Explain the basic concept of Multiple Access Schemes? Explain with brief com- parison FDMA, TDMA with suitable example?

Multiple Access Schemes are methods that let multiple devices share a communication channel without collisions.

They ensure fair and efficient use of the channel.

1. FDMA (Frequency Division Multiple Access): Users get separate frequencies. Like radio stations on different channels.
2. TDMA (Time Division Multiple Access): Users take turns in time slots. Like people talking on a conference call.
3. CDMA (Code Division Multiple Access): Users send data with unique codes. Like people talking in different languages.

These schemes manage how users share a channel to transmit and receive data without interfering with each other.

Comparison between FDMA and TDMA

Aspect	FDMA	TDMA
Basic Concept	Divides frequency spectrum into non-overlapping frequency bands for users.	Divides time into discrete slots for users.
Interference	Interference occurs if signals overlap in frequency.	Interference occurs if signals overlap in time.
Resource Allocation	Each user gets a fixed frequency band.	Users share the same frequency band but take turns using it.
Efficiency	Bandwidth can be unused if traffic is low for some users.	Efficient for bursty traffic, as users transmit only in their allocated time slots.

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Aspect	FDMA	TDMA
Complexity	Requires precise frequency control to avoid overlap.	Requires synchronization to allocate time slots correctly.
Examples	Cellular networks (different channels for users).	GSM (Global System for Mobile Communications) – users share channels with time slots.
Analogous Scenario	Different radio stations on separate frequencies.	People taking turns speaking in a conference call.
Advantages	Simple frequency allocation, suitable for voice communication.	Efficient use of bandwidth, adaptable to changing traffic.
Disadvantages	Inefficient for bursty data, limited users per frequency band.	Requires synchronization, complex in high-mobility scenarios.

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