b. Example:
    i. An 8-bit processor adds two 16-bit numbers in two steps, whereas a 16-bit processor does it in one step.

What is Parallel Processing?

Processing of multiple tasks simultaneously on multiple processors is called parallel computing.

Memory Access Architecture

1. Shared Memory Architecture (UMA & NUMA):
    a. Uniform Memory Access (UMA): All processors share a common global memory with equal access time.
    b. Non-Uniform Memory Access (NUMA): All processors have local memory and access time varies depending upon the location.
2. Distributed Memory Architecture:
    a. Each processor has its own private memory.
    b. Processors communicate via message passing. (MPI)
3. Hybrid Distributed Share Memory:
    a. Combines shared and distributed memory approaches.
    b. Some part of memory is shared while other parts are local to the processors.

Parallel Architectures

1. Pipeline Architecture

Concept:

- A single instruction is broken into multiple stages, with each stage executing in parallel.
- Works similarly to an assembly line in a factory.

Key Characteristics:

- Improves instruction throughput.
- Each stage processes part of the instruction in parallel with others.
- Efficient for repetitive tasks like instruction execution.

Example:

- **Instruction Pipeline in CPUs:**
    1. **Fetch**: Retrieve instruction from memory.
    2. **Decode**: Identify operation and operands.
    3. **Execute**: Perform calculations.
    4. **Memory Access**: Read/write data.
    5. **Write Back**: Store the result in registers.