Assignment - 6

Q.1] Explain the commonly found bus types in a modern PC with suitable diagram.

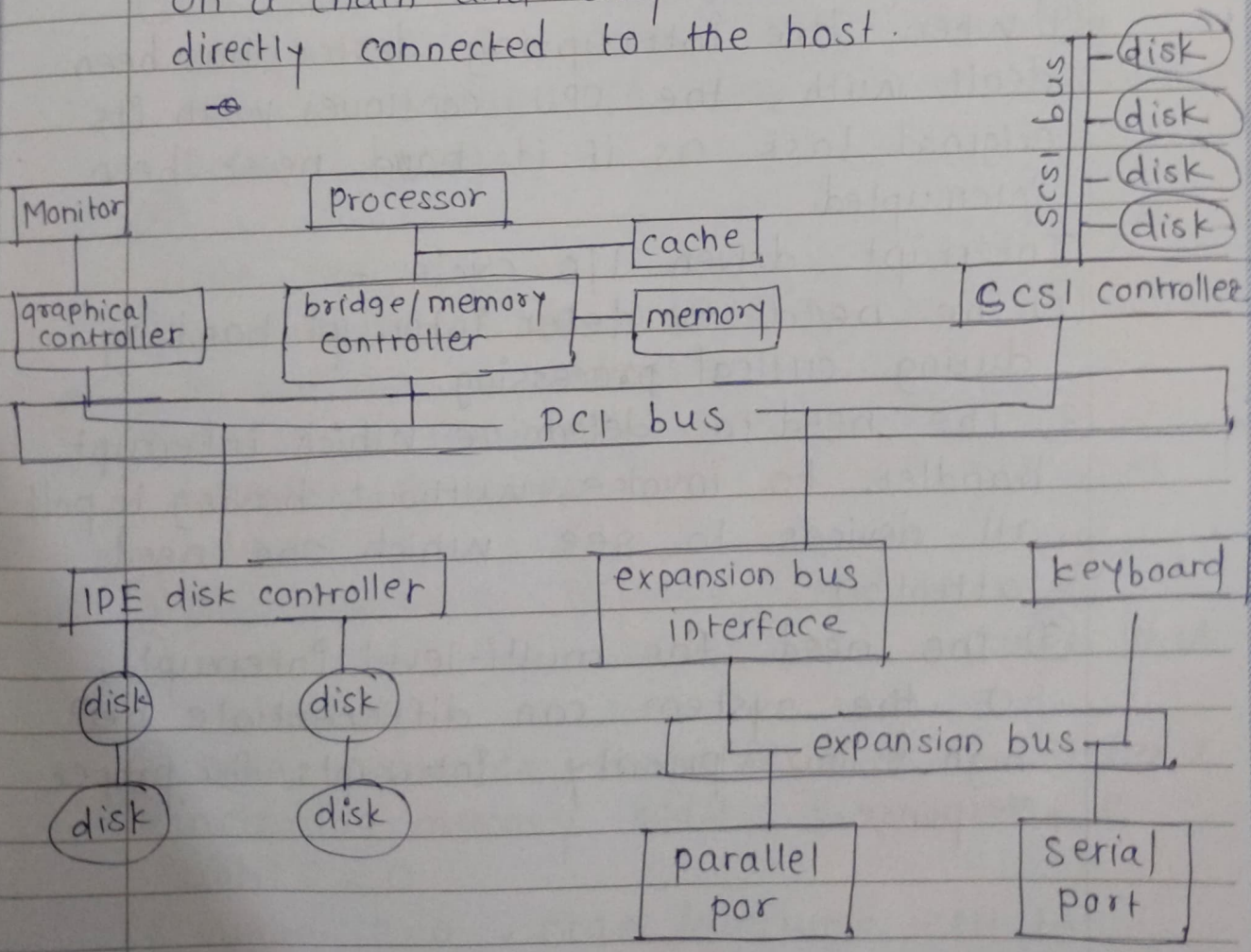
→ Four bus types commonly found in modern PC.

① The PCI bus connects high-speed high-bandwidth devices to memory subsystem.

② The expansion bus connects slower low-bandwidth devices, which typically deliver data one character at a time

③ The SCI bus connects a number of SCSI devices to a common SCSI controller.

④ A daisy-chain bus is when a string of devices is connected to each other like beads on a chain and only one of the devices is directly connected to the host.



Q. 2] ~~What~~ What is I/O interrupt? explain interrupt driven I/O cycle.

→ I/O interrupt :-

(1) An alternative scheme for dealing with I/O is interrupt driven method.

(2) An interrupt is a signal to microprocessor from a device that requires attention.

(3) A device controller puts an interrupt signal on the bus when it needs CPU's attention when CPU receives an interrupt, it saves its current state & invokes the appropriate interrupt handler using interrupt vector.

(4) When the interupting device has been dealt with, the CPU continues with its original task as if it had never been interrupted.

Interrupt driven I/O cycle :-

(1) The need to defer interrupt handling during critical processing.

(2) The need to determine which interrupt handler to invoke, without having to poll all devices to see which one needs attention

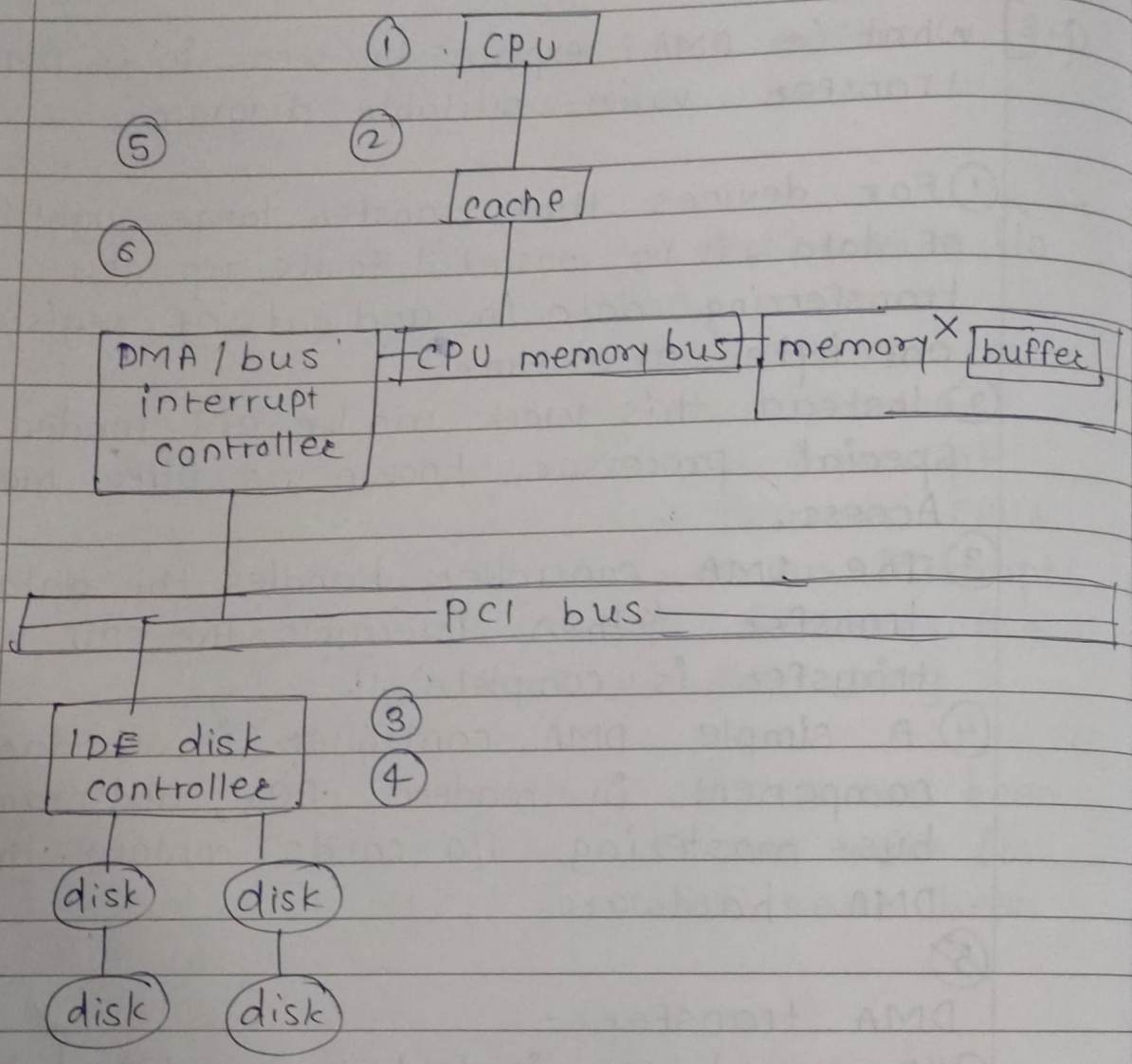
(3) The need for multi-level interrupts, so the system can differentiate betⁿ high & low-priority interrupts for proper response.

Q.3] What is DMA? explain the steps in a DMA transfer with suitable diagram.

→ (1) For devices that transfer large quantities of data, it is wasteful to tie up CPU transferring data in and out of registers one byte at a time.
(2) Instead this work can be off-loaded to special processor, known as Direct Memory Access.
(3) The DMA controller handles the data transfer & then interrupts the CPU when transfer is complete.
(4) A simple DMA controller is standard component in modern PCs, and many bus-mastering I/O cards contain their own DMA hardware.
(5)

DMA transfer:-

(1) Device driver is told to transfer disk data to buffer at address X.
(2) device driver tells disk controller to transfer C bytes from disk to buffer at address X
(3) disk controller initiates DMA transfer
(4) disk controller sends each byte to DMA controller
(5) DMA controller transfer byte to buffer X increasing memory address & decreasing C until C=0
(6) When C=0, DMA interrupts CPU to signal transfer completion.



Q.4] explain the services provided by kernel I/O subsystem in detail.

→ Kernel provide many services related to I/O. several services - Scheduling, buffering, catching, spooling, device reservation and error handling are provided by kernel's I/O subsystem.

① I/O Scheduling :-

1) To schedule a set of I/O requests means to determine a good order in which to execute them.
2) Scheduling I/O requests can greatly improve overall efficiency. priorities can also play a part in request scheduling.
3) The classic example is scheduling of disk accesses.

② ~~4~~ Buffering :-

Buffering of I/O is performed for (at least) 3 major reasons.

— 1. speed differences betⁿ two devices.

- A slow device may write data into a buffer, and when the buffer is full, the entire buffer is sent the fast device all at once. So that the slow device still has somewhere to write while this is going on, a second buffer is used, and the two buffers alternate as each becomes full. This is known as double buffering.

- Double buffering is often used in graphics, so that one screen image can be generated in buffer while the other buffer is displayed on the screen.

2. Data transfer size differences. Buffer are used in particular in networking system to break messages up into smaller packets for transfer and then for re-assembly at the receiving side.

3. To support copy semantics.
- with copy semantics, the version of data written to disk is guaranteed to be the version at the time of application system call, independant of any subsequent changes in application's buffer.

(3) caching :-
- caching involves keeping a copy of data in a faster-access location than where the data is normally stored.

(4) Spooling and Device Reservation :-
- A spool buffers data for devices such as printers that cannot support interleaved data streams.
- If multiple processes want to print at same time, they each send their print data to files stored in spool directory.

5] explain the concept of I/O performance.

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