

## PART B

### B1.

- (a) myRIP.py has been submitted along with the folder (inside Part B folder). Below is the result after running the script.

```
mininet@mininet-vm:~/Part B$ sudo python3 myRIP.py
*** Creating network
*** Adding controller
*** Adding hosts:
h1 h2 r1 r2 r3 r4
*** Adding switches:

*** Adding links:
(h1, r1) (h2, r4) (r1, r2) (r1, r3) (r2, r4) (r3, r4)
*** Configuring hosts
h1 h2 r1 r2 r3 r4
*** Starting controller
c0
*** Starting 0 switches

*** Starting CLI:
mininet> pingall
*** Ping: testing ping reachability
h1 -> h2 r1 r2 r3 r4
h2 -> h1 r1 r2 r3 r4
r1 -> h1 h2 r2 r3 r4
r2 -> h1 h2 r1 r3 r4
r3 -> h1 h2 r1 r2 r4
r4 -> h1 h2 r1 r2 r3
*** Results: 0% dropped (30/30 received)
mininet> █
```

- (b) Routing Table at each node:

For h1:

```
mininet> h1 route -n
Kernel IP routing table
Destination      Gateway          Genmask         Flags Metric Ref    Use Iface
192.0.1.0         0.0.0.0         255.255.255.0   U        0      0        0 h1-eth1
192.0.1.0         0.0.0.0         255.255.255.0   U        32     0        0 h1-eth1
193.0.1.0         192.0.1.2       255.255.255.0   UG       32     0        0 h1-eth1
194.0.1.0         192.0.1.2       255.255.255.0   UG       32     0        0 h1-eth1
195.0.1.0         192.0.1.2       255.255.255.0   UG       32     0        0 h1-eth1
196.0.1.0         192.0.1.2       255.255.255.0   UG       32     0        0 h1-eth1
197.0.1.0         192.0.1.2       255.255.255.0   UG       32     0        0 h1-eth1
mininet> █
```

For h2:

```
mininet> h2 route -n
Kernel IP routing table
Destination      Gateway         Genmask         Flags Metric Ref    Use Iface
192.0.1.0        197.0.1.2      255.255.255.0   UG    32    0      0 h2-eth1
193.0.1.0        197.0.1.2      255.255.255.0   UG    32    0      0 h2-eth1
194.0.1.0        197.0.1.2      255.255.255.0   UG    32    0      0 h2-eth1
195.0.1.0        197.0.1.2      255.255.255.0   UG    32    0      0 h2-eth1
196.0.1.0        197.0.1.2      255.255.255.0   UG    32    0      0 h2-eth1
197.0.1.0        0.0.0.0        255.255.255.0   U     0     0      0 h2-eth1
197.0.1.0        0.0.0.0        255.255.255.0   U     32    0      0 h2-eth1
mininet>
```

For r1:

```
mininet> r1 route -n
Kernel IP routing table
Destination      Gateway         Genmask         Flags Metric Ref    Use Iface
192.0.1.0        0.0.0.0        255.255.255.0   U     0     0      0 r1-eth1
192.0.1.0        0.0.0.0        255.255.255.0   U    32    0      0 r1-eth1
193.0.1.0        0.0.0.0        255.255.255.0   U     0     0      0 r1-eth2
193.0.1.0        0.0.0.0        255.255.255.0   U    32    0      0 r1-eth2
194.0.1.0        0.0.0.0        255.255.255.0   U     0     0      0 r1-eth3
194.0.1.0        0.0.0.0        255.255.255.0   U    32    0      0 r1-eth3
195.0.1.0        193.0.1.2      255.255.255.0   UG    32    0      0 r1-eth2
196.0.1.0        194.0.1.2      255.255.255.0   UG    32    0      0 r1-eth3
197.0.1.0        193.0.1.2      255.255.255.0   UG    32    0      0 r1-eth2
```

For r2:

```
mininet> r2 route -n
Kernel IP routing table
Destination      Gateway         Genmask         Flags Metric Ref    Use Iface
192.0.1.0        193.0.1.1      255.255.255.0   UG    32    0      0 r2-eth1
193.0.1.0        0.0.0.0        255.255.255.0   U     0     0      0 r2-eth1
193.0.1.0        0.0.0.0        255.255.255.0   U    32    0      0 r2-eth1
194.0.1.0        193.0.1.1      255.255.255.0   UG    32    0      0 r2-eth1
195.0.1.0        0.0.0.0        255.255.255.0   U     0     0      0 r2-eth2
195.0.1.0        0.0.0.0        255.255.255.0   U    32    0      0 r2-eth2
196.0.1.0        195.0.1.2      255.255.255.0   UG    32    0      0 r2-eth2
197.0.1.0        195.0.1.2      255.255.255.0   UG    32    0      0 r2-eth2
mininet>
```

For r3:

```
mininet> r3 route -n
Kernel IP routing table
Destination      Gateway         Genmask         Flags Metric Ref    Use Iface
192.0.1.0        194.0.1.1      255.255.255.0   UG    32    0      0 r3-eth1
193.0.1.0        194.0.1.1      255.255.255.0   UG    32    0      0 r3-eth1
194.0.1.0        0.0.0.0        255.255.255.0   U     0     0      0 r3-eth1
194.0.1.0        0.0.0.0        255.255.255.0   U    32    0      0 r3-eth1
195.0.1.0        196.0.1.2      255.255.255.0   UG    32    0      0 r3-eth2
196.0.1.0        0.0.0.0        255.255.255.0   U     0     0      0 r3-eth2
196.0.1.0        0.0.0.0        255.255.255.0   U    32    0      0 r3-eth2
197.0.1.0        196.0.1.2      255.255.255.0   UG    32    0      0 r3-eth2
mininet>
```

For r4:

```
mininet> r4 route -n
Kernel IP routing table
Destination      Gateway         Genmask         Flags Metric Ref    Use Iface
192.0.1.0        195.0.1.1      255.255.255.0   UG      32    0      0 r4-eth1
193.0.1.0        195.0.1.1      255.255.255.0   UG      32    0      0 r4-eth1
194.0.1.0        196.0.1.1      255.255.255.0   UG      32    0      0 r4-eth2
195.0.1.0        0.0.0.0        255.255.255.0   U        0    0      0 r4-eth1
195.0.1.0        0.0.0.0        255.255.255.0   U      32    0      0 r4-eth1
196.0.1.0        0.0.0.0        255.255.255.0   U        0    0      0 r4-eth2
196.0.1.0        0.0.0.0        255.255.255.0   U      32    0      0 r4-eth2
197.0.1.0        0.0.0.0        255.255.255.0   U        0    0      0 r4-eth3
197.0.1.0        0.0.0.0        255.255.255.0   U      32    0      0 r4-eth3
mininet>
```

(c) Traceroute output between h1 and h2:

```
mininet> h1 traceroute h2
traceroute to 197.0.1.1 (197.0.1.1), 30 hops max, 60 byte packets
 1  192.0.1.2 (192.0.1.2)  0.018 ms  0.003 ms  0.002 ms
 2  193.0.1.2 (193.0.1.2)  0.009 ms  0.004 ms  0.003 ms
 3  195.0.1.2 (195.0.1.2)  0.010 ms  0.004 ms  0.004 ms
 4  197.0.1.1 (197.0.1.1)  0.009 ms  0.005 ms  0.005 ms
```

Here, the path followed is: h1-> r1->r2->r4->h2

B2.

(a) Below is the command to bring down the link:

**link r1 r2 down** to bring down the r1-r2 link.

(b) Traceroute output with the new path between nodes h1 & h2:

```
mininet> link r1 r2 down
mininet> h1 traceroute h2
traceroute to 197.0.1.1 (197.0.1.1), 30 hops max, 60 byte packets
 1  192.0.1.2 (192.0.1.2)  0.020 ms  0.002 ms  0.002 ms
 2  194.0.1.2 (194.0.1.2)  0.009 ms  0.003 ms  0.003 ms
 3  196.0.1.2 (196.0.1.2)  0.010 ms  0.005 ms  0.005 ms
 4  197.0.1.1 (197.0.1.1)  0.009 ms  0.005 ms  0.005 ms
mininet>
```

Here, as the link r1-r2 is down, the new route takes the r1-r3 path. Complete path is as follows: h1-> r1 -> r3 -> r4 -> h2