kB}$

Perimeter $= 2\pi r$

$= 2\pi \times 10.5$

$= 65.92 \text{ cm}$

$r = \frac{21}{2} \text{ cm}$

$= 10.5 \text{ cm}$

$\therefore \text{maximum recording density} = \frac{128 \text{ kB}}{65.92 \text{ cm}}$

$= 1.94 \text{ kB/cm}$

⑥ If the diameter of inner most track is 21cm with 2kB/cm, what is the capacity of one track?

Perimeter $= 2\pi r$

$= 2 \times 10.5$

$= 65.97 \text{ cm}$

$$\therefore \text{Density} = \frac{\text{capacity}}{\text{perimeter}}$$

density = 2 kB/cm

$\Rightarrow$ capacity = density $\times$ perimeter

$= 2 \times 65.97$

$= 131.94$ kB

$\cong 132$ kB

⑦ If the disk is rotating at 3600 RPM, what is the data transfer rate?

Data transfer rate = BSP $\times$ rotation

$= 2 \times 512 \times 256 \times \frac{3600}{60}$ (×8)

$= 2^1 \times 2^9 \times 2^8 \times 2^3 \times 60$

$= 2^{21} \times 60$ bytes

$= 2 \times 60$ MBPS

$= 120$ MBPS

rotation = 3600 RPM

$= \frac{3600}{60}$ RPS

$= 1$

* How barcode scanner works:

1. Scanning head shines LED or laser light onto the barcode.

2. Light reflect from barcode into light-detecting electronic component called a photo electric cell. white areas of barcode reflect ma-

light and black areas reflect least.

3. photoelectric cell generates a pattern of on-off pulse corresponding to the black and white strip of reflecting light.
   → create off pulse for black strip
   → create on pulse for white strip
   → for example:

   black, black black white black white
   off off off on off on

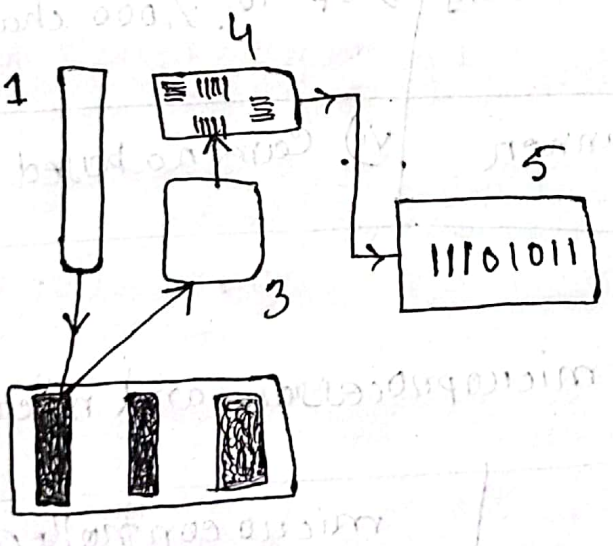


fig: Working principle of barcode scanner

4. An electronic circuit converts these on-off pulse into digital data.
5. The digital data from scanner is sent to a computer program which is the final barcode

* Difference between Barcode and QR code:

Feature	Barcode	QR code
i) full form	i) Bar-code	i) Quick Response code
ii) structure	ii) 1D	ii) 2D
iii) Appearence	iii) Parallel black and white lines	iii) square pattern with dots and shapes
iv) Error connection	iv) Low error connection	iv) High error connection
v) storage	v) 20-25 characters	v) Up to 7,000 characters
vi) Technology	vi) LED scanner	vi) Camera based scanner

* Difference between microprocesson and microcontroller:

microprocesson	microcontroller
i) contains only CPU	i) contains CPU, memory (RAM/ROM), I/O ports, timers etc.
ii) single chip	ii) It's a system
iii) Perform arithmatic and logical operation	iii) Perform multiple tasks.

iv) Used in computers or high pentonmance systems.	iv) Used in embedded systems
v) more powerful	v) less powerful
vi) Required external components for I/O function.	vi) Also includes components for I/O function.
vii) Ex: core-i3, core-i5, core-i7, Qualcom snapdragon, Media Tek, Google Tensor	vii) Ex: Arduino UNO Arduino mega Arduino Nano

*Microprocessor: Microprocessor is a central processing unit of computer or other electronic device that is integrated onto a single chip.

→ Responsible for executing instructions and controlling the devices' operations.

* Micro controller: Microcontroller is a small self contained computer on a single IC designed to control specific tasks in embedded systems.

→ contain CPU, memory, I/O ports, timers etc.

* What do you mean by computer interfacing? Write down the properties of computer interfacing.

Computer interfacing: The circuitry or devices are needed to connect the data bus with a peripheral device is called computer interfacing.

Example: RS232 is an interfacing device

Properties of interfacing:

i) Interfacing must be consists of a logic circuitry of decoder to decode the address.

ii) must be consist of a buffer

iii) must be consist circuitry of read write operation

iv) I/O device capable to communicate with DMA (Direct memory Access)

* Block diagram of Interfacing:

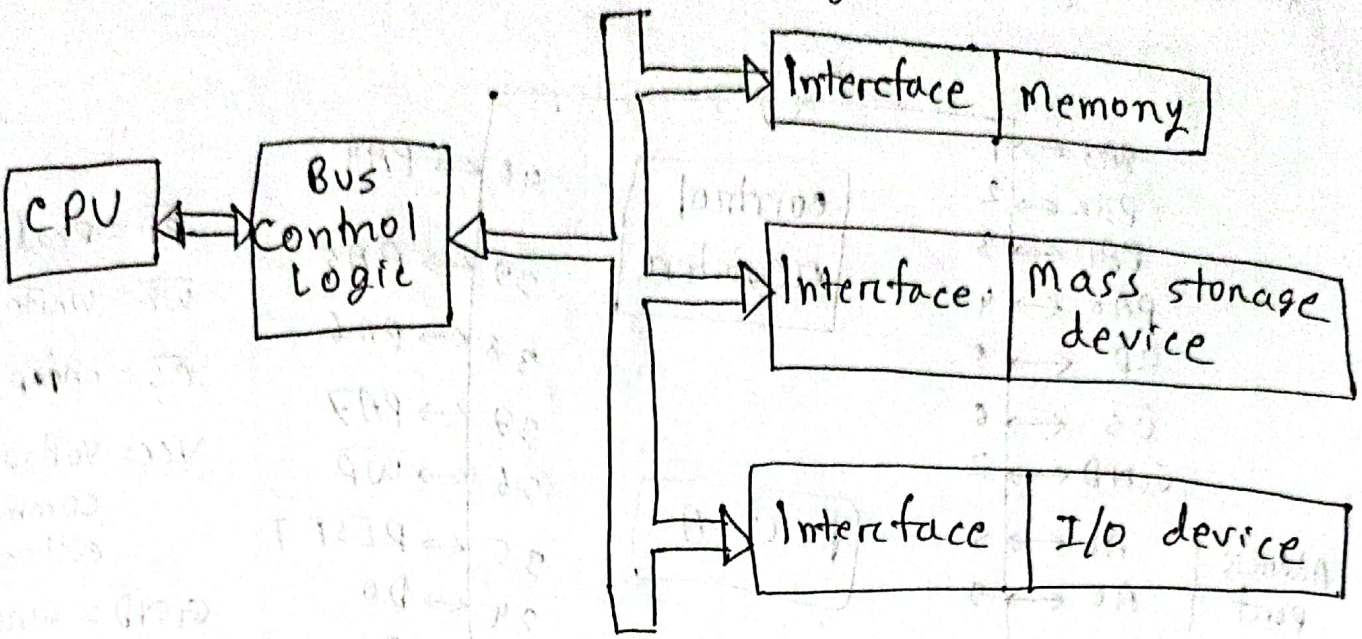


fig: Block diagram of interfacing

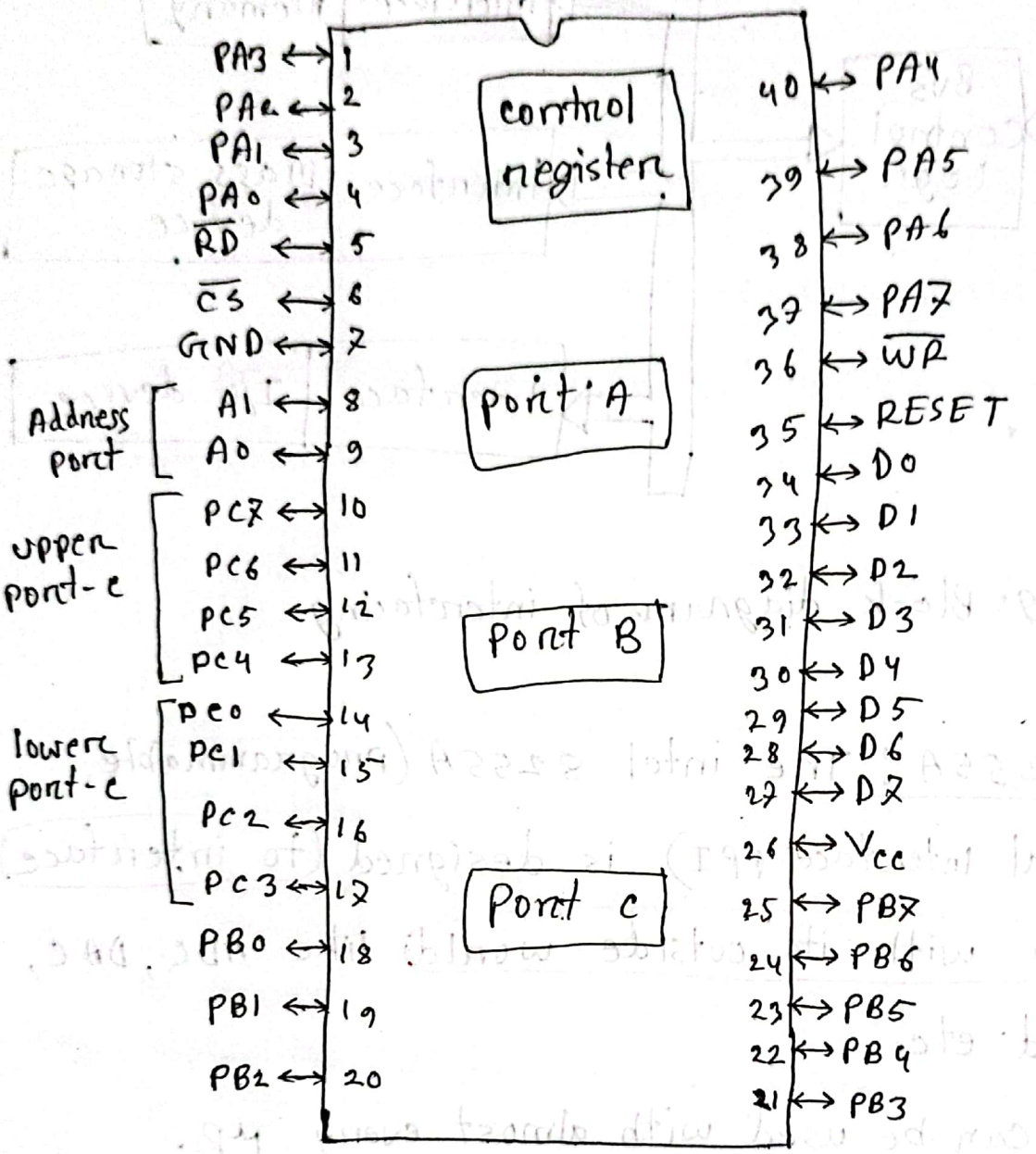
* Intel 8255A: The intel 8255A (programmable peripheral Interface-PPI) is designed to interface the CPU with its outside world like ADC, DAC, keyboard etc.

→ Can be used with almost every μp.

→ It has 40 pins

→ Has three ports: i) port A: } contains 8 bit input buffer
ii) port B: } 8 " output "
iii) port C: two parts
→ lower (PC3-PC0)
→ upper (PC7-PC4)

* Pin diagram of Intel-8255A :



$\overline{RD}$ = Read data
$\overline{WR}$ = write
$\overline{CS}$ = chip select
Vcc = voltage common collector
GND = Ground

Description :

- Port-A (PA_0-PA_7) : 8 pin (1-4, 40-37)
- port-B (PB_0-PB_7) : 8 pin (18-25)
- port-C (PC_0-PC_7) : lower port-c → 4 pin (14-17)
  Upper port-c → 4 pin (10-13)

Data pin (D_0 - D_7) : 8 Pin (34 - 27)

Address pin (A_0-A_1) : 2 Pin (8-9)

Read ($\overline{RD}$) : 1 Pin (5)

Write ($\overline{WR}$) : 1 Pin (36)

chip select ($\overline{CS}$) : 1 Pin (6)

RESET : 1 pin (35)

Voltage common collector (V_{cc}) : 1 pin (26)

Ground (GND) : 1 pin (7)

* Specialty about port-c and RESET pin :

Port-c :

→ used as an 8-bit I/o port or two 4-bit I/o port.

→ Produce handshake signal for port-A and port-B.

RESET :

→ Activate when it get high signal

→ clean/reset control register

* Address bit A_0 and A_1 use to select which register will be used : (Address bit এ data নিবে কোন register এ select হবে)

$\overline{CS}$	A_1	A_0	selection
0	0	0	port A
0	0	1	port B
0	1	0	port C
0	1	1	control register
1	X	X	No selection

port A, port B, port C } read-write operation held

control register } write operation will be held.

* Write the addressing technique of READ and WRITE operation of Intel-8255A.

Addressing technique of READ operation :

A_1	A_0	$\overline{RD}$	$\overline{WR}$	$\overline{CS}$	Function input operation (READ)
0	0	0	1	0	Port A → Data bus
0	1	0	1	0	Port B → Data bus
1	0	0	1	0	Port C → Data bus
1	1	0	1	0	Control register → Data bus

Addressing technique of WRITE operation :

A_1	A_0	$\overline{RD}$	$\overline{WR}$	$\overline{CS}$	Function output operation (write)
0	0	1	0	0	Data bus → port A
0	1	1	0	0	Data bus → port B
1	0	1	0	0	Data bus → port c
1	1	1	0	0	Data bus → control register

* Handshaking :
  → two types - input handshaking, output handshaking.
  → pre-acknowledgement (দুই ডিভাইস) before communicating two devices.

* 8255-A operational modes and Initialization :

There are three modes.

① Mode 0 (no handshaking) : Simple I/O mode.

There are no handshaking.

→ When we want to use a port for simple I/O without handshaking, we initialize that port in mode 0.

→ If both port-A and port-B are initialized in mode 0, the two halves of port-c can be used together

→ Two halves of port-c are independent. So One can be initialized as input and another as output.

→ Example: Blinking LED.

(2) Mode-1 (Handshaking):

→ When we want to use port-A or port-B for I/O operation with handshaking, we initialize that port in mode 1.

→ for port-A, some pins (4) of upper port-c used as handshaking.

→ for port-B, some pins (4) of lower port-c used as handshaking.

→ Example: Printer, ADC, DAC

(3) Mode-2 (Bidirectional handshaking):

→ Only port-A can be initialized in mode 2. Port A can be used for bidirectional data transfer. Upper port-c used as handshaking

→ Example: master slave communication between µp and µc

* 8255A control register word format:

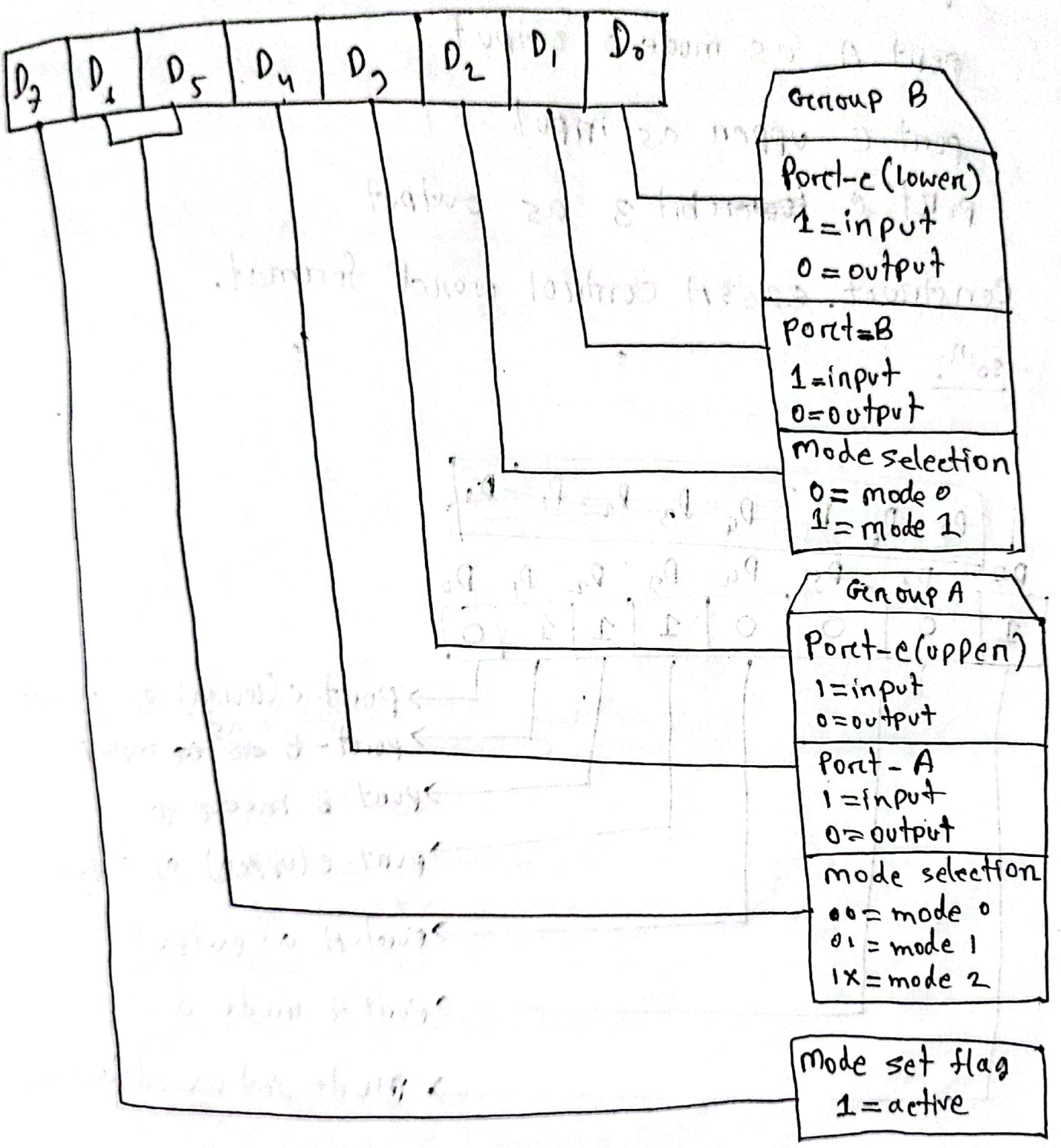


Fig: mode-set control word format

Example: 1

port B as mode1 input

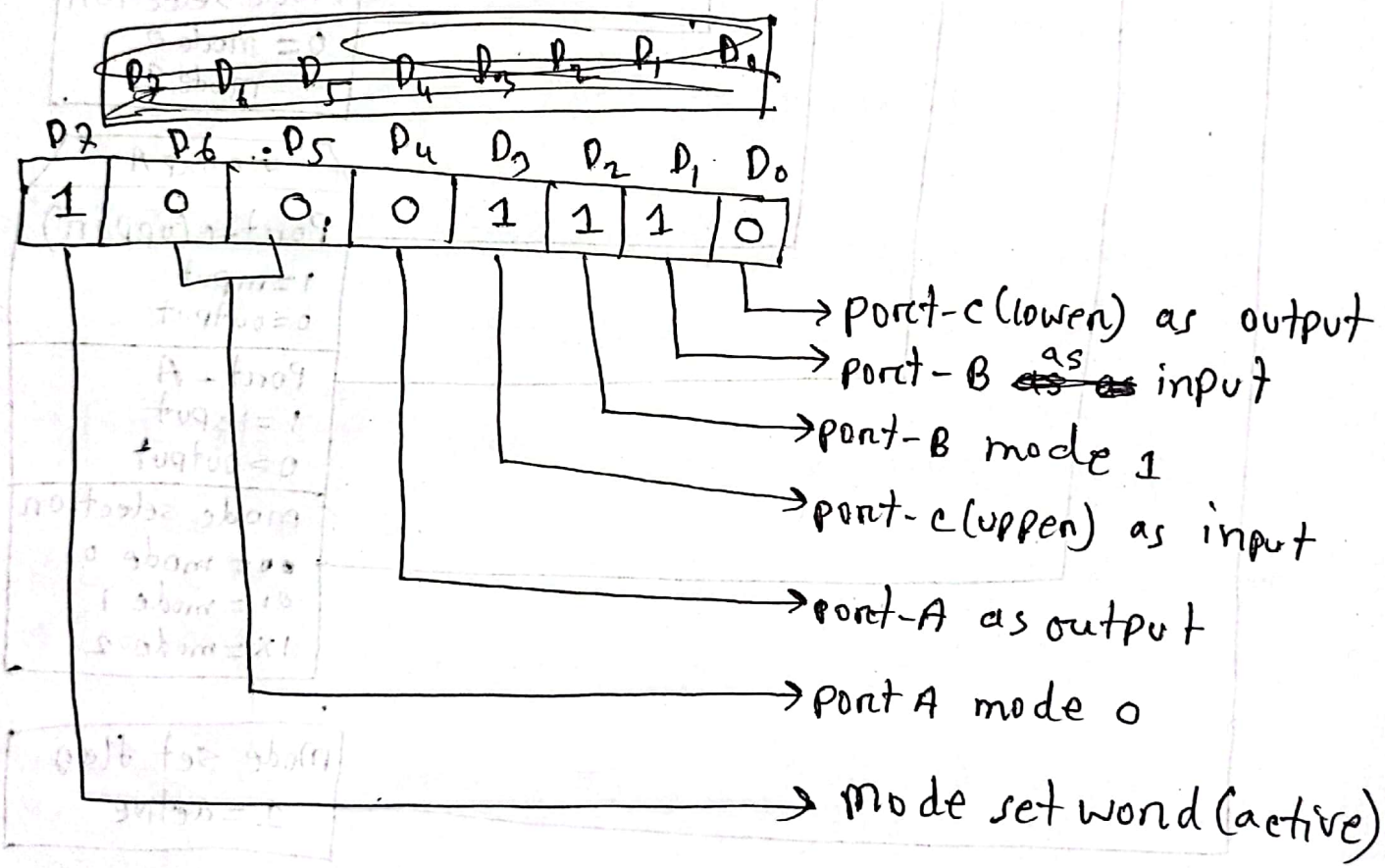
port A as mode 0 output

port C upper as input

port C ~~lower~~ bit 3 as output

Construct 8255A control word format.

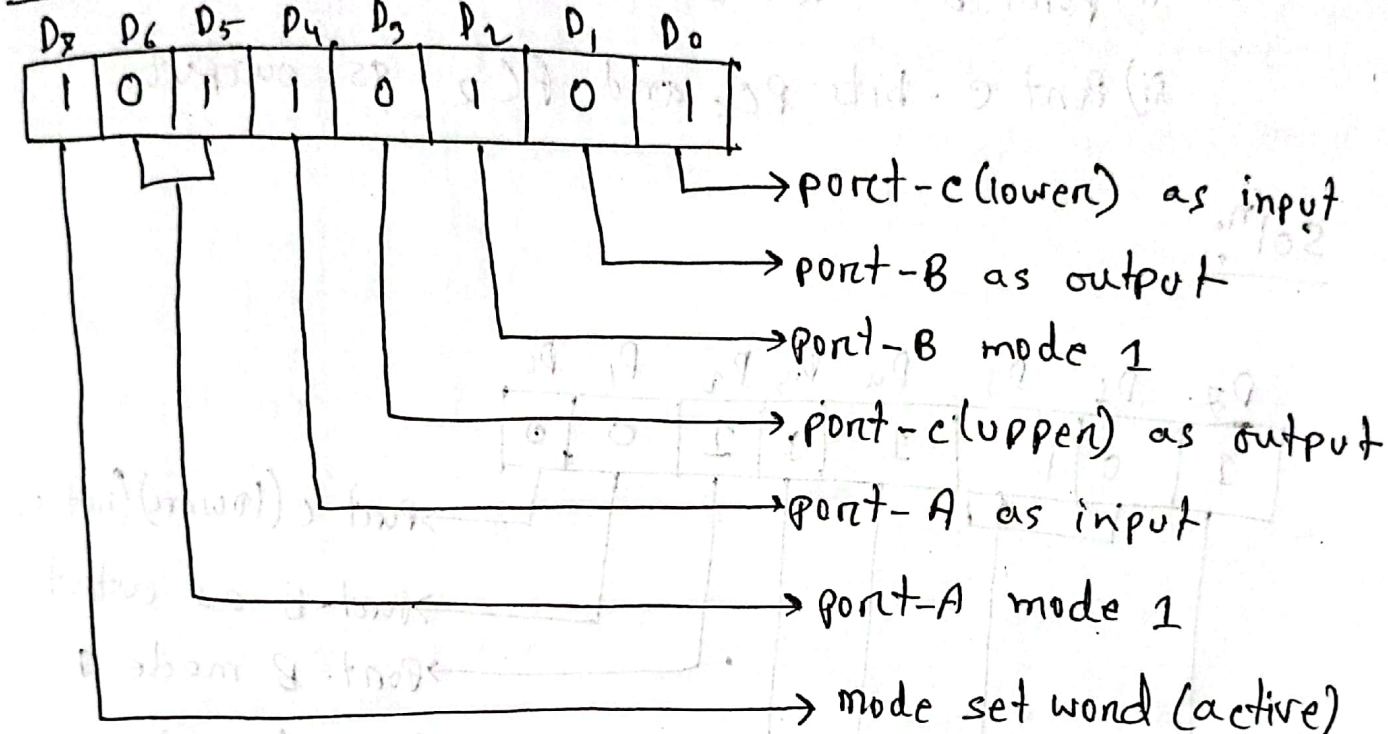
Soln:



Example-2:

If control register of Intel-8255A contain 10110101 value. what does it mean? explain it.

Soln:



So we can write that,

port-B as mode 1 output

port-A as mode 1 input

port-c lower as input

port-c upper as output

Example-3 :

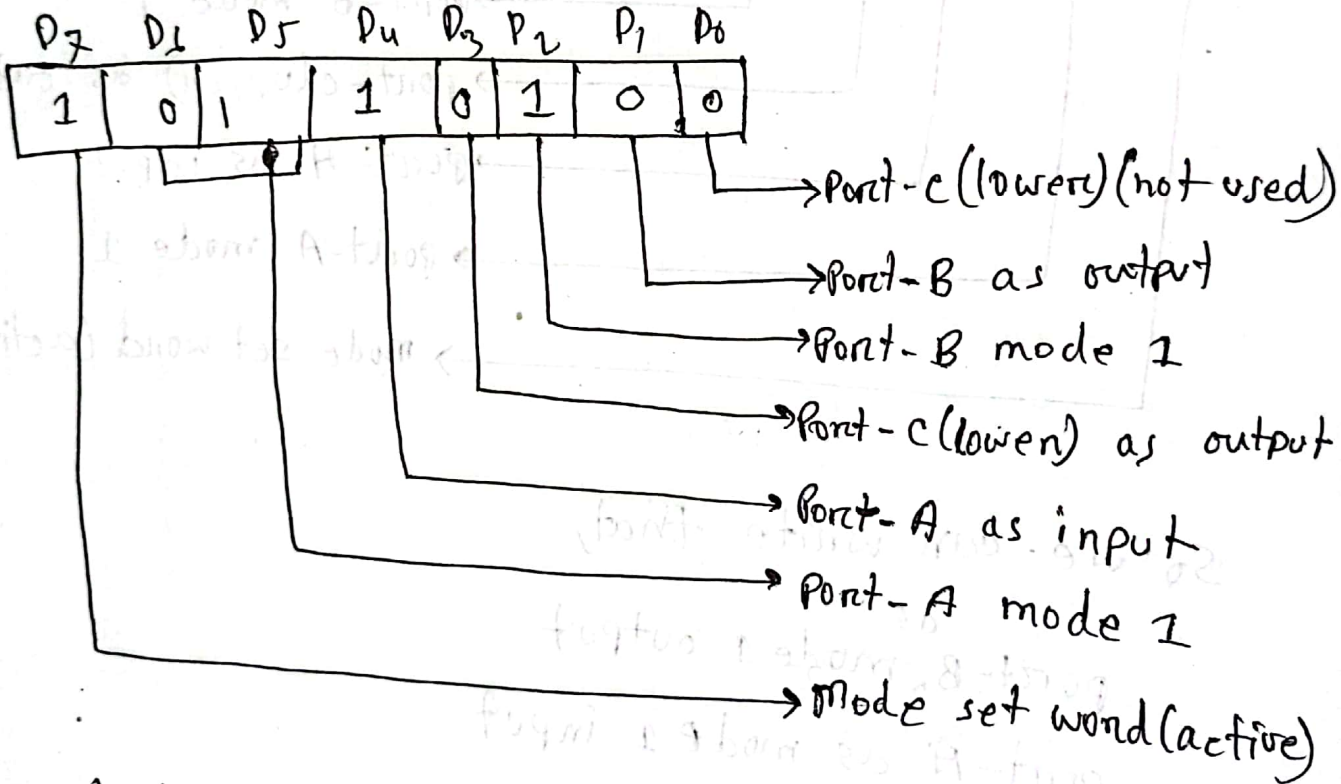
Write down the mode set control word needed to initialize an intel-8255A as follows:

i) port A - handshake input

ii) Port B - handshake output

iii) Port C - bits PC_6 and PC_2 as outputs

Soln:

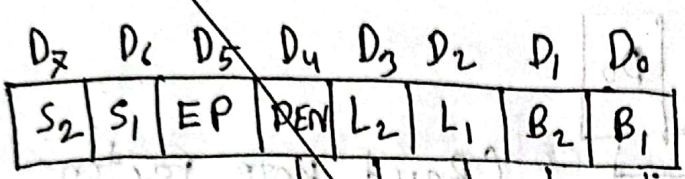


∴ control word is $= (10110100)_2$

$= (B4)_{16}$

8251A:

* Draw the formate of 8251A mode register for both synchronous and asynchronous communication.



Baud Rate Factor
00 = Synchronous communication
01 = factor-1
10 = factor-16
11 = factor-64

Number of data bit
00 = 5 bit
01 = 6 bit
10 = 7 bit
11 = 8 bit

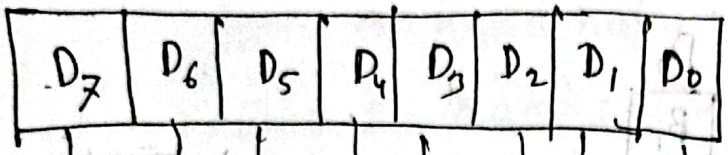
Parity Enable
0 = no parity bit absence
1 = " " present

Parity type
0 = odd par

p.t-o.

8251A :

* Draw the formate of 8251A mode negister for both synchronous and asynchronous communication.



Baud Rate factor
- 0 0 = synchronous
- 0 1 = factor-1 (ASYN)(x1)
- 1 0 = Factor 16 (ASYN)(x16)
- 1 1 = factor 64 (ASYN)(x64)

Character length
- 0 0 = 5 bit
- 0 1 = 6 "
- 1 0 = 7 "
- 1 1 = 8 "

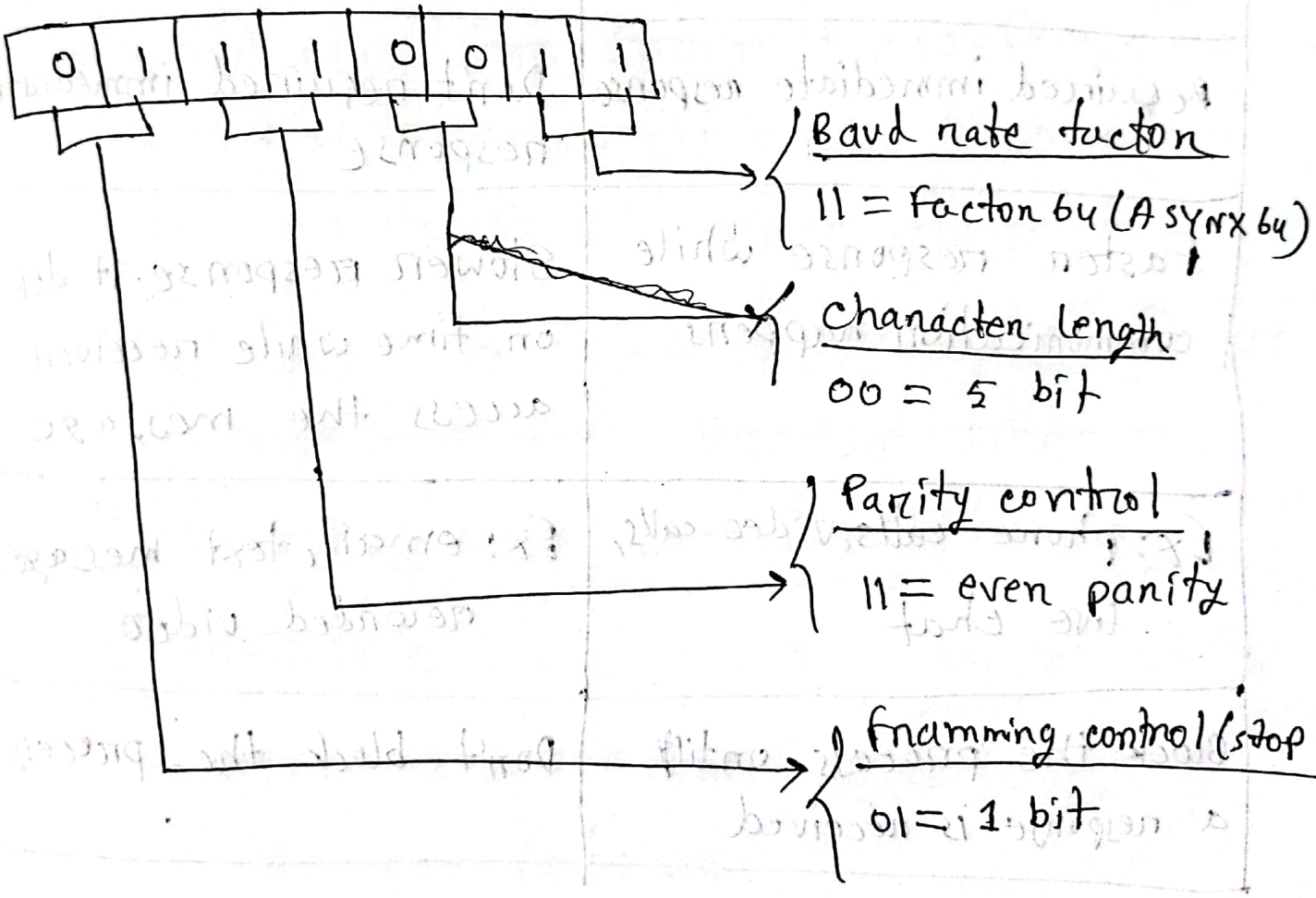
Parity control
- x 0 = low parity
- 0 1 = odd parity
- 1 1 = even parity

framming control (stop bit)
- 0 0 = Invalid
- 0 1 = 1 bit
- 1 0 = $1\frac{1}{2}$ bit
- 1 1 = 2 bit

*How is 8251A configured when mode instruction value is 73H ?

$(73)_{16} = (01110011)_2$

Here last two bit is 11. So, it configured by asynchronous mode register.



* Difference between synchronous and asynchronous communication :

Synchronous communication	Asynchronous communication
Real-time communication where both sender and receiver interact simultaneously.	communication where both sender and receiver do not need to interact simultaneously
Required immediate response.	Don't required immediate response
Faster response while communication happens	Slower response. It depends on time while receiver access the message
Ex: phone calls, video calls, live chat	Ex: email, text message, recorded video
Block the process, until a response is received	Don't block the process