Q3. How do modulation schemes work in the PHY layer? Compare different modulation schemes and their performance across various Wi-Fi standards.

Modulation schemes in Physical layer of a network define how data is converted into signals for transmission over a physical medium (like radio waves in Wi-Fi).

The PHY layer handles:

- Converting digital bits into analog signals (modulation)

- Sending and receiving signals over the air

- Recovering digital data from received signals (demodulation)

Types of modulation schemes in Wi-Fi:

BPSK – Basic modulation, 1 bit per symbol. Used in early standards like 802.11b.

QPSK – 2 bits per symbol, more efficient than BPSK.

16-QAM – 4 bits per symbol, balances speed and reliability.

64-QAM – 6 bits per symbol, used in 802.11n.

256-QAM – 8 bits per symbol, higher throughput, requires good signal quality.

1024-QAM – 10 bits per symbol, used in Wi-Fi 6, very high data rates.

OFDMA – Splits channels into smaller sub-channels for efficient multi-user access.

Q4. What is the significance of OFDM in WLAN? How does it improve performance?

OFDM - Orthogonal Frequency Division Multiplexing

Used in 802.11a/g/n/ac/ax.

Splits the channel into multiple orthogonal sub-carriers.

Each subcarrier carries part of the data in parallel.

Improves performance by reducing interference and increasing data throughput.

Because of OFDM Wi-Fi is faster , More reliable in buildings , Can serve multiple devices efficiently