

Chapter 5: Direct Memory Access

SECTION-II (SHORT QUESTIONS)

1. Define Direct Memory Access operation.

DMA allows data to transfer between memory and an I/O device **without using the CPU**.

Example: A hard disk saves data directly to RAM using DMA.

2. Describe need of DMA operation.

DMA is needed when large or fast data transfer is required, so the CPU is not overloaded.

Example: Audio or video streaming uses DMA to avoid delays.

3. Which two signals are used in DMA operation?

DMA mainly uses **HOLD** (request bus control) and **HLDA** (grant bus control).

Example: A network card sends a HOLD signal to start DMA transfer.

4. What is the advantage of DMA operation?

DMA speeds up data transfer and frees the CPU from handling byte-by-byte operations.

Example: Copying a 1 GB file is faster because DMA handles the transfer.

5. What is the effect on buses of microprocessor during DMA operation?

The CPU releases the **address, data, and control buses**, allowing DMA to take over.

Example: While DMA moves data, the CPU cannot use the main system bus.

6. What is the function of current address register in DMA controller?

It stores the **current memory address** where the next data will be read or written.

Example: If transferring a file, CAR updates after each byte or word is moved.

7. Define shared bus system.

A shared bus system allows multiple devices to use **one common bus** for communication.

Example: CPU, DMA, and I/O devices all share the same system bus.

8. What is the advantage of Shared Bus System?

It reduces hardware cost because many devices use one bus instead of separate lines.

Example: A single system bus connects CPU, RAM, and hard drives.

9. What is the function of the 8289 bus arbiter?

It decides which device gets control of the bus when multiple devices request it.

Example: If both CPU and DMA need the bus, the arbiter chooses one.

10. What is meant by local bus?

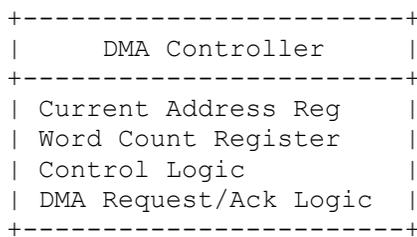
A local bus is a high-speed connection used close to the CPU for fast data transfer.

Example: The CPU communicates with cache memory through the local bus.

SECTION-III (LONG QUESTIONS)

(Explained in short, exam-friendly form)

1. Draw the block diagram of DMA Controller and describe its operation.



Operation (short):

DMA receives a request from an I/O device, sends **HOLD** to the CPU, takes control of buses after **HLDA**, and transfers data directly between memory and device.

Example: Copying data from SSD to RAM.

2. Explain operation of shared bus system with diagram.



Operation (short):

Multiple devices request the shared bus; the **arbiter selects one device** at a time to use the bus.

Example: CPU runs instructions while DMA transfers data in the background.