**5. How are frequency bands divided for Wi-Fi? Explain different bands and their channels.**

Wi-Fi uses specific frequency bands to avoid interference and ensure proper communication between devices. These bands are divided into smaller chunks called channels. Each band has its own range, number of channels, and usage rules, which are managed by regulatory bodies in each country.

**Wi-Fi Frequency Bands and Their Channels:**

**2.4 GHz Band:**

* This is the oldest and most commonly used band.
* Has 14 channels, but only 1, 6, and 11 are non-overlapping (in most countries).
* Offers better range but is more prone to interference (since many devices like Bluetooth and microwave ovens also use it).
* Used in 802.11b/g/n/ax.

**5 GHz Band:**

* Provides more channels (typically up to 25 non-overlapping channels).
* Offers faster speeds and less interference than 2.4 GHz.
* Shorter range compared to 2.4 GHz due to higher frequency.
* Used in 802.11a/n/ac/ax.

**6 GHz Band (Wi-Fi 6E):**

* Introduced recently with Wi-Fi 6E.
* Much wider bandwidth and more non-overlapping channels.
* Designed for high-density environments and low-latency applications.
* Less congested compared to 2.4 GHz and 5 GHz.

**Channel Division**

In Wi-Fi, each frequency band is split into smaller parts called channels. These channels help reduce interference between nearby networks. The size of the channel, also called channel width, plays a big role in speed—wider channels can carry more data. But if channels overlap, it can cause interference, especially in the 2.4 GHz band. That’s why using non-overlapping channels is important. The most common channel widths are 20 MHz, 40 MHz, 80 MHz, and even 160 MHz in some newer standards.