B1

Execute copy_file_scipt.sh before we run myRIP.py to avoid permission issues. The bird configuration is under bird_conf. The following information is printed by the program.

(a) Routing tables

```
*** Routing Table on Router r1:
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
192.168.10.0    0.0.0.0         255.255.255.0   U     0      0        0 r1-eth0
192.168.10.0    0.0.0.0         255.255.255.0   U     32     0        0 r1-eth0
192.168.12.0    0.0.0.0         255.255.255.0   U     0      0        0 r1-eth1
192.168.12.0    0.0.0.0         255.255.255.0   U     32     0        0 r1-eth1
192.168.13.0    0.0.0.0         255.255.255.0   U     0      0        0 r1-eth2
192.168.13.0    0.0.0.0         255.255.255.0   U     32     0        0 r1-eth2
192.168.20.0    192.168.12.21   255.255.255.0   UG    32     0        0 r1-eth1
192.168.24.0    192.168.12.21   255.255.255.0   UG    32     0        0 r1-eth1
192.168.34.0    192.168.13.31   255.255.255.0   UG    32     0        0 r1-eth2

*** Routing Table on Router r2:
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
192.168.10.0    192.168.12.12   255.255.255.0   UG    32     0        0 r2-eth1
192.168.12.0    0.0.0.0         255.255.255.0   U     0      0        0 r2-eth1
192.168.12.0    0.0.0.0         255.255.255.0   U     32     0        0 r2-eth1
192.168.13.0    192.168.12.12   255.255.255.0   UG    32     0        0 r2-eth1
192.168.20.0    192.168.24.42   255.255.255.0   UG    32     0        0 r2-eth0
192.168.24.0    0.0.0.0         255.255.255.0   U     0      0        0 r2-eth0
192.168.24.0    0.0.0.0         255.255.255.0   U     32     0        0 r2-eth0
192.168.34.0    192.168.24.42   255.255.255.0   UG    32     0        0 r2-eth0

*** Routing Table on Router r3:
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
192.168.10.0    192.168.13.13   255.255.255.0   UG    32     0        0 r3-eth1
192.168.12.0    192.168.13.13   255.255.255.0   UG    32     0        0 r3-eth1
192.168.13.0    0.0.0.0         255.255.255.0   U     0      0        0 r3-eth1
192.168.13.0    0.0.0.0         255.255.255.0   U     32     0        0 r3-eth1
192.168.20.0    192.168.34.43   255.255.255.0   UG    32     0        0 r3-eth0
192.168.24.0    192.168.34.43   255.255.255.0   UG    32     0        0 r3-eth0
192.168.34.0    0.0.0.0         255.255.255.0   U     0      0        0 r3-eth0
192.168.34.0    0.0.0.0         255.255.255.0   U     32     0        0 r3-eth0

*** Routing Table on Router r4:
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
192.168.10.0    192.168.24.24   255.255.255.0   UG    32     0        0 r4-eth1
192.168.12.0    192.168.24.24   255.255.255.0   UG    32     0        0 r4-eth1
192.168.13.0    192.168.34.34   255.255.255.0   UG    32     0        0 r4-eth2
192.168.20.0    0.0.0.0         255.255.255.0   U     0      0        0 r4-eth0
192.168.20.0    0.0.0.0         255.255.255.0   U     32     0        0 r4-eth0
192.168.24.0    0.0.0.0         255.255.255.0   U     0      0        0 r4-eth1
192.168.24.0    0.0.0.0         255.255.255.0   U     32     0        0 r4-eth1
192.168.34.0    0.0.0.0         255.255.255.0   U     0      0        0 r4-eth2
192.168.34.0    0.0.0.0         255.255.255.0   U     32     0        0 r4-eth2
```

(b) Traceroute output

```
*** trace route output from h1 to h2
traceroute to 192.168.20.10 (192.168.20.10), 30 hops max, 60 byte packets
 1  192.168.10.12 (192.168.10.12)  0.066 ms  0.007 ms  0.005 ms
 2  192.168.13.31 (192.168.13.31)  0.019 ms  0.007 ms  0.006 ms
 3  192.168.34.43 (192.168.34.43)  0.020 ms  0.009 ms  0.008 ms
 4  192.168.20.10 (192.168.20.10)  0.028 ms  0.010 ms  0.010 ms

*** trace route output from h2 to h1
traceroute to 192.168.10.10 (192.168.10.10), 30 hops max, 60 byte packets
 1  192.168.20.12 (192.168.20.12)  0.022 ms  0.006 ms  0.005 ms
 2  192.168.34.34 (192.168.34.34)  0.012 ms  0.006 ms  0.006 ms
 3  192.168.13.13 (192.168.13.13)  0.014 ms  0.011 ms  0.008 ms
 4  192.168.10.10 (192.168.10.10)  0.012 ms  0.009 ms  0.008 ms
```

B2

From the traceroute output we know that H1 to H2 is through R1-R3-R4, thus we bring down R1 and R2 using the command: link r1 r3 down. The new traceroute output is as follows:

```
mininet> link r1 r3 down
mininet> py h1.cmd("traceroute -I 192.168.20.10")
traceroute to 192.168.20.10 (192.168.20.10), 30 hops max, 60 byte packets
 1  192.168.10.12 (192.168.10.12)  0.028 ms  0.005 ms  0.004 ms
 2  192.168.12.21 (192.168.12.21)  0.013 ms  0.005 ms  0.005 ms
 3  192.168.24.42 (192.168.24.42)  0.014 ms  0.007 ms  0.007 ms
 4  192.168.20.10 (192.168.20.10)  0.013 ms  0.008 ms  0.008 ms
```

We can see that the route is now R1-R2-R4.