1. **What are the key features of Wi-Fi 6, 6E and 7 and how do they differ from previous standards like Wi-Fi 5 (802.11ac)?**

**Wi-Fi 5 (802.11ac):**

* Introduced in 2014.
* Operates only on 5 GHz band.
* Max speed: ~3.5 Gbps.
* Uses 256-QAM modulation.
* Channel width up to 80 MHz (160 MHz optional).
* MU-MIMO supported, but only for downlink.
* No OFDMA (less efficient with multiple devices).
* Designed mainly for speed improvement over Wi-Fi 4.

**Wi-Fi 6 (802.11ax):**

* Introduced in 2019.
* Operates on 2.4 GHz and 5 GHz bands.
* Max speed: ~9.6 Gbps.
* Uses 1024-QAM modulation (more data packed per signal).
* Channel width up to 160 MHz.
* OFDMA introduced → better efficiency by splitting channels.
* MU-MIMO for both uplink and downlink.
* Target Wake Time (TWT) improves battery life for devices.
* Focus on speed + capacity + efficiency.

**Wi-Fi 6E:**

* Extension of Wi-Fi 6.
* Adds a new 6 GHz band (in addition to 2.4 GHz and 5 GHz).
* Provides more channels → less interference, cleaner signal.
* Ideal for AR/VR, 8K streaming, gaming.
* Same features as Wi-Fi 6 (OFDMA, MU-MIMO, TWT, 1024-QAM).

**Wi-Fi 7 (802.11be):**

* Operates on 2.4 GHz, 5 GHz, and 6 GHz.
* Max theoretical speed: > 40 Gbps.
* Uses 4096-QAM (very high data density).
* Channel width up to 320 MHz (double Wi-Fi 6).
* Introduces Multi-Link Operation (MLO) → simultaneous use of multiple bands.
* Enhances MU-MIMO and OFDMA for even lower latency.
* Designed for ultra-low latency, real-time applications, AR/VR, cloud gaming.