

Module 1 Assignment

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1. In which OSI Layer the Wi-Fi standard/protocol fits?

Solution:

Wi-Fi fits primarily into the **Data Link Layer (Layer 2)** and **Physical Layer (Layer 1)** of the OSI model.

- **Physical Layer:** Handles modulation, transmission, and reception of radio signals.
- **Data Link Layer:** Uses IEEE 802.11 MAC protocol to handle access control, framing, error detection, etc.

2. Can you share the Wi-Fi devices that you are using day to day life, share that device's wireless capability/properties after connecting to network. Match your device to corresponding Wi-Fi Generations based on properties?

Solution:

Dell Laptop :

SSID:	JioFiber-5G-Pree
Protocol:	Wi-Fi 5 (802.11ac)
Security type:	WPA2-Personal
Manufacturer:	Qualcomm Communications Inc.
Description:	Qualcomm QCA9377 802.11ac Wireless Adapter
Driver version:	12.0.0.1118
Network band (channel):	5 GHz (44)
Aggregated link speed (Receive/Transmit):	433/433 (Mbps)

Matches **Wi-Fi 5 (802.11ac)** – Offers higher throughput on 5 GHz with MU-MIMO support.

3.What is BSS and ESS?

Solution:

- **BSS (Basic Service Set):** A set of devices connected to a single Access Point (AP). Identified by a unique BSSID (MAC of AP).
- **ESS (Extended Service Set):** A collection of multiple BSSs with the same SSID, allowing roaming between APs (like in a university or mall Wi-Fi).

4. What are the basic functionalities of Wi-Fi Accesspoint?

Solution:

- Acts as a bridge between wireless and wired networks
- Provides DHCP to assign IP addresses
- Manages wireless client authentication and security
- Handles QoS (Quality of Service)
- Broadcasts SSID and manages channel selection.

5. Difference between Bridge Mode and Repeater Mode?

Solution:

Feature	Bridge Mode	Repeater Mode
Purpose	Connects two different networks (e.g., router to router)	Extends the coverage of the same Wi-Fi network
Function	Disables router functions (NAT, DHCP) on secondary router	Receives and rebroadcasts the signal from the main router
Connection Type	Typically requires an Ethernet cable	Wireless connection between repeater and main router
Network Name (SSID)	Can use same or different SSID	Usually keeps the same SSID as the main network
Performance	Offers better performance and lower latency	May reduce speed due to double wireless transmission

6. Difference between 802.11a and 802.11b?

Solution:

Feature	802.11a	802.11b
Frequency Band	5 GHz	2.4 GHz
Maximum Speed	Up to 54 Mbps	Up to 11 Mbps
Range	Shorter due to higher frequency	Longer range due to lower frequency
Interference	Less interference	More interference (shared with Bluetooth, microwave)
Adoption	More used in enterprise environments	Popular in early home Wi-Fi networks

7. Difference Between IEEE and WFA?

Solution:

Feature	IEEE	WFA (Wi-Fi Alliance)
Full Form	Institute of Electrical and Electronics Engineers	Wi-Fi Alliance
Role	Develops Wi-Fi technical standards (e.g., 802.11 series)	Certifies Wi-Fi products for compliance and interoperability
Focus Area	Standardization and research	Product certification and branding
Membership	Professional engineering body with individuals and companies	Consortium of companies in Wi-Fi industry
Output	Defines how technologies work	Ensures devices meet standards and work together

8. List down the type of Wi-Fi internet connectivity backhaul, share your home/collegels wireless internet connectivity backhaul name and its properties?

Solution:

Type	Description
Fiber Optic	High-speed, used in cities/home broadband (e.g., JioFiber)
DSL	Uses telephone lines (older tech)
Cable	Coaxial cable-based, offered by ISPs like Spectrum
Mobile Backhaul	4G/5G networks for hotspots

Type	Description
Satellite	Used in rural areas, slower, high latency

9. List down the Wi-Fi topologies and use cases of each one?

Solution:

Topology	Description	Use Case
Infrastructure	Devices connect to an Access Point (AP)	Home, Office, Campus Wi-Fi
Ad-hoc	Peer-to-peer, no AP required	Direct file transfer between laptops
Mesh	Multiple APs work together	Smart homes, large campuses
Wi-Fi Direct	Device-to-device (like Bluetooth)	Wireless printing, file sharing
Hotspot	Mobile device provides internet	On-the-go internet sharing

10. Configure your modem/hotspot to operate only in 2.4Ghz and connect your laptop/Wi-Fi device , and capture the capability/properties in your Wi-Fi device. Repeat the same in 5Ghzand tabulate all the differences you observed during this?

Solution:

Parameter	JioFiber (2.4 GHz)	JioFiber5g (5 GHz)
Frequency Band	2.412 GHz (Channel 1)	5.180 GHz (Channel 36)
Receive Rate	72 Mbps	433 Mbps
Transmit Rate	72 Mbps	433 Mbps
Signal Strength	-42 dBm	-56 dBm
Radio Type	802.11n (Wi-Fi 4)	802.11ac (Wi-Fi 5)
Channel Width	20 MHz	80 MHz
SNR (Signal-to-Noise Ratio)	48 dB	36 dB
Latency (ping to 8.8.8.8)	21 ms average	7 ms average

Security Type	WPA2-Personal	WPA2-Personal
Device Used	Qualcomm QCA9377 Wireless Adapter	Qualcomm QCA9377 Wireless Adapter