**What advantage does a circuit-switched network have over a packet-switched network? What advantages does TDM have over FDM in a circuit-switched network?**

**Ans:**

**1. Circuit-Switched vs. Packet-Switched Networks**

**Advantage of Circuit-Switched Networks**

**Guaranteed resources / constant rate:**

In a circuit-switched network, once a circuit is established, a fixed amount of bandwidth is reserved for the connection for its entire duration.

This guarantees a **constant transmission rate** and **predictable delay**, which is important for **real-time applications** like traditional voice calls.

**2. TDM vs. FDM in Circuit-Switched Networks**

**Time-Division Multiplexing (TDM)**

* Each connection is allocated a **time slot** in a repeating frame.
* All connections use the **entire channel bandwidth**, but only during their allocated time slots.

**Frequency-Division Multiplexing (FDM)**

* Each connection is allocated a **separate frequency band** within the channel.
* All connections use the channel **continuously** but in different frequency ranges.

**Advantages of TDM over FDM**

1. **No need for guard bands:**
   * FDM requires small unused frequency gaps between adjacent channels to prevent interference.
   * TDM doesn’t need these guard bands -- more efficient use of bandwidth.
2. **Easier to adapt to digital data:**
   * TDM is naturally suited for digital communication (time slots carry digital bits).
   * FDM is more natural for analog signals.
3. **Simpler hardware for dynamic allocation:**
   * In TDM, assigning or changing time slots is done by scheduling; in FDM, changing frequency bands requires tunable filters and oscillators.