1. The main difference between UTP and STP cables is their shielding and how it is constructed. When we come to UTP, it consists of different twisted wires inside an insulating coat. However, STP consists of a metallic shield surrounding the twisted pairs, making it more resistant to crosstalk and electromagnetic interference, whereas UTP has less. UTP is very cheap, in contrast to STP, which is more expensive.

2. Advantages of STP are that it is highly resistant to noise( i.e., crosstalk and electromagnetic interference) due to its metallic shield, and also has a better performance in challenging environments, and longer cables are required. The disadvantage is that it is very expensive to install, and it has a larger size to function as a flexible surface.

3. Coaxial cables are a type of cable to transmit high-frequency electromagnetic signals with a very small amount of noise. It is a multilayered cable(i.e., it consists of a central conductor, an insulating layer, a metal shield, and an outer insulating layer). In order to avoid interference. Coaxial cable is mainly used for telecommunication, radio, and cable television transmission, and is used for any high-frequency signal transfer.

4. BNC connector is a connector of two coaxial cables with a rotating ring to securely connect them, and is mainly used in video and Radio frequency applications.

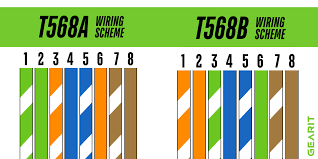
5. RJ45 is mainly used in connecting one device with another device with 8pins with different colors, but RJ11 has only 4 or 6 pins and is used only on telephone networks(voice transmissions) and sometimes on DSL internet communications through DSL modems.

6.

|  |  |  |
| --- | --- | --- |
| Specification | Cat 5e | Cat 6 |

|  |  |  |
| --- | --- | --- |
| |  |  |  |  | | --- | --- | --- | --- | | Max Speed | 1 Gbps | 10 Gbps (limited range) |  | | Max Bandwidth | 100 MHz | 250 MHz |  | | Max Range @ Max Speed | 100 m (1 Gbps) | 55 m (10 Gbps) |  | | Max Range @ 1 Gbps | 100 m | 100 m |  | |  |  |
| 7. The two types of fiber optic cables are single-mode and multimode fiber optic cables. Single-mode fiber optic cables are for very long distances and higher bandwidth requirements, but we use multimode when we want to install fiber-optic cables in shorter distances with lower bandwidth requirements. Multi-mode is effective for short distances and also for LANs.  8. Single-mode is used for very long and high signal transmission networks, but multimode is used for short, mainly LAN networks, and has less bandwidth compared to single-mode.  9. The first is that fiber optic cables have very high strength and are very noiseless. My second point is that fiber optics can serve for very large distances, and they can transmit signals in huge water bodies without any loss. |  |  |
|  |  |  |
|  |  |  |

10.



|  |  |
| --- | --- |
| T568A Color Code:    Pin 1: White/Green | T568B Color Code:  Pin 1: White/Orange |
| Pin 2: Green | Pin 2: Orange |
| Pin 3: White/Orange | Pin 3: White/Green |
| Pin 4: Blue | Pin 4: Blue |
| Pin 5: White/Blue | Pin 5: White/Blue |
| Pin 6: Orange | Pin 6: Green |
| Pin 7: White/Brown | Pin 7: White/Brown |
| Pin 8: Brown | Pin 8: Brown |

11. An Ethernet cable or UTP, where the wiring on both ends is identical, is used  to connect devices that operate at different layers of the network model, for example: a cable connecting a switch to a router and a PC to a hub

12. We use a crossover cable to connect one pc to another pc

13. To create Ethernet cables such as crossover, rollover, or straight through, we use an RJ45 crimping tool, and to test it, we use an RJ45 tester

14. Fill in the blanks: A straight-through cable connects pc   to a hub  , and  a crossover cable connects  pc to  pc

### 15. **Cable Type Comparison Table**

| **Feature** | **Coaxial Cable** | **Twisted Pair Cable (UTP/STP)** | **Fiber Optic Cable** |
| --- | --- | --- | --- |
| **Cost** | Moderate | Low (especially UTP) | High (installation & materials) |
| **Speed** | Medium (Up to 10 Mbps–1 Gbps for modern types) | Medium to High (1–10 Gbps for Cat 5e/6/6a) | Very High (10 Gbps up to 100+ Gbps) |
| **Susceptibility to Interference** | Low (shielding helps resist EMI) | Medium to High (UTP is unshielded; STP is better) | Very Low (immune to EMI & RFI) |

**section 2**

16. A communication model in computer networks is a model that explains how data is transmitted from one device, how it goes through, how it is organized, how the receiver device gets the data, and how the receiver gets the intended data

17. The three basic types of data flow are simplex, half duplex, and full duplex. An Example of a simplex is a broadcast message from a TV or radio station that one party always transmits and all the rest receive.  For full duplex military or police radio transmissions, when both parties can't talk simultaneously, we can use a telephone call; both can transmit their information at once

18. The difference between the three basic types of data flow is that in simplex, one party always transfers, and all the rest receive is a broadcast message, and the sender can't receive feedback at that channel. For Example, a broadcast message   from a TV or radio station, for the half duplex,  both parties can't talk simultaneously, for example, military or police radio transmissions (walkie-talkies), and for the full duplex, both can transmit their information at once, for example, we can use a telephone call between people

19. Protocols are too important for communication models. They define the rules, syntax, semantics, and synchronization for transmitting information between devices, ensuring that different hardware and software can communicate effectively

20. Sender-Is the originator of the message, which creates, encodes, and transmits the data

The receiver is the intended destination of the message. It decodes and interprets the received data.

Message - Is the actual data/information being communicated, which can be text, audio, video, file, etc.

Medium / Channel- Is the physical path the message travels through

Protocol- Is a set of rules that govern data transmission and ensure proper communication

**Section 3**

21.application layer

Presentation Layer



Session Layer

Transport Layer

Network Layer

Data link Layer

Physical Layer

22. Application- HTTP

Transport- TCP

Network- IP

Data link- Ethernet

Physical- Fiber optic

23. The transport layer ensures end-to-end communication, and it splits data into segments that it numbers, and finally, it reassembles each segment of the data. It checks if there is data lost and retransmits the data if a loss occurs. The common examples of the transport layer of the OSI model are TCP and UDP.

24. IP addressing occurs at the network layer of the OSI model. It gives each device connected to a network a unique IP address and uses it in routing data packets, for security purposes, and for locating devices.

25. What is the Data Unit Name used at the following layers: Layer 4 (Transport)

→ \_segment\_Layer 3 Network) → \_\_packet\_ Layer 2 (Data Link) → \_\_\_Frames\_

Layer 1 (Physical) →\_BITS

26. A router is a network device used to connect two or more different networks and find the best path to the data packet through the routing of IP addresses, and for data security. Routers operate on the network layer of the OSI model. A switch is a network device used to connect devices in the local area network and choose the best path for a data frame within a single network. When we come to Hub, Hub is used to connect devices in a local network, but doesn’t know where to send, so it broadcasts to all members of the network. It is not a smart device; it is dull. A Hub operates on the physical layer of the OSI Model.

27. The sender will enter the message(file) using the software application that runs through the FTP protocol. After this presentation, the layer will take place.  Then the presentation layer will encrypt, translate the data, and compress it, and then forward it to the session layer. The session layer will create the session and then set checkpoints for long transfers. It will manage the session until it’s terminated. After this, the transport layer takes place. It will split the data into segments and number them, then it will check if an error exists. If an error is detected, it will retransmit the data. Now, the network layer will split segments into packets and select the best path available to route and forward the packets. After this, the data link layer will convert packets into frames, and it will perform the MAC addressing function and detect errors. Finally, the physical layer will take place. On the physical layer, binary transmission through a physical transport path finally reaches the NIC. When the data reaches another device, the process begins with the physical layer of the receiver device, and the reverse process will take place.

28. is important because it helps us understand and design how data moves through a network by breaking the process into clear, structured layers.  It makes complex networks understandable, fixable, and scalable.

29.

🧳 Sending a package:

Application Layer: A letter is written

Presentation Layer: Translate it to the recipient’s language

Session Layer: Seal the envelope and start a conversation

Transport Layer: Break it into pages (segments) and number

Network Layer: Choose the postal route (network path)

Datalink Layer Address it with sender/receiver (MAC address)

Physical Layer: Physically deliver it (bike, truck, Wi-Fi signal)

30. Since the OSI model and TCP model have the same function, the OSI model has 7 layers. We use OSI for more theoretical and analytical purposes, but TCP is the more practical one. As a similarity, both have an application and transport layer. The difference is that in the OSI model, the transport layer

Guarantees the delivery of packets, but in the TCP/IP model, the transport layer does not guarantee delivery of packets, so the TCP/IP model is more reliable.