PART A)

cd ~/Documents/CN/ASS\ 3/TASK1

sudo python3 topology.py

\*\*\* Creating network

\*\*\* Adding controller

\*\*\* Adding hosts:

h1 h2 h3 h4 h5 h6 h7 h8

\*\*\* Adding switches:

s1 s2 s3 s4

\*\*\* Adding links:

(5ms delay) (5ms delay) (h1, s1) (5ms delay) (5ms delay) (h2, s1) (5ms delay) (5ms delay) (h3, s2) (5ms delay) (5ms delay) (h4, s2) (5ms delay) (5ms delay) (h5, s3) (5ms delay) (5ms delay) (h6, s3) (5ms delay) (5ms delay) (h7, s4) (5ms delay) (5ms delay) (h8, s4) (7ms delay) (7ms delay) (s1, s2) (7ms delay) (7ms delay) (s1, s3) (7ms delay) (7ms delay) (s2, s3) (7ms delay) (7ms delay) (s3, s4) (7ms delay) (7ms delay) (s4, s1)

\*\*\* Configuring hosts

h1 h2 h3 h4 h5 h6 h7 h8

\*\*\* Starting controller

c0

\*\*\* Starting 4 switches

s1 s2 s3 s4 ...(5ms delay) (5ms delay) (7ms delay) (7ms delay) (7ms delay) (5ms delay) (5ms delay) (7ms delay) (7ms delay) (5ms delay) (5ms delay) (7ms delay) (7ms delay) (7ms delay) (5ms delay) (5ms delay) (7ms delay) (7ms delay)

\*\*\* Starting CLI:

mininet> h3 ping -c 10 10.0.0.2

PING 10.0.0.2 (10.0.0.2) 56(84) bytes of data.

From 10.0.0.4 icmp\_seq=1 Destination Host Unreachable

From 10.0.0.4 icmp\_seq=2 Destination Host Unreachable

From 10.0.0.4 icmp\_seq=3 Destination Host Unreachable

From 10.0.0.4 icmp\_seq=4 Destination Host Unreachable

From 10.0.0.4 icmp\_seq=5 Destination Host Unreachable

From 10.0.0.4 icmp\_seq=6 Destination Host Unreachable

From 10.0.0.4 icmp\_seq=7 Destination Host Unreachable

From 10.0.0.4 icmp\_seq=8 Destination Host Unreachable

From 10.0.0.4 icmp\_seq=9 Destination Host Unreachable

From 10.0.0.4 icmp\_seq=10 Destination Host Unreachable

--- 10.0.0.2 ping statistics ---

10 packets transmitted, 0 received, +10 errors, 100% packet loss, time 9199ms

pipe 4

mininet> h5 ping -c 10 10.0.0.8

PING 10.0.0.8 (10.0.0.8) 56(84) bytes of data.

From 10.0.0.6 icmp\_seq=1 Destination Host Unreachable

From 10.0.0.6 icmp\_seq=2 Destination Host Unreachable

From 10.0.0.6 icmp\_seq=3 Destination Host Unreachable

From 10.0.0.6 icmp\_seq=4 Destination Host Unreachable

From 10.0.0.6 icmp\_seq=5 Destination Host Unreachable

From 10.0.0.6 icmp\_seq=6 Destination Host Unreachable

From 10.0.0.6 icmp\_seq=7 Destination Host Unreachable

From 10.0.0.6 icmp\_seq=8 Destination Host Unreachable

From 10.0.0.6 icmp\_seq=9 Destination Host Unreachable

From 10.0.0.6 icmp\_seq=10 Destination Host Unreachable

--- 10.0.0.8 ping statistics ---

10 packets transmitted, 0 received, +10 errors, 100% packet loss, time 9139ms

pipe 4

mininet> h8 ping -c 10 10.0.0.3

PING 10.0.0.3 (10.0.0.3) 56(84) bytes of data.

From 10.0.0.9 icmp\_seq=1 Destination Host Unreachable

From 10.0.0.9 icmp\_seq=2 Destination Host Unreachable

From 10.0.0.9 icmp\_seq=3 Destination Host Unreachable

From 10.0.0.9 icmp\_seq=4 Destination Host Unreachable

From 10.0.0.9 icmp\_seq=5 Destination Host Unreachable

From 10.0.0.9 icmp\_seq=6 Destination Host Unreachable

From 10.0.0.9 icmp\_seq=7 Destination Host Unreachable

From 10.0.0.9 icmp\_seq=8 Destination Host Unreachable

From 10.0.0.9 icmp\_seq=9 Destination Host Unreachable

From 10.0.0.9 icmp\_seq=10 Destination Host Unreachable

--- 10.0.0.3 ping statistics ---

10 packets transmitted, 0 received, +10 errors, 100% packet loss, time 9218ms

pipe 4

mininet> h3 ping -c 10 10.0.0.2

PING 10.0.0.2 (10.0.0.2) 56(84) bytes of data.

From 10.0.0.4 icmp\_seq=1 Destination Host Unreachable

From 10.0.0.4 icmp\_seq=2 Destination Host Unreachable

From 10.0.0.4 icmp\_seq=3 Destination Host Unreachable

From 10.0.0.4 icmp\_seq=4 Destination Host Unreachable

From 10.0.0.4 icmp\_seq=5 Destination Host Unreachable

From 10.0.0.4 icmp\_seq=6 Destination Host Unreachable

From 10.0.0.4 icmp\_seq=7 Destination Host Unreachable

From 10.0.0.4 icmp\_seq=8 Destination Host Unreachable

From 10.0.0.4 icmp\_seq=9 Destination Host Unreachable

From 10.0.0.4 icmp\_seq=10 Destination Host Unreachable

--- 10.0.0.2 ping statistics ---

10 packets transmitted, 0 received, +10 errors, 100% packet loss, time 9228ms

pipe 4

mininet> h5 ping -c 10 10.0.0.8

PING 10.0.0.8 (10.0.0.8) 56(84) bytes of data.

From 10.0.0.6 icmp\_seq=1 Destination Host Unreachable

From 10.0.0.6 icmp\_seq=2 Destination Host Unreachable

From 10.0.0.6 icmp\_seq=3 Destination Host Unreachable

From 10.0.0.6 icmp\_seq=4 Destination Host Unreachable

From 10.0.0.6 icmp\_seq=5 Destination Host Unreachable

From 10.0.0.6 icmp\_seq=6 Destination Host Unreachable

From 10.0.0.6 icmp\_seq=7 Destination Host Unreachable

From 10.0.0.6 icmp\_seq=8 Destination Host Unreachable

From 10.0.0.6 icmp\_seq=9 Destination Host Unreachable

From 10.0.0.6 icmp\_seq=10 Destination Host Unreachable

--- 10.0.0.8 ping statistics ---

10 packets transmitted, 0 received, +10 errors, 100% packet loss, time 9231ms

pipe 4

mininet> h8 ping -c 10 10.0.0.3

PING 10.0.0.3 (10.0.0.3) 56(84) bytes of data.

From 10.0.0.9 icmp\_seq=1 Destination Host Unreachable

From 10.0.0.9 icmp\_seq=2 Destination Host Unreachable

From 10.0.0.9 icmp\_seq=3 Destination Host Unreachable

From 10.0.0.9 icmp\_seq=4 Destination Host Unreachable

From 10.0.0.9 icmp\_seq=5 Destination Host Unreachable

From 10.0.0.9 icmp\_seq=6 Destination Host Unreachable

From 10.0.0.9 icmp\_seq=7 Destination Host Unreachable

From 10.0.0.9 icmp\_seq=8 Destination Host Unreachable

From 10.0.0.9 icmp\_seq=9 Destination Host Unreachable

From 10.0.0.9 icmp\_seq=10 Destination Host Unreachable

--- 10.0.0.3 ping statistics ---

10 packets transmitted, 0 received, +10 errors, 100% packet loss, time 9205ms

pipe 4

mininet> h3 ping -c 10 10.0.0.2

PING 10.0.0.2 (10.0.0.2) 56(84) bytes of data.

From 10.0.0.4 icmp\_seq=1 Destination Host Unreachable

From 10.0.0.4 icmp\_seq=2 Destination Host Unreachable

From 10.0.0.4 icmp\_seq=3 Destination Host Unreachable

From 10.0.0.4 icmp\_seq=4 Destination Host Unreachable

From 10.0.0.4 icmp\_seq=5 Destination Host Unreachable

From 10.0.0.4 icmp\_seq=6 Destination Host Unreachable

From 10.0.0.4 icmp\_seq=7 Destination Host Unreachable

From 10.0.0.4 icmp\_seq=8 Destination Host Unreachable

From 10.0.0.4 icmp\_seq=9 Destination Host Unreachable

From 10.0.0.4 icmp\_seq=10 Destination Host Unreachable

--- 10.0.0.2 ping statistics ---

10 packets transmitted, 0 received, +10 errors, 100% packet loss, time 9234ms

pipe 4

mininet> h5 ping -c 10 10.0.0.8

PING 10.0.0.8 (10.0.0.8) 56(84) bytes of data.

From 10.0.0.6 icmp\_seq=1 Destination Host Unreachable

From 10.0.0.6 icmp\_seq=2 Destination Host Unreachable

From 10.0.0.6 icmp\_seq=3 Destination Host Unreachable

From 10.0.0.6 icmp\_seq=4 Destination Host Unreachable

From 10.0.0.6 icmp\_seq=5 Destination Host Unreachable

From 10.0.0.6 icmp\_seq=6 Destination Host Unreachable

From 10.0.0.6 icmp\_seq=7 Destination Host Unreachable

From 10.0.0.6 icmp\_seq=8 Destination Host Unreachable

From 10.0.0.6 icmp\_seq=9 Destination Host Unreachable

From 10.0.0.6 icmp\_seq=10 Destination Host Unreachable

--- 10.0.0.8 ping statistics ---

10 packets transmitted, 0 received, +10 errors, 100% packet loss, time 9218ms

pipe 4

mininet> h8 ping -c 10 10.0.0.3

PING 10.0.0.3 (10.0.0.3) 56(84) bytes of data.

From 10.0.0.9 icmp\_seq=1 Destination Host Unreachable

From 10.0.0.9 icmp\_seq=2 Destination Host Unreachable

From 10.0.0.9 icmp\_seq=3 Destination Host Unreachable

From 10.0.0.9 icmp\_seq=4 Destination Host Unreachable

From 10.0.0.9 icmp\_seq=5 Destination Host Unreachable

From 10.0.0.9 icmp\_seq=6 Destination Host Unreachable

From 10.0.0.9 icmp\_seq=7 Destination Host Unreachable

From 10.0.0.9 icmp\_seq=8 Destination Host Unreachable

From 10.0.0.9 icmp\_seq=9 Destination Host Unreachable

From 10.0.0.9 icmp\_seq=10 Destination Host Unreachable

--- 10.0.0.3 ping statistics ---

10 packets transmitted, 0 received, +10 errors, 100% packet loss, time 9203ms

pipe 4

mininet> EOF

\*\*\* Stopping 1 controllers

c0

\*\*\* Stopping 13 links

.............

\*\*\* Stopping 4 switches

s1 s2 s3 s4

\*\*\* Stopping 8 hosts

h1 h2 h3 h4 h5 h6 h7 h8

\*\*\* Done

**PART B)**

sudo python3 topology.py

\*\*\* Creating network

\*\*\* Adding controller

\*\*\* Adding hosts:

h1 h2 h3 h4 h5 h6 h7 h8

\*\*\* Adding switches:

s1 s2 s3 s4

\*\*\* Adding links:

(5ms delay) (5ms delay) (h1, s1) (5ms delay) (5ms delay) (h2, s1) (5ms delay) (5ms delay) (h3, s2) (5ms delay) (5ms delay) (h4, s2) (5ms delay) (5ms delay) (h5, s3) (5ms delay) (5ms delay) (h6, s3) (5ms delay) (5ms delay) (h7, s4) (5ms delay) (5ms delay) (h8, s4) (7ms delay) (7ms delay) (s1, s2) (7ms delay) (7ms delay) (s1, s3) (7ms delay) (7ms delay) (s2, s3) (7ms delay) (7ms delay) (s3, s4) (7ms delay) (7ms delay) (s4, s1)

\*\*\* Configuring hosts

h1 h2 h3 h4 h5 h6 h7 h8

\*\*\* Starting controller

c0

\*\*\* Starting 4 switches

s1 s2 s3 s4 ...(5ms delay) (5ms delay) (7ms delay) (7ms delay) (7ms delay) (5ms delay) (5ms delay) (7ms delay) (7ms delay) (5ms delay) (5ms delay) (7ms delay) (7ms delay) (7ms delay) (5ms delay) (5ms delay) (7ms delay) (7ms delay)

\*\*\* Starting CLI:

mininet> py time.sleep(60)

mininet> h3 ping -c 10 10.0.0.2

PING 10.0.0.2 (10.0.0.2) 56(84) bytes of data.

64 bytes from 10.0.0.2: icmp\_seq=1 ttl=64 time=104 ms

64 bytes from 10.0.0.2: icmp\_seq=2 ttl=64 time=40.2 ms

64 bytes from 10.0.0.2: icmp\_seq=3 ttl=64 time=39.1 ms

64 bytes from 10.0.0.2: icmp\_seq=4 ttl=64 time=39.3 ms

64 bytes from 10.0.0.2: icmp\_seq=5 ttl=64 time=41.9 ms

64 bytes from 10.0.0.2: icmp\_seq=6 ttl=64 time=36.6 ms

64 bytes from 10.0.0.2: icmp\_seq=7 ttl=64 time=39.7 ms

64 bytes from 10.0.0.2: icmp\_seq=8 ttl=64 time=38.3 ms

64 bytes from 10.0.0.2: icmp\_seq=9 ttl=64 time=38.1 ms

64 bytes from 10.0.0.2: icmp\_seq=10 ttl=64 time=38.8 ms

--- 10.0.0.2 ping statistics ---

10 packets transmitted, 10 received, 0% packet loss, time 9013ms

rtt min/avg/max/mdev = 36.583/45.595/103.947/19.495 ms

mininet> h5 ping -c 10 10.0.0.8

PING 10.0.0.8 (10.0.0.8) 56(84) bytes of data.

64 bytes from 10.0.0.8: icmp\_seq=1 ttl=64 time=150 ms

64 bytes from 10.0.0.8: icmp\_seq=2 ttl=64 time=53.8 ms

64 bytes from 10.0.0.8: icmp\_seq=3 ttl=64 time=54.8 ms

64 bytes from 10.0.0.8: icmp\_seq=4 ttl=64 time=52.2 ms

64 bytes from 10.0.0.8: icmp\_seq=5 ttl=64 time=55.9 ms

64 bytes from 10.0.0.8: icmp\_seq=6 ttl=64 time=56.2 ms

64 bytes from 10.0.0.8: icmp\_seq=7 ttl=64 time=52.5 ms

64 bytes from 10.0.0.8: icmp\_seq=8 ttl=64 time=54.6 ms

64 bytes from 10.0.0.8: icmp\_seq=9 ttl=64 time=54.2 ms

64 bytes from 10.0.0.8: icmp\_seq=10 ttl=64 time=52.7 ms

--- 10.0.0.8 ping statistics ---

10 packets transmitted, 10 received, 0% packet loss, time 9024ms

rtt min/avg/max/mdev = 52.242/63.721/150.348/28.904 ms

mininet> h8 ping -c 10 10.0.0.3

PING 10.0.0.3 (10.0.0.3) 56(84) bytes of data.

64 bytes from 10.0.0.3: icmp\_seq=1 ttl=64 time=109 ms

64 bytes from 10.0.0.3: icmp\_seq=2 ttl=64 time=39.1 ms

64 bytes from 10.0.0.3: icmp\_seq=3 ttl=64 time=54.6 ms

64 bytes from 10.0.0.3: icmp\_seq=4 ttl=64 time=52.3 ms

64 bytes from 10.0.0.3: icmp\_seq=5 ttl=64 time=52.4 ms

64 bytes from 10.0.0.3: icmp\_seq=6 ttl=64 time=46.7 ms

64 bytes from 10.0.0.3: icmp\_seq=7 ttl=64 time=41.8 ms

64 bytes from 10.0.0.3: icmp\_seq=8 ttl=64 time=48.3 ms

64 bytes from 10.0.0.3: icmp\_seq=9 ttl=64 time=49.9 ms

64 bytes from 10.0.0.3: icmp\_seq=10 ttl=64 time=48.8 ms

--- 10.0.0.3 ping statistics ---

10 packets transmitted, 10 received, 0% packet loss, time 9033ms

rtt min/avg/max/mdev = 39.149/54.313/109.282/18.871 ms

mininet> h3 ping -c 10 10.0.0.2

PING 10.0.0.2 (10.0.0.2) 56(84) bytes of data.

64 bytes from 10.0.0.2: icmp\_seq=1 ttl=64 time=48.4 ms

64 bytes from 10.0.0.2: icmp\_seq=2 ttl=64 time=40.1 ms

64 bytes from 10.0.0.2: icmp\_seq=3 ttl=64 time=38.3 ms

64 bytes from 10.0.0.2: icmp\_seq=4 ttl=64 time=37.2 ms

64 bytes from 10.0.0.2: icmp\_seq=5 ttl=64 time=40.1 ms

64 bytes from 10.0.0.2: icmp\_seq=6 ttl=64 time=37.7 ms

64 bytes from 10.0.0.2: icmp\_seq=7 ttl=64 time=37.6 ms

64 bytes from 10.0.0.2: icmp\_seq=8 ttl=64 time=38.6 ms

64 bytes from 10.0.0.2: icmp\_seq=9 ttl=64 time=38.7 ms

64 bytes from 10.0.0.2: icmp\_seq=10 ttl=64 time=39.4 ms

--- 10.0.0.2 ping statistics ---

10 packets transmitted, 10 received, 0% packet loss, time 9010ms

rtt min/avg/max/mdev = 37.204/39.608/48.442/3.090 ms

mininet> h5 ping -c 10 10.0.0.8

PING 10.0.0.8 (10.0.0.8) 56(84) bytes of data.

64 bytes from 10.0.0.8: icmp\_seq=1 ttl=64 time=55.2 ms

64 bytes from 10.0.0.8: icmp\_seq=2 ttl=64 time=54.7 ms

64 bytes from 10.0.0.8: icmp\_seq=3 ttl=64 time=54.5 ms

64 bytes from 10.0.0.8: icmp\_seq=4 ttl=64 time=53.2 ms

64 bytes from 10.0.0.8: icmp\_seq=5 ttl=64 time=54.1 ms

64 bytes from 10.0.0.8: icmp\_seq=6 ttl=64 time=56.0 ms

64 bytes from 10.0.0.8: icmp\_seq=7 ttl=64 time=54.8 ms

64 bytes from 10.0.0.8: icmp\_seq=8 ttl=64 time=55.8 ms

64 bytes from 10.0.0.8: icmp\_seq=9 ttl=64 time=54.9 ms

64 bytes from 10.0.0.8: icmp\_seq=10 ttl=64 time=54.7 ms

--- 10.0.0.8 ping statistics ---

10 packets transmitted, 10 received, 0% packet loss, time 9015ms

rtt min/avg/max/mdev = 53.193/54.787/56.044/0.770 ms

mininet> h8 ping -c 10 10.0.0.3

PING 10.0.0.3 (10.0.0.3) 56(84) bytes of data.

64 bytes from 10.0.0.3: icmp\_seq=1 ttl=64 time=40.0 ms

64 bytes from 10.0.0.3: icmp\_seq=2 ttl=64 time=38.1 ms

64 bytes from 10.0.0.3: icmp\_seq=3 ttl=64 time=41.5 ms

64 bytes from 10.0.0.3: icmp\_seq=4 ttl=64 time=38.2 ms

64 bytes from 10.0.0.3: icmp\_seq=5 ttl=64 time=52.4 ms

64 bytes from 10.0.0.3: icmp\_seq=6 ttl=64 time=40.1 ms

64 bytes from 10.0.0.3: icmp\_seq=7 ttl=64 time=37.8 ms

64 bytes from 10.0.0.3: icmp\_seq=8 ttl=64 time=39.4 ms

64 bytes from 10.0.0.3: icmp\_seq=9 ttl=64 time=39.6 ms

64 bytes from 10.0.0.3: icmp\_seq=10 ttl=64 time=40.1 ms

--- 10.0.0.3 ping statistics ---

10 packets transmitted, 10 received, 0% packet loss, time 9018ms

rtt min/avg/max/mdev = 37.818/40.714/52.380/4.030 ms

mininet> h3 ping -c 10 10.0.0.2

PING 10.0.0.2 (10.0.0.2) 56(84) bytes of data.

64 bytes from 10.0.0.2: icmp\_seq=1 ttl=64 time=37.7 ms

64 bytes from 10.0.0.2: icmp\_seq=2 ttl=64 time=39.4 ms

64 bytes from 10.0.0.2: icmp\_seq=3 ttl=64 time=38.9 ms

64 bytes from 10.0.0.2: icmp\_seq=4 ttl=64 time=38.1 ms

64 bytes from 10.0.0.2: icmp\_seq=5 ttl=64 time=44.1 ms

64 bytes from 10.0.0.2: icmp\_seq=6 ttl=64 time=39.0 ms

64 bytes from 10.0.0.2: icmp\_seq=7 ttl=64 time=38.4 ms

64 bytes from 10.0.0.2: icmp\_seq=8 ttl=64 time=36.9 ms

64 bytes from 10.0.0.2: icmp\_seq=9 ttl=64 time=36.1 ms

64 bytes from 10.0.0.2: icmp\_seq=10 ttl=64 time=39.6 ms

--- 10.0.0.2 ping statistics ---

10 packets transmitted, 10 received, 0% packet loss, time 9019ms

rtt min/avg/max/mdev = 36.127/38.827/44.132/2.054 ms

mininet> h5 ping -c 10 10.0.0.8

PING 10.0.0.8 (10.0.0.8) 56(84) bytes of data.

64 bytes from 10.0.0.8: icmp\_seq=1 ttl=64 time=58.6 ms

64 bytes from 10.0.0.8: icmp\_seq=2 ttl=64 time=52.3 ms

64 bytes from 10.0.0.8: icmp\_seq=3 ttl=64 time=54.2 ms

64 bytes from 10.0.0.8: icmp\_seq=4 ttl=64 time=55.4 ms

64 bytes from 10.0.0.8: icmp\_seq=5 ttl=64 time=52.9 ms

64 bytes from 10.0.0.8: icmp\_seq=6 ttl=64 time=56.0 ms

64 bytes from 10.0.0.8: icmp\_seq=7 ttl=64 time=54.3 ms

64 bytes from 10.0.0.8: icmp\_seq=8 ttl=64 time=55.7 ms

64 bytes from 10.0.0.8: icmp\_seq=9 ttl=64 time=55.1 ms

64 bytes from 10.0.0.8: icmp\_seq=10 ttl=64 time=53.8 ms

--- 10.0.0.8 ping statistics ---

10 packets transmitted, 10 received, 0% packet loss, time 9042ms

rtt min/avg/max/mdev = 52.286/54.822/58.577/1.691 ms

mininet> h8 ping -c 10 10.0.0.3

PING 10.0.0.3 (10.0.0.3) 56(84) bytes of data.

64 bytes from 10.0.0.3: icmp\_seq=1 ttl=64 time=37.6 ms

64 bytes from 10.0.0.3: icmp\_seq=2 ttl=64 time=39.0 ms

64 bytes from 10.0.0.3: icmp\_seq=3 ttl=64 time=37.6 ms

64 bytes from 10.0.0.3: icmp\_seq=4 ttl=64 time=37.4 ms

64 bytes from 10.0.0.3: icmp\_seq=5 ttl=64 time=37.9 ms

64 bytes from 10.0.0.3: icmp\_seq=6 ttl=64 time=39.2 ms

64 bytes from 10.0.0.3: icmp\_seq=7 ttl=64 time=36.6 ms

64 bytes from 10.0.0.3: icmp\_seq=8 ttl=64 time=39.0 ms

64 bytes from 10.0.0.3: icmp\_seq=9 ttl=64 time=37.5 ms

64 bytes from 10.0.0.3: icmp\_seq=10 ttl=64 time=39.3 ms

--- 10.0.0.3 ping statistics ---

10 packets transmitted, 10 received, 0% packet loss, time 9016ms

rtt min/avg/max/mdev = 36.553/38.105/39.261/0.889 ms

mininet> EOF

\*\*\* Stopping 1 controllers

c0

\*\*\* Stopping 13 links

.............

\*\*\* Stopping 4 switches

s1 s2 s3 s4

\*\*\* Stopping 8 hosts

h1 h2 h3 h4 h5 h6 h7 h8

\*\*\* Done