Assignment 3

***Prepare a detailed report demonstrating the following with proper illustrations and screen shots as applicable.***

1. ***CAT-5/CAT-6 cable preparation with RJ-45 connector; both straight and cross cabling.***
2. ***IP address configuration (both Static and DHCP) on Linux and Windows systems.***
3. ***Introduction to the following important network related tools and commands with appropriate examples,***
   1. ***ipconfig (Windows)***
   2. ***ifconfig (Linux)***
   3. ***ip***
   4. ***hostname***
   5. ***ping***
   6. ***netstat***
   7. ***route***
   8. ***traceroute or tracert***
   9. ***tcpdump***
   10. ***Wireshark***

**Answer:**

**Ans A:** Preparing CAT-5/CAT-6 cables with RJ-45 connectors involves a few standard steps.

Tools Required:

* + - CAT-5/CAT-6 cable
    - RJ-45 connectors
    - Crimping tool
    - Cable cutter/stripper
    - Optional: Cable tester (for verifying connections)

Steps:

For ***Straight-Through Cable****:*

* Strip the Cable: Use a cable cutter/stripper to carefully remove about 1.5 inches (38 mm) of the outer insulation from the end of the cable. Inside, you will find four twisted pairs of wires.
* Untwist the Pairs: Gently untwist the pairs and straighten each wire.
* Arrange the Wires: Arrange the wires according to the T568B wiring standard. The order from left to right should be:
  + Orange Stripe
  + Orange
  + Green Stripe
  + Blue
  + Blue Stripe
  + Green
  + Brown Stripe
  + Brown
* Trim Excess: Trim the wires to a uniform length, leaving approximately 1/2 inch (12 mm) extending past the jacket.
* Insert Wires into RJ-45 Connector: Carefully insert the wires into the RJ-45 connector, ensuring they go all the way to the end and are in the correct order.
* Crimp the Connector: Use a crimping tool to crimp the connector onto the cable securely. Apply enough pressure to ensure a good connection without damaging the cable.
* Repeat for the Other End: Repeat the above steps for the other end of the cable.
* Test the Cable: Optional but recommended, use a cable tester to ensure the connections are correct and there are no faults.

For ***Crossover Cable***:

A crossover cable is used to connect two similar devices directly, such as two computers without a switch in between. The wiring pattern for a crossover cable is slightly different from a straight-through cable.

The only difference in the process is the wiring arrangement:

Instead of following T568B on both ends, follow this wiring pattern on one end and T568A on the other:

* End 1 (T568B):
  + Orange Stripe
  + Orange
  + Green Stripe
  + Blue
  + Blue Stripe
  + Green
  + Brown Stripe
  + Brown
* End 2 (T568A):
  + Green Stripe
  + Green
  + Orange Stripe
  + Blue
  + Blue Stripe
  + Orange
  + Brown Stripe
  + Brown

This arrangement effectively swaps the transmit and receive lines, creating a crossover connection.

Repeat all other steps as described for a straight-through cable. By following these steps, you should be able to prepare both straight-through and crossover CAT-5/CAT- 6 cables with RJ-45 connectors.

**Ans B:** Linux:

Static IP Configuration:

* Open the terminal.
* Edit the network configuration file using a text editor like nano or vi:

**sudo nano /etc/network/interfaces**

* Find the line for your network interface (e.g., eth0).
* Modify it to include the static IP address, netmask, gateway, and DNS servers:

**iface eth0 inet static**

**address 192.168.1.100**

**netmask 255.255.255.0**

**gateway 192.168.1.1**

**dns-nameservers 8.8.8.8 8.8.4.4**

* Save the file and exit the text editor.
* Restart the network service:

**sudo systemctl restart networking**

DHCP IP Configuration:

* Open the terminal.
* Edit the DHCP configuration file:

**sudo nano /etc/network/interfaces**

* Find the line for your network interface (e.g., eth0).
* Modify it to use DHCP:

**iface eth0 inet dhcp**

* Save the file and exit the text editor.
* Restart the network service:

**sudo systemctl restart networking**

Windows:

Static IP Configuration:

* Right-click on the network icon in the system tray and select "Open Network & Internet settings."
* Click on "Change adapter options."
* Right-click on the network adapter you want to configure and select "Properties."
* Select "Internet Protocol Version 4 (TCP/IPv4)" and click "Properties."
* Choose "Use the following IP address" and enter the IP address, subnet mask, default gateway, and DNS server addresses.
* Click "OK" to save the settings.

DHCP IP Configuration:

* Follow steps 1-3 from the Static IP Configuration section.
* Select "Obtain an IP address automatically" and "Obtain DNS server address automatically." Click "OK" to save the settings.

That's it! You've configured both cable connections with RJ-45 connectors and IP addresses on Linux and Windows systems.

**Ans C:** Here's an introduction to each of the mentioned network-related tools and commands with appropriate examples:

1. ipconfig (Windows):
   * ipconfig is a command-line utility in Windows used to display and manage network configurations of the local system.
   * Example: ***ipconfig /all*** displays detailed information about all network interfaces.
2. ifconfig (Linux):
   * ifconfig is a command-line utility in Linux used to configure and display information about network interfaces.
   * Example: ***ifconfig eth0*** displays information about the Ethernet interface eth0.
3. ip:
   * The ip command is a powerful utility for network configuration in Linux. It is more versatile than ifconfig and route.
   * Example: ***ip*** address show displays IP addresses assigned to all network interfaces.
4. hostname:
   * hostname is a command that displays or sets the hostname of the system.
   * Example: ***hostname*** displays the current hostname of the system.
5. ping:
   * ping is a utility used to test the reachability of a host on an Internet Protocol (IP) network.
   * Example: ***ping google.com*** sends ICMP echo requests to google.com to check connectivity.
6. netstat:
   * netstat is a command-line tool used for displaying network connections, routing tables, interface statistics, masquerade connections, and multicast memberships.
   * Example: ***netstat -an*** displays all active network connections.
7. route:
   * route is a command-line utility in Linux used to view and manipulate the IP routing table.
   * Example: ***route -n*** displays the kernel routing table in numerical format.
8. traceroute or tracert:
   * traceroute (Linux) or tracert (Windows) is used to trace the route that packets take from the local host to a destination host.
   * Example: ***traceroute google.com*** traces the route to google.com displaying the IP addresses of routers along the path.
9. tcpdump:
   * tcpdump is a command-line packet analyzer. It allows the user to display TCP/IP and other packets being transmitted or received over a network.
   * Example: ***tcpdump -i eth0*** captures packets on the eth0 interface.
10. Wireshark:
    * Wireshark is a GUI-based packet analyzer that allows the user to capture and interactively browse the traffic running on a computer network.
    * Example: Launch ***Wireshark***, select the network interface, and start capturing packets for analysis.

These tools and commands are essential for network troubleshooting, monitoring, and configuration in both Windows and Linux environments.