Q1.)

```
┌(~)────────────────────────────────────────────(flameblazer@xxxflamyxxx:pts/3)─
└(17:07:03)──> ifconfig                                             ─(Wed,Aug28)─
lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 140871  bytes 13872323 (13.8 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 140871  bytes 13872323 (13.8 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

wlo1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.42.197  netmask 255.255.224.0  broadcast 192.168.63.255
        inet6 fe80::fd8b:db35:c5fd:7250  prefixlen 64  scopeid 0x20<link>
        ether 50:c2:e8:c2:76:d3  txqueuelen 1000  (Ethernet)
        RX packets 10354837  bytes 7424875308 (7.4 GB)
        RX errors 0  dropped 23699  overruns 0  frame 0
        TX packets 487904  bytes 168662750 (168.6 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

My ip4address is 192.168.42.197 assigned by my local network. This is my private ip address
used to communicate within my local network.

What Is My IP?

My Public IPv4: 103.25.231.126 📋

My Public IPv6: Not Detected

My IP Location: Noida, UP IN 📋

My ISP: Indraprastha Institute of Information Technology Delhi 📋

The Ip address shown here and in the ifconfig output are different due to the fact that the Ip
address on the website is the Public Ip address of my router which is used to access the
internet, while my private ip address is assigned to me by my router for communication in the
local network.

Q2.)

```
┌(~)────────────────────────────────(flameblazer@xxxflamyxxx:pts/0)┐
(17:34:14)──➤ ifconfig                                              ─(Wed,Aug28)┘
lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 824  bytes 86096 (86.0 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 824  bytes 86096 (86.0 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

wlo1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.42.197  netmask 255.255.224.0  broadcast 192.168.63.255
        inet6 fe80::fd8b:db35:c5fd:7250  prefixlen 64  scopeid 0x20<link>
        ether 50:c2:e8:c2:76:d3  txqueuelen 1000  (Ethernet)
        RX packets 17004  bytes 8528843 (8.5 MB)
        RX errors 0  dropped 76  overruns 0  frame 0
        TX packets 2715  bytes 993665 (993.6 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
┌(~)────────────────────────────────(flameblazer@xxxflamyxxx:pts/0)┐
(17:34:17)──➤ sudo ifconfig enp0s3 1.1.1.3 netmask 255.255.224.0 up  ─(Wed,Aug28)┘
[sudo] password for flameblazer:
SIOCSIFADDR: No such device
enp0s3: ERROR while getting interface flags: No such device
SIOCSIFNETMASK: No such device
enp0s3: ERROR while getting interface flags: No such device
┌(~)────────────────────────────────(flameblazer@xxxflamyxxx:pts/0)┐
(17:35:15)──➤ sudo ifconfig wlo1 192.168.42.200 netmask 255.255.224.0 up  255 ─(Wed,Aug28)┘
┌(~)────────────────────────────────(flameblazer@xxxflamyxxx:pts/0)┐
(17:36:48)──➤ ifconfig                                              ─(Wed,Aug28)┘
lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 1317  bytes 118986 (118.9 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 1317  bytes 118986 (118.9 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

wlo1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.42.200  netmask 255.255.224.0  broadcast 192.168.63.255
        inet6 fe80::fd8b:db35:c5fd:7250  prefixlen 64  scopeid 0x20<link>
        ether 50:c2:e8:c2:76:d3  txqueuelen 1000  (Ethernet)
```

```
(17:36:48)──➤ ifconfig                                              ─(Wed,Aug28)┘
lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 1317  bytes 118986 (118.9 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 1317  bytes 118986 (118.9 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

wlo1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.42.200  netmask 255.255.224.0  broadcast 192.168.63.255
        inet6 fe80::fd8b:db35:c5fd:7250  prefixlen 64  scopeid 0x20<link>
        ether 50:c2:e8:c2:76:d3  txqueuelen 1000  (Ethernet)
        RX packets 54229  bytes 28831718 (28.8 MB)
        RX errors 0  dropped 236  overruns 0  frame 0
        TX packets 3320  bytes 1157505 (1.1 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
┌(~)────────────────────────────────(flameblazer@xxxflamyxxx:pts/0)┐
(17:36:53)──➤ sudo ifconfig wlo1 192.168.42.197 netmask 255.255.224.0 up  ─(Wed,Aug28)┘
┌(~)────────────────────────────────(flameblazer@xxxflamyxxx:pts/0)┐
(17:37:32)──➤ ifconfig                                              ─(Wed,Aug28)┘
lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 1836  bytes 159638 (159.6 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 1836  bytes 159638 (159.6 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

wlo1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.42.197  netmask 255.255.224.0  broadcast 192.168.63.255
        inet6 fe80::fd8b:db35:c5fd:7250  prefixlen 64  scopeid 0x20<link>
        ether 50:c2:e8:c2:76:d3  txqueuelen 1000  (Ethernet)
        RX packets 64955  bytes 34134990 (34.1 MB)
        RX errors 0  dropped 284  overruns 0  frame 0
        TX packets 3901  bytes 1239696 (1.2 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
┌(~)────────────────────────────────(flameblazer@xxxflamyxxx:pts/0)┐
(17:37:34)──➤ █                                                     ─(Wed,Aug28)┘
```
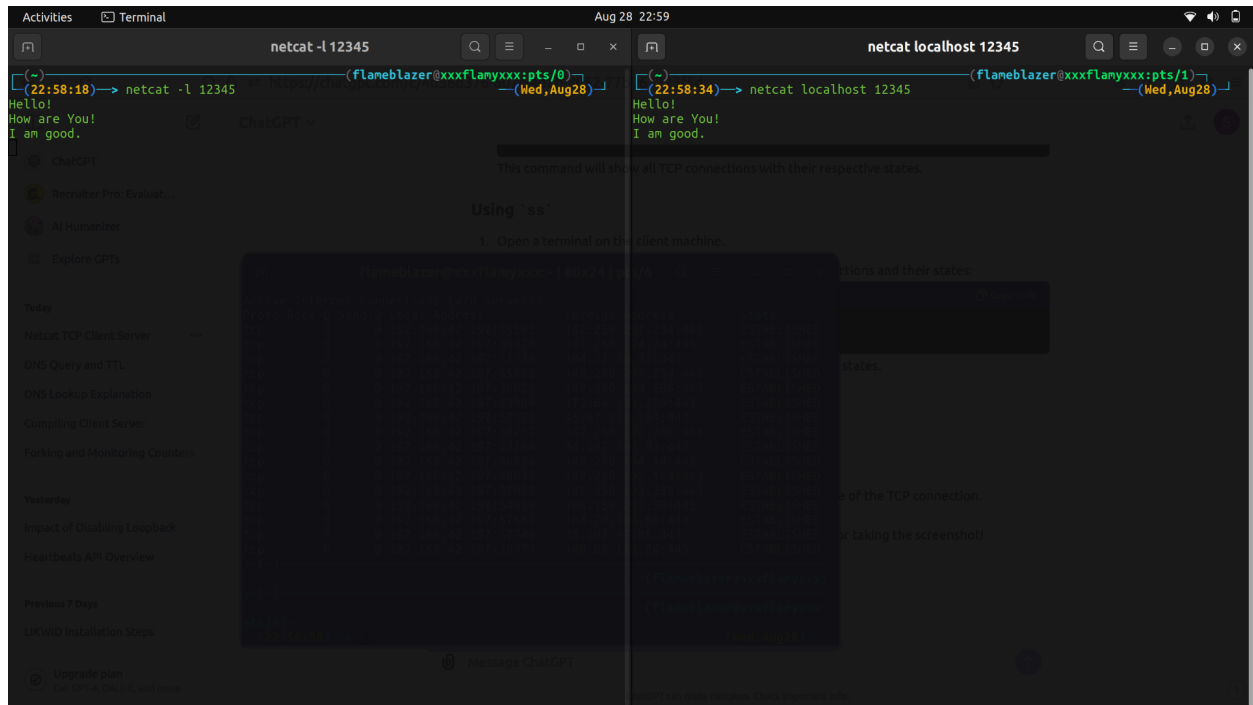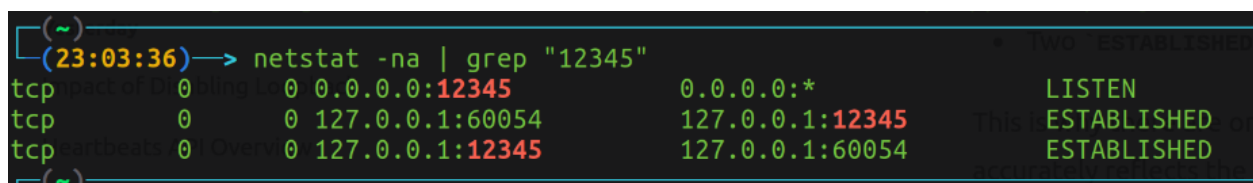
I changed my ip address from 192.168.42.197 to 192.168.42.200 and then reverted back.

Q3.)

b.)

The second entry corresponds to the client node. It is in ESTABLISHED state connecting to the server listening on port 12345.

I have the server on port 12345 listening for any active connections.
Also I have one tcp connection between by machine and the server(hosted on the same machine) both the client-side and the server-side entries for this connection are in the ESTABLISHED state.

Q4)
a.)

```
┌(~)────────────────────────────────────────────(flameblazer@xxxflamyxxx:pts/5)┐
└(21:26:52)──> nslookup -type=ns google.in                     ─(Wed,Aug28)─
Server:          127.0.0.53
Address:         127.0.0.53#53

Non-authoritative answer:
google.in       nameserver = ns1.google.com.
google.in       nameserver = ns4.google.com.
google.in       nameserver = ns3.google.com.
google.in       nameserver = ns2.google.com.

Authoritative answers can be found from:
ns1.google.com  internet address = 216.239.32.10
ns1.google.com  has AAAA address 2001:4860:4802:32::a
ns4.google.com  internet address = 216.239.38.10
ns4.google.com  has AAAA address 2001:4860:4802:38::a
ns3.google.com  internet address = 216.239.36.10
ns3.google.com  has AAAA address 2001:4860:4802:36::a
ns2.google.com  internet address = 216.239.34.10
ns2.google.com  has AAAA address 2001:4860:4802:34::a

┌(~)────────────────────────────────────────────(flameblazer@xxxflamyxxx:pts/5)┐
└(21:27:07)──> nslookup google.in ns3.google.com              ─(Wed,Aug28)─
Server:          ns3.google.com
Address:         216.239.36.10#53

Name:    google.in
Address: 142.250.194.228
Name:    google.in
Address: 2404:6800:4002:825::2004
```

I first queried to find nameservers which have authority over the 'google.in' domain. Then I
queried to one of these nameservers to find out the ip address of 'google.in'. This gave me an
authoritative answer.

b.)

```
┌(~)────────────────────────────────────────────(flameblazer@xxxflamyxxx:pts/7)─
└(21:59:41)──→ nslookup -debug google.in          ──(Wed,Aug28)─
Server:          127.0.0.53
Address:         127.0.0.53#53

------------
    QUESTIONS:
        google.in, type = A, class = IN
    ANSWERS:
    ->  google.in
        internet address = 142.250.193.4
        ttl = 135
    AUTHORITY RECORDS:
    ADDITIONAL RECORDS:
------------
Non-authoritative answer:
Name:    google.in
Address: 142.250.193.4
------------
    QUESTIONS:
        google.in, type = AAAA, class = IN
    ANSWERS:
    ->  google.in
        has AAAA address 2404:6800:4002:819::2004
        ttl = 300
    AUTHORITY RECORDS:
    ADDITIONAL RECORDS:
------------
Name:    google.in
Address: 2404:6800:4002:819::2004
```

Using the -debug option for a more verbose result, I can see that on my local dns the TTL for google.in IPv4 address is 135seconds. This means that the DNS record expires every 135 seconds and the server has to query to refresh the record.

Q5.
a.)

```
                                                                        ┌(flameblazer@xxxflamyxxx:pts/0)¬
~)
└(15:33:40)──→ traceroute google.in                      ──(Wed,Aug28)┘
traceroute to google.in (142.250.193.4), 30 hops max, 60 byte packets
 1  192.168.32.254 (192.168.32.254)  25.459 ms  25.427 ms  25.407 ms
 2  auth.iiitd.edu.in (192.168.1.99)  11.342 ms  11.319 ms  11.302 ms
 3  103.25.231.1 (103.25.231.1)  10.216 ms  10.195 ms  10.174 ms
 4  * * *
 5  10.119.234.162 (10.119.234.162)  10.090 ms  10.073 ms  11.102 ms
 6  72.14.195.56 (72.14.195.56)  11.084 ms 72.14.194.160 (72.14.194.160)  19.089 ms 72.14.195.56 (72.14.195.56)  12.325 ms
 7  142.251.54.111 (142.251.54.111)  61.303 ms  61.282 ms 192.178.80.159 (192.178.80.159)  32.670 ms
 8  142.251.54.89 (142.251.54.89)  27.196 ms 142.251.54.87 (142.251.54.87)  37.216 ms 142.251.54.89 (142.251.54.89)  27.149 ms
 9  del11s14-in-f4.1e100.net (142.250.193.4)  60.196 ms  60.171 ms  51.225 ms
```

IP Addresses and Average Latency:

- **Hop 1:**
    - **IP Address:** 192.168.32.254
    - **Average Latency:** (25.459 ms + 25.427 ms + 25.407 ms) / 3 = **25.431 ms**
- **Hop 2:**
    - **IP Address:** 192.168.1.99
    - **Average Latency:** (11.342 ms + 11.319 ms + 11.302 ms) / 3 = **11.321 ms**
- **Hop 3:**
    - **IP Address:** 103.25.231.1
    - **Average Latency:** (10.216 ms + 10.195 ms + 10.174 ms) / 3 = **10.195 ms**
- **Hop 4:**
    - **IP Address:** * * * (No response)
    - **Average Latency:** N/A
- **Hop 5:**
    - **IP Address:** 10.119.234.162
    - **Average Latency:** (10.090 ms + 10.073 ms + 11.102 ms) / 3 = **10.422 ms**
- **Hop 6:**
    - **IP Address:** 72.14.195.56 and 72.14.194.160
    - **Average Latency:** (11.084 ms + 19.089 ms + 12.325 ms) / 3 = **14.166 ms**
- **Hop 7:**
    - **IP Address:** 142.251.54.111 and 192.178.80.159
    - **Average Latency:** (61.303 ms + 61.282 ms + 32.670 ms) / 3 = **51.752 ms**
- **Hop 8:**
    - **IP Address:** 142.251.54.89 and 142.251.54.87
    - **Average Latency:** (27.196 ms + 37.216 ms + 27.149 ms) / 3 = **30.520 ms**
- **Hop 9:**
    - **IP Address:** 142.250.193.4
    - **Average Latency:** (60.196 ms + 60.171 ms + 51.225 ms) / 3 = **57.197 ms**

b.)

```
┌──(~/Documents/CNassignments/Ass1)────────────(flameblazer@xxxflamyxxx:pts/1)─
└─(15:56:20)──> ping -c 50 google.in                    2 ←─(Wed,Aug28)─
PING google.in (142.250.193.4) 56(84) bytes of data.
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=1 ttl=112 time=140 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=2 ttl=112 time=75.2 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=3 ttl=112 time=94.1 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=4 ttl=112 time=99.6 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=5 ttl=112 time=103 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=6 ttl=112 time=49.6 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=7 ttl=112 time=162 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=8 ttl=112 time=75.3 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=9 ttl=112 time=196 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=10 ttl=112 time=121 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=11 ttl=112 time=153 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=12 ttl=112 time=184 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=13 ttl=112 time=104 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=14 ttl=112 time=105 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=15 ttl=112 time=130 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=16 ttl=112 time=151 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=17 ttl=112 time=171 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=18 ttl=112 time=113 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=19 ttl=112 time=125 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=20 ttl=112 time=144 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=21 ttl=112 time=166 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=22 ttl=112 time=82.4 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=23 ttl=112 time=102 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=24 ttl=112 time=132 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=25 ttl=112 time=152 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=26 ttl=112 time=183 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=27 ttl=112 time=107 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=28 ttl=112 time=129 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=29 ttl=112 time=55.4 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=30 ttl=112 time=153 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=31 ttl=112 time=83.8 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=32 ttl=112 time=97.7 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=33 ttl=112 time=143 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=34 ttl=112 time=147 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=35 ttl=112 time=210 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=36 ttl=112 time=96.4 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=37 ttl=112 time=115 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=38 ttl=112 time=136 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=39 ttl=112 time=162 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=40 ttl=112 time=87.7 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=41 ttl=112 time=98.8 ms
```

```
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=29 ttl=112 time=55.4 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=30 ttl=112 time=153 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=31 ttl=112 time=83.8 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=32 ttl=112 time=97.7 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=33 ttl=112 time=143 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=34 ttl=112 time=147 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=35 ttl=112 time=210 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=36 ttl=112 time=96.4 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=37 ttl=112 time=115 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=38 ttl=112 time=136 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=39 ttl=112 time=162 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=40 ttl=112 time=87.7 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=41 ttl=112 time=98.8 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=42 ttl=113 time=28.1 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=43 ttl=113 time=152 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=44 ttl=113 time=27.6 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=45 ttl=113 time=100 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=46 ttl=113 time=148 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=47 ttl=113 time=53.6 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=48 ttl=113 time=54.3 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=49 ttl=113 time=112 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=50 ttl=113 time=111 ms

--- google.in ping statistics ---
50 packets transmitted, 50 received, 0% packet loss, time 49070ms
rtt min/avg/max/mdev = 27.612/118.441/209.716/41.448 ms
```

c)
When you sum the RTTs from each hop in the traceroute, the total latency might be higher than what you see in the ping command because traceroute measures the RTT to each intermediate hop individually, not the entire round-trip time to the final destination in one go.

d)
Maximum ping latency amongst the intermediate hosts is about 60ms while that in b is 118ms. The maximum ping latency for the intermediate host is less than that of the google.in's server as as b the path is to the google.in's server and back through multiple intermediate hosts, while in a.) the probe is just to one of the intermediate hosts in the path to google.in's server. As

google.in's server more hops in between it is likely that it takes more time to ping. But as network congestion is unpredictable the results could vary for multiple calls.

e)
This could be due to the fact that there may be multiple routers available to route that particular hop. For example, in Hop 7 I see 2 probes reach the ip address (142.251.54.111) and one probe reach the device at ip address (192.178.80.159). Thus there might be atleast two different devices to route the packets at that hop.

f)

g)

```
                                         (flameblazer@xxxflamyxxx:pts/0)¬
(16:25:09)──→ traceroute stanford.edu                                                                                              (Wed,Aug28)
traceroute to stanford.edu (171.67.215.200), 30 hops max, 60 byte packets
 1  192.168.32.254 (192.168.32.254)  104.495 ms  104.465 ms  104.440 ms
 2  auth.iiitd.edu.in (192.168.1.99)  92.274 ms  92.255 ms  92.234 ms
 3  103.25.231.1 (103.25.231.1)  104.493 ms  104.470 ms  104.445 ms
 4  10.1.209.201 (10.1.209.201)  109.745 ms  109.725 ms  104.384 ms
 5  10.1.200.137 (10.1.200.137)  107.782 ms  110.708 ms  104.319 ms
 6  10.255.238.122 (10.255.238.122)  132.932 ms 10.255.238.254 (10.255.238.254)  61.992 ms 10.255.238.122 (10.255.238.122)  59.673 ms
 7  180.149.48.18 (180.149.48.18)  40.677 ms  158.438 ms  158.406 ms
 8  * * *
 9  * * *
10  * * *
11  * * *
12  * * *
13  * * *
14  * * *
15  * * *
16  * * *
17  * * *
18  * * *
19  * * *
20  * * *
21  * * *
22  * * *
23  * * campus-east-rtr-vl1120.SUNet (171.66.255.232)  332.441 ms
24  campus-ial-nets-a-vl1004.SUNet (171.64.255.200)  506.938 ms campus-ial-nets-b-vl1104.SUNet (171.66.255.200)  427.941 ms *
25  * * web.stanford.edu (171.67.215.200)  324.776 ms
```

The number of hops in greater in the case of stanford.edu (25) compared to the number of hops in the case of google.in (9).

h)

The average latency for google.in is 118 ms while that for stanford.edu is 447.333 ms.

This could be due to the following factors:

1) Geographical Location: Google servers are available in India while that of stanford are located in USA. This would mean greater number of hops to reach the stanford servers and incur greater delay.

2) Infrastructure: The infrastructure of Google servers would be much more robust that the stanford servers so they would be able to serve requests much faster.

Q6)

I used the command - *sudo inconfig lo down*, to make the ping command fail.

```
┌(~/Documents/CNassignments/Ass1)─────────────────────────────────────(flameblazer@xxxflamyxxx:pts/1)─
└(16:55:18)──> sudo ifconfig lo down                                              ─(Wed,Aug28)─
[sudo] password for flameblazer:
┌(~/Documents/CNassignments/Ass1)─────────────────────────────────────(flameblazer@xxxflamyxxx:pts/1)─
└(16:55:55)──> ping 127.0.0.1                                                     ─(Wed,Aug28)─
PING 127.0.0.1 (127.0.0.1) 56(84) bytes of data.
^C
--- 127.0.0.1 ping statistics ---
21 packets transmitted, 0 received, 100% packet loss, time 20462ms

┌(~/Documents/CNassignments/Ass1)─────────────────────────────────────(flameblazer@xxxflamyxxx:pts/1)─
└(16:56:27)──> ping 192.168.226.175                                          1 ↵ ─(Wed,Aug28)─
PING 192.168.226.175 (192.168.226.175) 56(84) bytes of data.
64 bytes from 192.168.226.175: icmp_seq=1 ttl=63 time=29.8 ms
64 bytes from 192.168.226.175: icmp_seq=2 ttl=63 time=5.69 ms
64 bytes from 192.168.226.175: icmp_seq=3 ttl=63 time=9.33 ms
64 bytes from 192.168.226.175: icmp_seq=4 ttl=63 time=11.2 ms
64 bytes from 192.168.226.175: icmp_seq=5 ttl=63 time=13.4 ms
64 bytes from 192.168.226.175: icmp_seq=6 ttl=63 time=4.52 ms
64 bytes from 192.168.226.175: icmp_seq=7 ttl=63 time=15.7 ms
^C
--- 192.168.226.175 ping statistics ---
7 packets transmitted, 7 received, 0% packet loss, time 6010ms
rtt min/avg/max/mdev = 4.517/12.808/29.786/7.846 ms
┌(~/Documents/CNassignments/Ass1)─────────────────────────────────────(flameblazer@xxxflamyxxx:pts/1)─
└(16:56:49)──> ping google.in                                                    ─(Wed,Aug28)─
ping: google.in: Temporary failure in name resolution
```

I disable the loopback interface with the command. Now when I ping to the localhost ip address (127.0.0.1) I get 100% packet loss.

But when I ping to another Ip address every thing works as usual. But when I ping to the google.in , I get a failure in name resolution as the loopback interface is integral part of name resolution.