به نام خالق رنگین کمان

سوال 1:

```
*** Starting CLI:
mininet> pingall
*** Ping: testing ping reachability
r1 -> h1 h2 h3 h4
h1 -> r1 h2 h3 h4
h2 -> r1 h1 h3 h4
h3 -> r1 h1 h2 h4
h4 -> r1 h1 h2 h3
*** Results: 0% dropped (20/20 received)
mininet> S
```

سوال 2: تغییرات در کد به شرح زیر است:

```
r1.cmd('iptables -t nat -A PREROUTING -p ICMP -s 24.30.65.1 -d 24.30.90.3 -j DNAT --to 24.30.65.5')
r1.cmd('iptables -t nat -A POSTROUTING -p ICMP -s 24.30.90.3 -d 24.30.65.1 -j SNAT --to 24.30.90.5')
```

سوال 4: اجرای کد داده شده:

```
LXTerminal
File  Edit  Tabs  Help
mininet@TCPIP-VM:/media/sf_Computer-Network-Laboratory-IUST/final-exam$ sudo pyt
hon ex2.py
*** Creating network
*** Adding controller
*** Adding hosts:
h1 h2 h3 h4 h5 h6 h7 h8
*** Adding switches:
s1 s2 s3 s4
*** Adding links:
(10.00Mbit) (10.00Mbit) (h1, s1) (10.00Mbit) (10.00Mbit) (h2, s1) (10.00Mbit) (1
0.00Mbit) (h3, s2) (10.00Mbit) (10.00Mbit) (h4, s2) (10.00Mbit) (10.00Mbit) (h5,
 s3) (10.00Mbit) (10.00Mbit) (h6, s3) (10.00Mbit) (10.00Mbit) (h7, s4) (10.00Mbi
t) (10.00Mbit) (h8, s4) (10.00Mbit) (10.00Mbit) (s1, s2) (15.00Mbit) (15.00Mbit)
 (s2, s3) (25.00Mbit) (25.00Mbit) (s3, s4)
*** Configuring hosts
h1 h2 h3 h4 h5 h6 h7 h8
*** Starting controller
*** Starting 4 switches
s1 (10.00Mbit) (10.00Mbit) (10.00Mbit) s2 (10.00Mbit) (10.00Mbit) (10.00Mbit) (1
5.00Mbit) s3 (10.00Mbit) (10.00Mbit) (15.00Mbit) (25.00Mbit) s4 (10.00Mbit) (10.
00Mbit) (25.00Mbit)
*** Starting CLI:
mininet> _
```

ابتدا با xterm برای هر ماشین یک پنجره باز میکنیم:

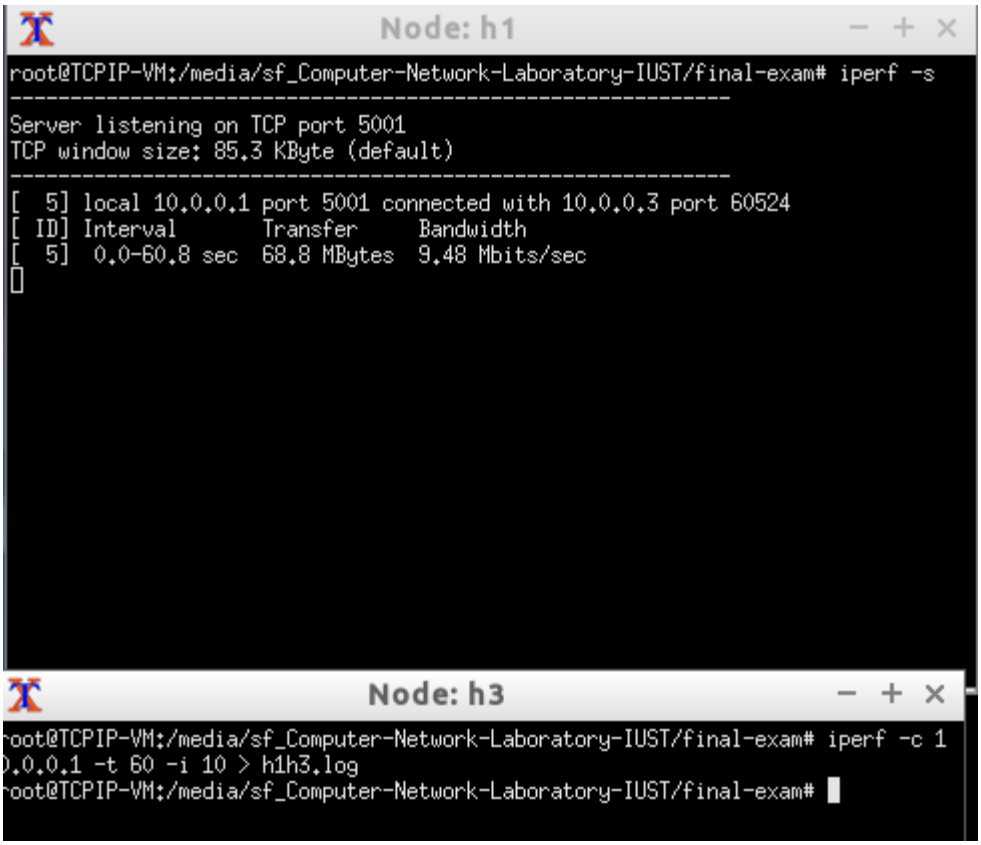
```
mininet> xterm h1
mininet> xterm h2
mininet> xterm h3
mininet> xterm h4
mininet> xterm h5
mininet> xterm h6
mininet> xterm h7
mininet> xterm h8
mininet> _
```

سپس دستور dump را اجرا میکنیم تا IP هرکدام را متوجه شویم:

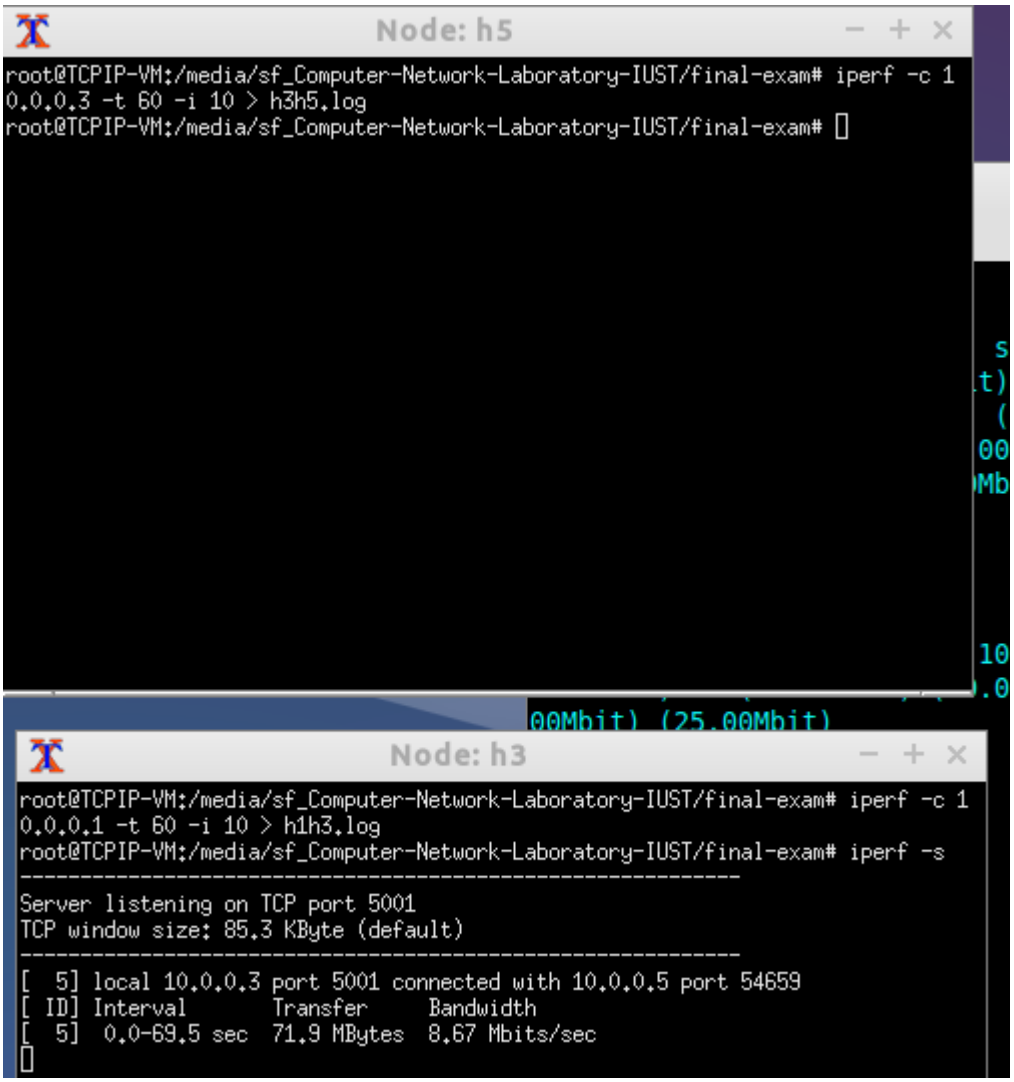
```
mininet> dump
<Host h1: h1-eth0:10.0.0.1 pid=2953>
<Host h2: h2-eth0:10.0.0.2 pid=2954>
<Host h3: h3-eth0:10.0.0.3 pid=2956>
<Host h4: h4-eth0:10.0.0.4 pid=2957>
<Host h5: h5-eth0:10.0.0.5 pid=2958>
<Host h6: h6-eth0:10.0.0.6 pid=2959>
<Host h7: h7-eth0:10.0.0.7 pid=2960>
<Host h8: h8-eth0:10.0.0.8 pid=2961>
<OVSSwitch s1: lo:127.0.0.1,s1-eth1:None,s1-eth2:None,s1-eth3:None pid=2964>
<OVSSwitch s2: lo:127.0.0.1,s2-eth1:None,s2-eth2:None,s2-eth3:None,s2-eth4:None
pid=2969>
<OVSSwitch s3: lo:127.0.0.1,s3-eth1:None,s3-eth2:None,s3-eth3:None,s3-eth4:None
pid=2974>
<OVSSwitch s4: lo:127.0.0.1,s4-eth1:None,s4-eth2:None,s4-eth3:None pid=2979>
<Controller c0: 127.0.0.1:6633 pid=2945>
mininet>
```

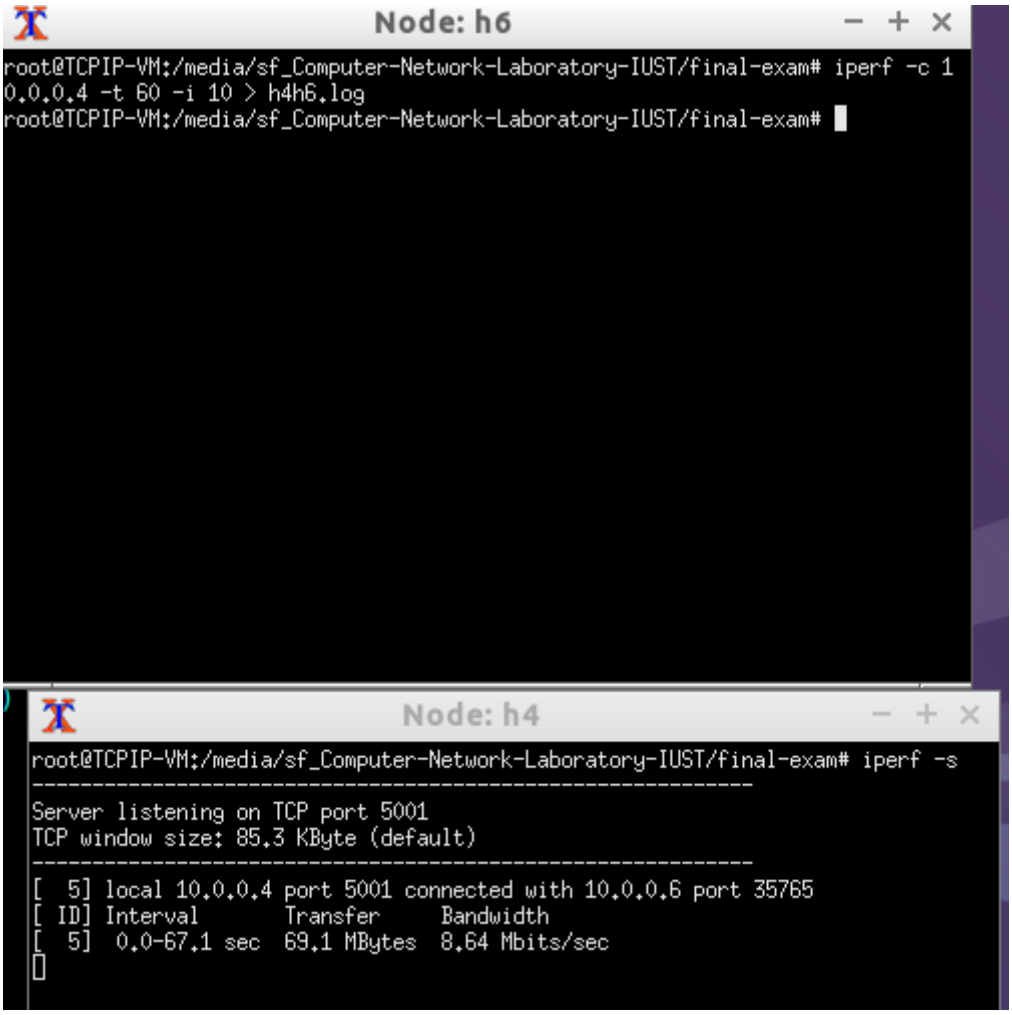
حال دستور iperf را برای هر سناریو میزنیم:

1. سناریو اول:

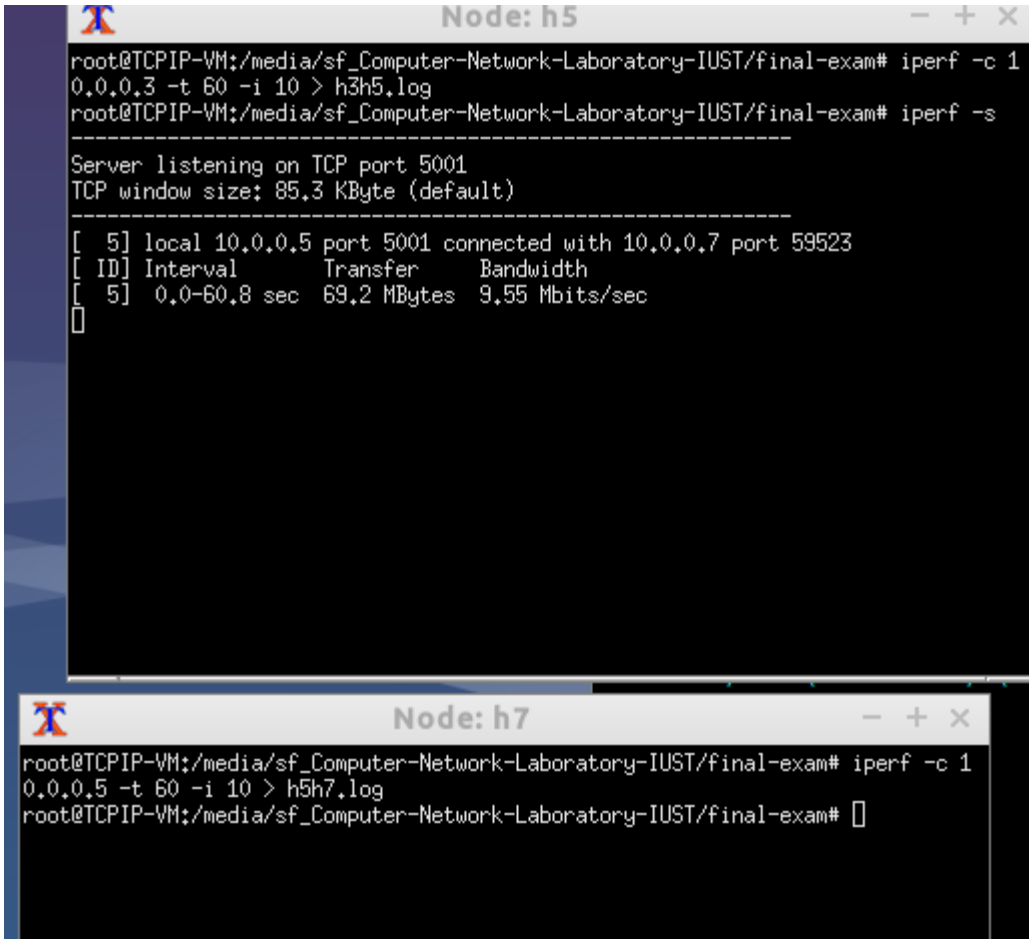

Node: h1
root@TCPIP-VM:/media/sf_Computer-Network-Laboratory-IUST/final-exam# iperf -s
Server listening on TCP port 5001
TCP window size: 85.3 KByte (default)
[5] local 10.0.0.1 port 5001 connected with 10.0.0.3 port 60524
[ID] Interval Transfer Bandwidth
[5] 0.0-60.8 sec 68.8 MBytes 9.48 Mbits/sec
Node: h3
root@TCPIP-VM:/media/sf_Computer-Network-Laboratory-IUST/final-exam# iperf -c 1
0.0.0.1 -t 60 -i 10 > h1h3.log
root@TCPIP-VM:/media/sf_Computer-Network-Laboratory-IUST/final-exam#

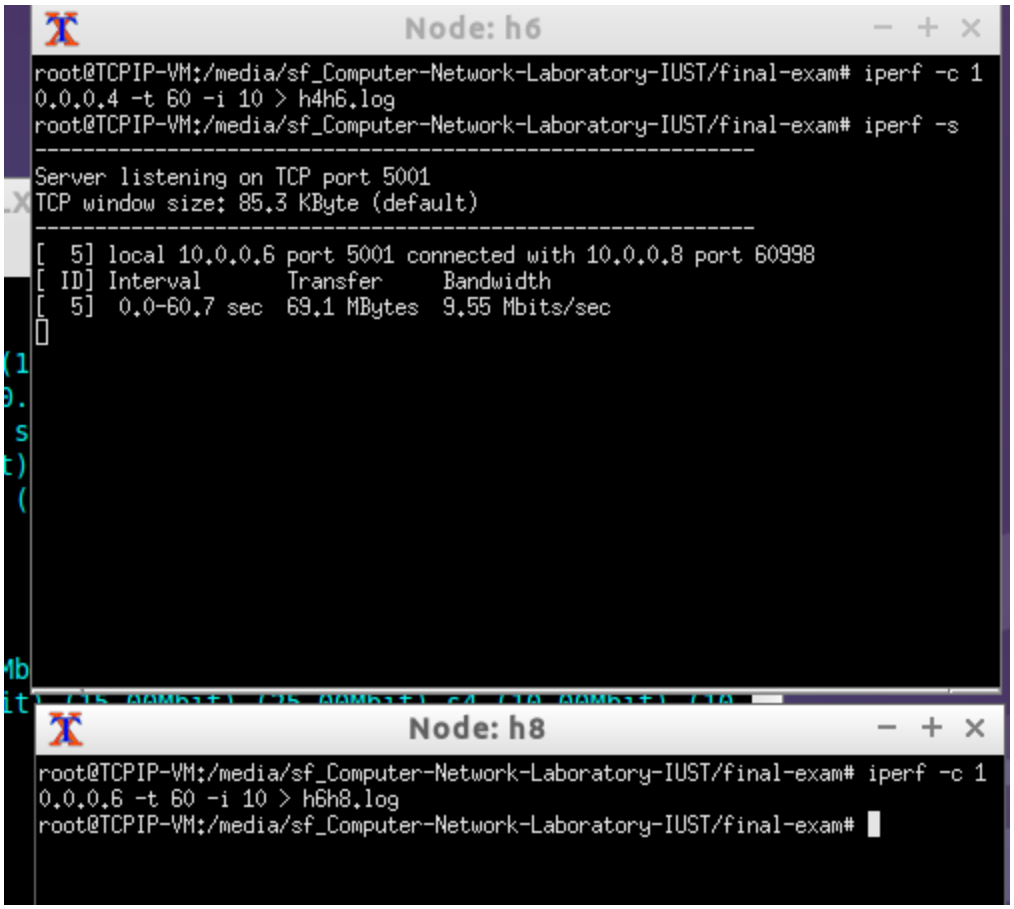
2. سناریو دوم:


Node: h5
root@TCPIP-VM:/media/sf_Computer-Network-Laboratory-IUST/final-exam# iperf -c 1
0.0.0.3 -t 60 -i 10 > h3h5.log
root@TCPIP-VM:/media/sf_Computer-Network-Laboratory-IUST/final-exam#
Node: h3
root@TCPIP-VM:/media/sf_Computer-Network-Laboratory-IUST/final-exam# iperf -c 1
0.0.0.1 -t 60 -i 10 > h1h3.log
root@TCPIP-VM:/media/sf_Computer-Network-Laboratory-IUST/final-exam# iperf -s
Server listening on TCP port 5001
TCP window size: 85.3 KByte (default)
[5] local 10.0.0.3 port 5001 connected with 10.0.0.5 port 54659
[ID] Interval Transfer Bandwidth
[5] 0.0-69.5 sec 71.9 MBytes 8.67 Mbits/sec


Node: h6
root@TCPIP-VM:/media/sf_Computer-Network-Laboratory-IUST/final-exam# iperf -c 1
0.0.0.4 -t 60 -i 10 > h4h6.log
root@TCPIP-VM:/media/sf_Computer-Network-Laboratory-IUST/final-exam#
Node: h4
root@TCPIP-VM:/media/sf_Computer-Network-Laboratory-IUST/final-exam# iperf -s
Server listening on TCP port 5001
TCP window size: 85.3 KByte (default)
[5] local 10.0.0.4 port 5001 connected with 10.0.0.6 port 35765
[ID] Interval Transfer Bandwidth
[5] 0.0-67.1 sec 69.1 MBytes 8.64 Mbits/sec

3. سناریو سوم:


Node: h5
root@TCPIP-VM:/media/sf_Computer-Network-Laboratory-IUST/final-exam# iperf -c 10.0.0.3 -t 60 -i 10 > h3h5.log
root@TCPIP-VM:/media/sf_Computer-Network-Laboratory-IUST/final-exam# iperf -s
Server listening on TCP port 5001
TCP window size: 85.3 KByte (default)
[5] local 10.0.0.5 port 5001 connected with 10.0.0.7 port 59523
[ID] Interval Transfer Bandwidth
[5] 0.0-60.8 sec 69.2 MBytes 9.55 Mbits/sec
Node: h7
root@TCPIP-VM:/media/sf_Computer-Network-Laboratory-IUST/final-exam# iperf -c 10.0.0.5 -t 60 -i 10 > h5h7.log
root@TCPIP-VM:/media/sf_Computer-Network-Laboratory-IUST/final-exam#


Node: h6
root@TCPIP-VM:/media/sf_Computer-Network-Laboratory-IUST/final-exam# iperf -c 10.0.0.4 -t 60 -i 10 > h4h6.log
root@TCPIP-VM:/media/sf_Computer-Network-Laboratory-IUST/final-exam# iperf -s
Server listening on TCP port 5001
TCP window size: 85.3 KByte (default)
[5] local 10.0.0.6 port 5001 connected with 10.0.0.8 port 60998
[ID] Interval Transfer Bandwidth
[5] 0.0-60.7 sec 69.1 MBytes 9.55 Mbits/sec
Node: h8
root@TCPIP-VM:/media/sf_Computer-Network-Laboratory-IUST/final-exam# iperf -c 10.0.0.6 -t 60 -i 10 > h6h8.log
root@TCPIP-VM:/media/sf_Computer-Network-Laboratory-IUST/final-exam#