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Assignment:- 3

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Q.1. A school wants to connect all computers within a lab efficiently. which device would you recommend and why?

ans To connect all computers in a school lab efficiently, the best device to recommend is a network switch.

Recommended Device :- Network switch

⟹ A network switch is the ideal choice for connecting multiple computers in a lab because:

1. Efficient Data Transfer:-
Switches forward data only to the specific port where the destination device is connected, reducing unnecessary traffic.

2. Better Performance:-
They manage traffic intelligently, providing faster communication between computers compared with simpler devices.

3. Scalability:-
Switches are available with many ports (e.g. 8, 16, 24 or more). making it easy to expand the lab network.

~~4. Scalability:-
Switches are available with many por~~

4. Supports Full-Duplex:-
This allows simultaneous sending and receiving-

of data Improved network speed.

Q.2. Hub, switch, and router compare based on OSI layers and performance.

	Basis	Hub	Switch	Router
1.	OSI Layer	Layer 1 (physical)	layer 2 (Data link)	Layer 3 Network
2.	Address user	No address used	MAC Address	IP address.
3.	Data forw-arding	Broadcast data to all devices.	send data only to the destination device	Routers data between different networks.
4.	Performance	Low (many collisions)	High (fewer collisions	very high (best path selection)
5.	Purpose	Basic device to connect computer	Efficient communication within a LAN	connects multiple n/w (LAN to Internet)
6.	collision domain	Single collision domain	Separate collis-ion domain for each port	No collision domain (works at network level
7.	security	very low (data sent to all devices	better security (data sent only to target mac	High security (can use firewall, filtering, NAT.

Q.3 Why is twisting done in twisted pair cable?

ans Twisting is done in twisted pair cable to reduce noise and interference during data transmission.

Explanation (simple):-
- When two wires are twisted together, the electromagnetic interference (EMI) picked up by one wire is canceled by the other.

- Twisting help reduce crosstalk, which is unwanted interference between nearby wire pairs.

- It ensures clear and reliable signal transmission over the cable.

Simple one short:-
Twisting is done in twisted pair cable to minimize electromagnetic interference and crosstalk, improving signal quality.

Q.4 Explain network cable in detail with suitable diagram.

ans Network cables (also called communication cables or transmission media) is a physical medium used to connect computer and network devices so that can be transmitted from one devices to another in a network.
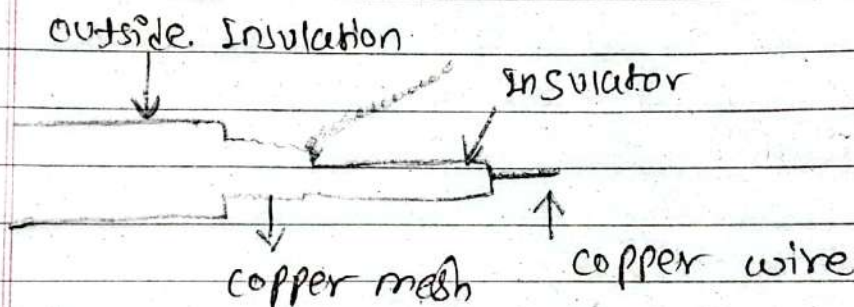
Network cable or Ethernet cable
are mainly of three types:

1- Twisted pair cable
2- Coaxial cables
3. Fiber optic cables

1. Coaxial cables:-
A coaxial cable has a single copper core,
surrounded by insulation a metallic
shield and an outer cover.

Fig:- coaxial cable.

outside. Insulation

Insulator

copper mesh   copper wire

used for:
- Cable TV
- Older Ethernet (10 Base 2)
- Some CCTV systems
- older computer networks

2. Twisted pair cable:-
This is the cable you see most often with
RJ 45 connectors in homes and offices.
It consists of 8 copper wires arranged
in 4 twisted pairs.
Why twisted? Twisted reduces electromag-
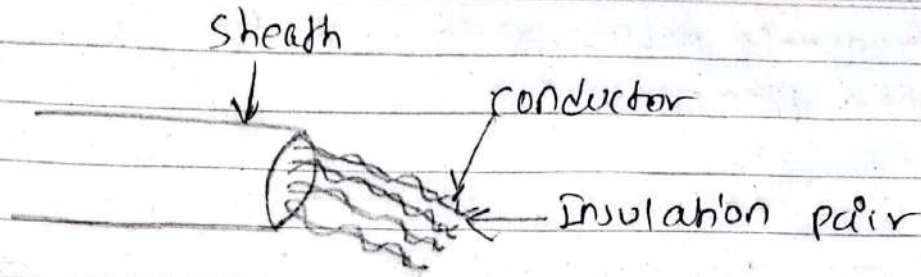netic interference (EMI) and crosstalk
(interference between pairs).

Sheath

conductor

Insulation pair

Fig:- Twisted pair cable

Uses:
School labs, Office networks, Etherned Connections.
etc.

Types:-
- UTP (unshielded) → Cheapest & most common
- STP /FTP (shielded /foilded) → better EMI protection but more expensive & stiffer.

3. Fiber optic cable:-
Fiber optic cable transmits data using light signals through glass or plastic fibers.

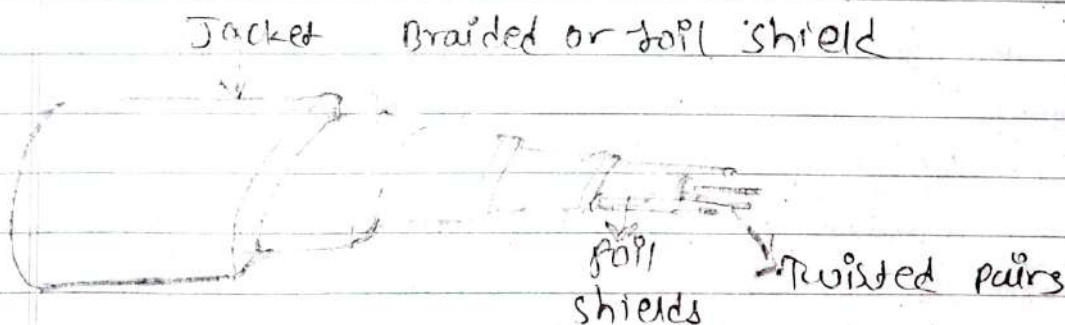Jacket   Braided or foil shield

foil shields   Twisted pairs

Fig:- Fibre optic cable

Types of fiber optics cable:-

L single mode ⇒ It uses one single ray of light

to transmit data. It is used for long-distance transmission.

- Multi-mode fiber:- It uses multiple light rays to transmit data. It is comparatively less expensive.

Features:-
- Very high speed and bandwidth
- No electromagnetic interference
- Suitable for long-distance communication

Uses:
- Internet backbone.
- Long-distance data transmission.

Q5 Why ring hubs considered less secure than switches?.

Ans Hubs are considered less secure than switches because they broadcast data to all connected devices.

Explanation :-
- n hub sends every incoming data packet to all ports regardless of the destination.
- This means every connected computer receives all data even if it is not intended for them.
- Any user can easily capture or read sensitive information using packet-sniffing tools.
- There is no filtering no addressing and no

traffic control in a hub.

In contrast (why switches are more secure):-
- A switch sends data only to the intended device using MAC addresses.
- other devices on the network cannot see the data improving confidentiality.

Q.6. Explain the role of a repeater in extending network distance.

ans A repeater is a basic networking device used to extend the distance of a network by overcoming signal loss.

Role of a Repeater in Extending Network Distance
1. Signal Regeneration
- As data signals travel through a cable, they become weak or distorted due to attenuation
- A repeater receives the weakened signal, cleans it, and regenerates the original signal strength before forwarding it.

2. overcomes Attenuation
- Network cables (like twisted pair or fiber) have a maximum transmission distance

3. Extends physical Network coverage.
- Repeaters allow a network to cover larger areas such as:

- long corridors in schools
- Large office buildings
- Campus networks.

4. Works at physical layer (Layer L of OSI Model):
- Repeaters operate only on raw data signal not on data frames or packets.
- They do not filter traffic check addresses or reduce congestion.

Example:-
If an Ethernet cable support up to 100 meters adding a repeater at 100 meters allows the signal to travel another 100 meters effectively doubling the network distance.

Q.7. Give real-life examples where repeater are used

ans.1. Mobile Phone Networks:
- Cellular repeaters (signal boosters) are used in:
- Rural areas
- Basements
- Inside large building (malls, hospitals).
- They receive weak signal mobiles from towers, amplify them, and retransmit them so phones get better coverage.

2. Wi-Fi Network:-
- Wifi Network repeaters/extenders are used in:
  • Large homes
  • schools and colleges
  • Hotels

3. Optical fiber Communication:-
- In long distance fiber optic network repeaters are placed.
- Between cities
- In submarine cables

4. Television and Radio Broadcasting
- Repeaters are installed on:
  • Hills or towers
  • remote regions

5. Computer Networks (LAN)
- In large offices or campus networks, repeaters are used to:
  • Extend Ethernet cable length beyond its limit
  • Connect distant building.

6. Railways and Highway Communication systems:
- Repeaters help maintain communication:
  • Along long railway tracks
  • On highways for traffic control and emergency system

7. Security and surveillance systems:-
- Used in CCTV network to transmit video signal over long cable distances without