**Task No.01**

**1) Identify the main function of the network layer**

Provides services to allow end devices to exchange data,

It also provides 4 basic operations: Addressing end devices, Encapsulation, Routing, De-encapsulation.

**2) Describe the characteristics of IP protocol**

* IP is Connectionless:
  + IP does not establish a connection with the destination before sending the packet.
  + There is no control information needed (synchronizations, acknowledgments, etc.).
  + The destination will receive the packet when it arrives, but no pre-notifications are sent by IP.
  + If there is a need for connection-oriented traffic, then another protocol will handle this (typically TCP at the transport layer).
* IP is Best Effort:
  + IP will not guarantee delivery of the packet.
  + IP has reduced overhead since there is no mechanism to resend data that is not received.
  + IP does not expect acknowledgments.
  + IP does not know if the other device is operational or if it received the packet.
* Media Independent
  + IP is unreliable:
    - It cannot manage or fix undelivered or corrupt packets.
    - IP cannot retransmit after an error.
    - IP cannot realign out of sequence packets.
    - IP must rely on other protocols for these functions.
* IP is media Independent:
  + IP does not concern itself with the type of frame required at the data link layer or the media type at the physical layer
  + IP can be sent over any media type: copper, fiber, or wireless

**3) Message segmentation into packets increase the efficiency, explain.**

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**Task No.2**

**1) Define the function of data link layer.**

* The Data Link layer is responsible for communications between end device network interface cards.
* It allows upper layer protocols to access the physical layer media and encapsulates Layer 3 packets (IPv4 and IPv6) into Layer 2 Frames.
* It also performs error detection and rejects corrupts frames.

**2) Explain the meaning of Contention-based access**

All nodes operating in half-duplex, competing for use of the medium. Examples are:

* Carrier sense multiple access with collision detection (CSMA/CD) as used on legacy bus-topology Ethernet.
* Carrier sense multiple access with collision avoidance (CSMA/CA) as used on Wireless LANs

**3) Differentiate between CSMA/CD and CSMA/CA**

|  |  |
| --- | --- |
| **CSMA/CD** | **CSMA/CA** |
| Used by legacy Ethernet LANs | Used by IEEE 802.11 WLANs |
| Operates in half-duplex mode where only one device sends or receives at a time | Operates in half-duplex mode where only one device sends or receives at a time |
| Uses a collision detection process to govern when a device can send and what happens if multiple devices send at the same time | Uses a collision avoidance process to govern when a device can send and what happens if multiple devices send at the same time |
| Devices transmitting simultaneously will result in a signal collision on the shared media. | When transmitting, devices also include the time duration needed for the transmission |
| Devices detect the collision | Other devices on the shared medium receive the time duration information and know  how long the medium will be unavailable |
| Devices wait a random period of time and retransmit data |  |