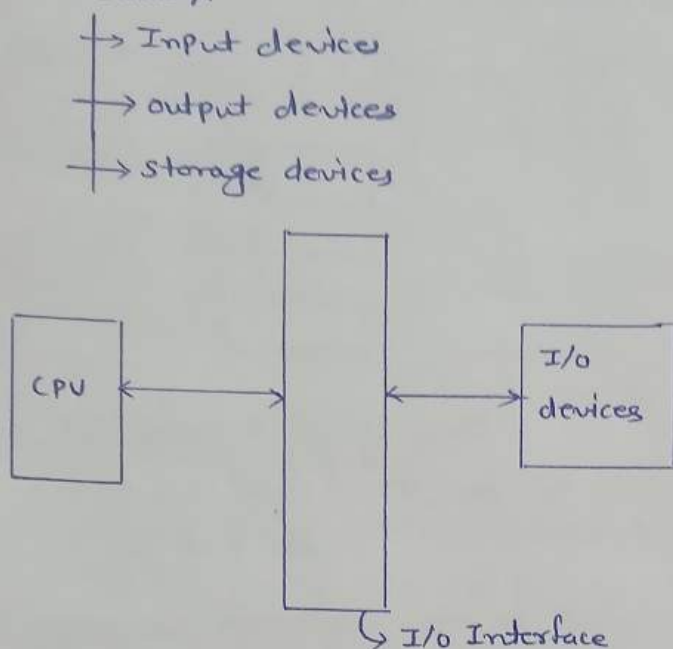


• I/O organization :-

→ Peripheral devices Connected to the processor Externally.

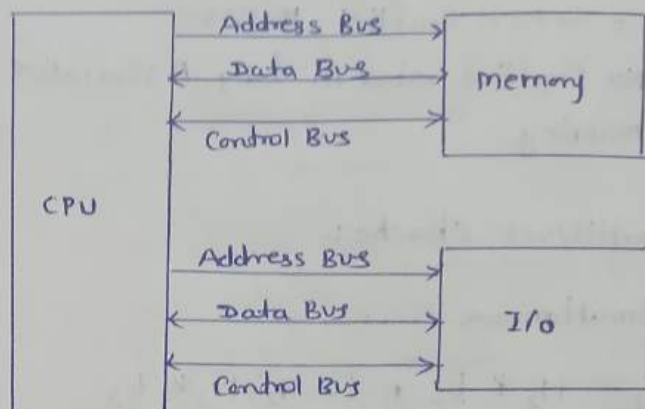


→ Need of IO Interface :-

- Peripherals are electromechanical or electromagnetic devices and their manner of operation is different from the operation of the CPU and memory, which are electronic devices, so Conversion of Signal required.
- The data transfer rate ~~is~~ of peripherals is usually slow. So synchronization is required.
- Data codes and format in peripherals differ from the Word format in the CPU and memory. So Conversion of format is required.
- operating modes of peripherals are different from Each other, so a peripheral does not disturb the operation of other peripherals.

There are 3 types to Connect memory and I/O with CPU through buses.

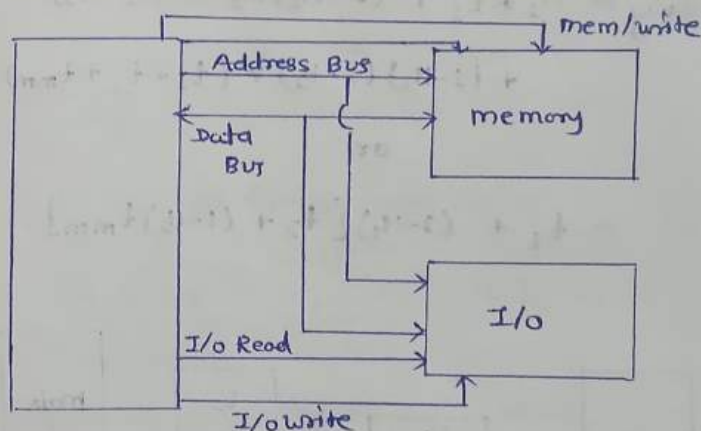
1) Separate buses for both :-



⊕ → Easy to Implement

⊖ → Costly

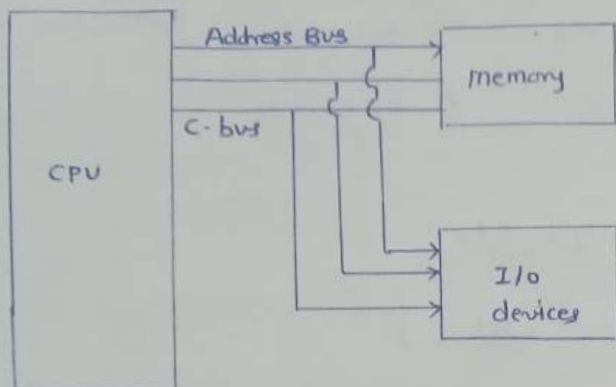
2) Common Data and Address Bus



→ I/O devices have their own address
↓
IO mapped I/O
or
Isolated I/O

⊕ → No memory wastage

3.) Common data, Address and Control Bus -

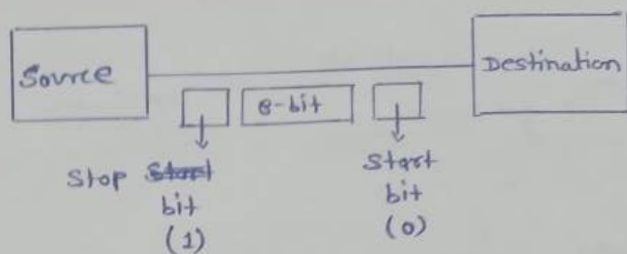


⊖ → Wastage of memory space

↳ This is memory-mapped I/O because
Some memory is allocated to devices.

Memory mapped I/O	I/O mapped I/O
1) memory wastage	1) No memory wastage
2) All mem Access Instr ⁿ used for I/O access also	2) I/O Access Instr ⁿ and mem Access Instr ⁿ are different
3) No separate Address space for I/O	3) I/O have their own separate Address space
4) more Instr ⁿ for I/O Access	4) Less Instr ⁿ for I/O Access
5) more Addressing modes for I/O access	5) Less Addressing modes for I/O Access

* Serial Asynchronous Transfer :-



- No Transfer means '1' state
- '0' (start bit) detected transmission started.
- character bit follow start bit
- After last bit of character '1' (stop bit) will be sent.

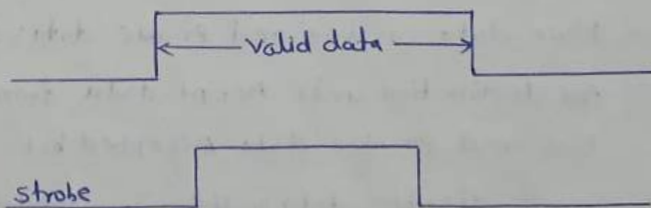
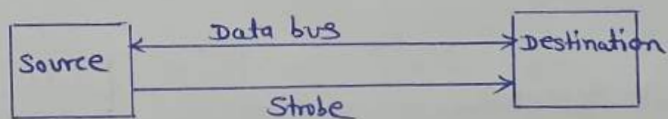
• 2 types of method are used in Asynchronous data Transfer-

- 1) Strobe Control
- 2) Handshaking method

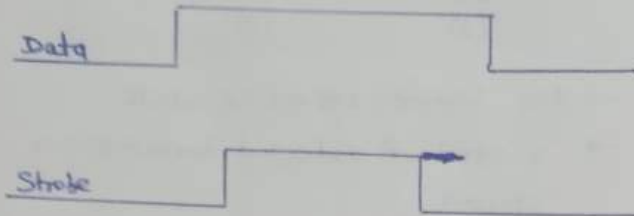
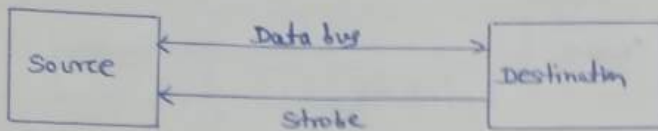
1) Strobe Control :-

- It Employs a single Control line at time of each transfer
- Strobe may be activated by either Source or destination.

⇒ Source Initiated Strobe for data Transfer-



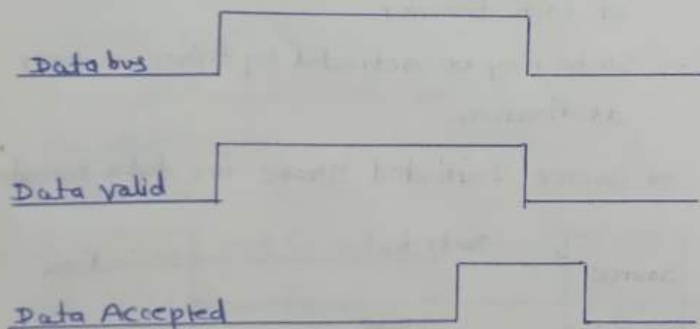
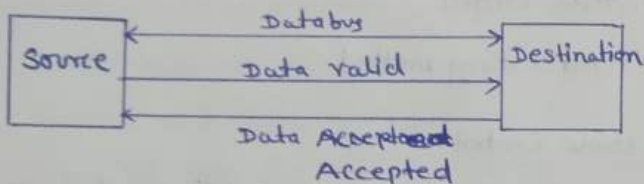
⇒ Destination Initiated Strobe-



2) Hand-Shaking method:-

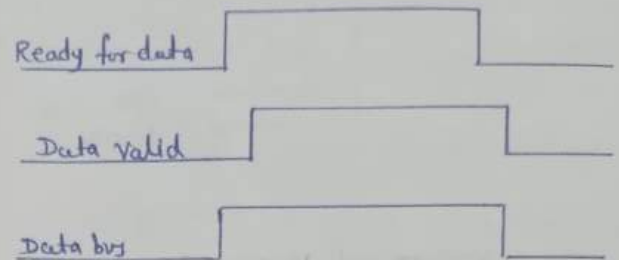
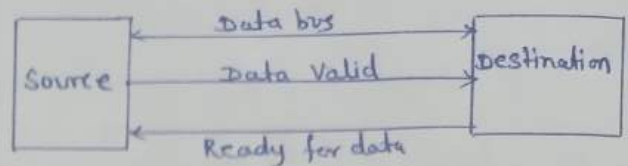
→ (Strobe Control) + (Acknowledgement) Signal

• Source - Initiated Handshaking:-



- Place data on bus and enable data valid.
- ~~Acc~~ destination unit Accept data from bus and enable data Accepted bit.
- Source disable data valid, Invalidate data on bus
- destination unit disable data Accepted.

• Destination - Initiated Handshaking



- destination unit ~~Ready~~ Ready to ~~Acc~~ Accept data, Enable ready for data.
- Place data on bus Enable data valid
- Accept data from bus, Disable ready for data.
- Disable data valid, Invalidate data on bus (initial state)

* Modes of Transfer:-

- 1) Programmed Io or Program Control Io
 - 2) Interrupt Initiated Io
 - 3) Direct memory Access (DMA)
- Between Io and memory
- data Transfer b/w CPU and Io

1) Programmed IO

- Programmed IO operations are result of IO Instruction written in Computer Program.
- Each data transfer is initiated by an IO Instruction in the Program (to Access register or memory on a device)
- Data Transfer through this mode require Constant monitoring of the peripheral devices by the CPU.
- Thus CPU stays in a Loop untill IO device Indicates that it is ready.

