Tutorial 4: Computer System Architecture and OS Structure

1. Differentiate between single-processor and multiprocessor systems.

- **Single-processor system:** Only one CPU executes all instructions.
- **Multiprocessor system:** Two or more CPUs share memory and work together, increasing throughput and reliability.

2. List the main advantages of multiprocessor systems.

- Increased throughput (parallel processing)
- Economy of scale (shared resources)
- Improved reliability (system continues if one CPU fails)

3. Compare Asymmetric and Symmetric Multiprocessing.

Feature	Asymmetric (AMP)	Symmetric (SMP)
Role of CPUs	Each has a specific role	All are equal peers
Control	One master controls others	OS schedules all equally
Flexibility	Less flexible	More flexible and scalable

4. Explain the concept of dual-core processors.

A dual-core processor has **two independent CPU cores** on one chip, each capable of executing its own instructions simultaneously — improving performance and multitasking efficiency.

5. What is multiprogramming, and why is it needed?

Multiprogramming keeps multiple jobs in memory so that the CPU always has something to execute while other jobs wait for I/O — maximizing CPU utilization.

6. Describe how timesharing extends multiprogramming.

Timesharing allows **multiple users** to use the system simultaneously.
The CPU switches between users rapidly, giving the illusion of parallel execution and quick response times.

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7. What is a clustered system, and why is it used?

Clustered systems consist of multiple computers (nodes) working together, usually sharing storage.
They provide **high availability**, **load balancing**, and **fault tolerance**.

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8. Distinguish between asymmetric and symmetric clustering.

- **Asymmetric clustering:** One node is active; another is on standby (hot backup).
- **Symmetric clustering:** All nodes are active and share the workload.

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9. Explain how clustering increases system reliability.

If one node fails, others continue running or take over tasks — ensuring uninterrupted service.

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10. What is a distributed lock manager (DLM) used for in clusters?

A DLM prevents conflicts by ensuring that two nodes do not modify the same data or file at the same time.