LAB 1: Study and Demonstration of Ethernet Cabling: Straight-through and Crossover Cabling

Objectives:

- To understand the pin assignments for transmitting (TX) and receiving (RX) data across different device categories.
- To study Ethernet networking and demonstrate the preparation and working of straight-through and crossover Ethernet cables using different network devices.

Theory:

Ethernet is a commonly used technology for Local Area Networks (LAN). It allows computers and network devices to communicate using wired connections. Ethernet works mainly at the Physical layer and Data Link layer of the OSI model.
Ethernet communication uses UTP (Unshielded Twisted Pair) cable with RJ-45 connectors. The cable contains 8 wires arranged in 4 twisted pairs. Twisting of wires reduces noise and interference.
In 10/100 Mbps Ethernet, only two pairs are used for data transmission.

TX and RX Pins

1. TX (Transmit): Sends data
2. RX (Receive): Receives data

Category A Devices (End Devices)

Examples: PC, Laptop, Printer

- TX → Pins 1 & 2
- RX → Pins 3 & 6

Category B Devices (Network Devices)

Examples: Switch, Hub

- TX → Pins 3 & 6
- RX → Pins 1 & 2

For proper communication, TX of one device must connect to RX of the other.

Types of Ethernet Cables

1. Straight-Through Cable

- It is used to connect two different types of devices.
- It is commonly used to connect a PC to a switch or hub.
- In this cable, both ends follow the same wiring standard.
- It allows proper communication by connecting the transmit and receive pins correctly.

  Connections:

OrangeWhite	OrangeWhite
Orange	Orange
GreenWhite	GreenWhite
Blue	Blue
BlueWhite	BlueWhite
Green	Green
BrownWhite	BrownWhite
Brown	Brown

2. Crossover Cable

- It is used to connect two similar types of devices.
- It is commonly used to connect PC to PC or switch to switch.
- In this cable, both ends follow the different wiring standards.
- In this cable, the transmit and receive pairs are crossed.

  Connections:

OrangeWhite	OrangeWhite
Orange	Orange
GreenWhite	GreenWhite
Blue	BrownWhite
BlueWhite	Brown
Green	Green
BrownWhite	Blue
Brown	BlueWhite

Discussion and Conclusion:

In this experiment, Ethernet cabling and its types were studied practically. Straight-through and crossover cables were prepared using UTP cable and RJ-45 connectors. The function of transmit (TX) and receive (RX) pins was observed while connecting different network devices. Proper wiring and crimping were necessary to achieve successful data transmission, which was verified using a LAN tester.

The study and demonstration of Ethernet cabling were completed successfully. Both types of cables worked correctly and proper communication between devices was established. This experiment enhanced practical understanding of Ethernet networking, cable types, and their importance in establishing reliable network connections.