

BIRZEIT UNIVERSITY

Faculty of Engineering & Technology
Department of Electrical & Computer Engineering
ENCS4130-Computer network laboratory

To DO #2

Dynamic Routing 2 (Link State Routing Protocols) Open Shortest Path

First (OSPF)

Prepared by:

Saja Asfour 1210737

Instructor:

Dr. Ahmed Shawahna

Assistant:

Eng.Tariq Odeh

Section:

Sec7

Date:

10/10/2024

Table of Contents

Table of Figures:	2
Question 1:	3
Question 2:	4

Table of Figures:

Figure 1:The Topolgy	5
Figure 2:Setteing IPs for interfaces in router0.....	5
Figure 3:Setteing IPs for interfaces in router1.....	6
Figure 4:Setteing IPs for interfaces in router2.....	6
Figure 5:Setteing IPs for interfaces in router3.....	7
Figure 6:Setteing IPs for interfaces in router4.....	8
Figure 7:Setteing IPs for interfaces in router5.....	8
Figure 8:Setteing IPs for interfaces in router5.....	9
Figure 9:Enable OSPF for router0	9
Figure 10:Enable OSPF for router1	10
Figure 11:Enable OSPF for router2	10
Figure 12:Enable OSPF for router3	11
Figure 13:Enable OSPF for router4	11
Figure 14:Enable OSPF for router5	11
Figure 15:Enable OSPF for router6	12
Figure 16:add the loopback0 7.7.7.7/24 to router6 and enable OSPF for it	12
Figure 17:Routing table after OSPF for router0	12
Figure 18:Routing table after OSPF for router1	13
Figure 19:Routing table after OSPF for router2	13
Figure 20:Routing table after OSPF for router3	13
Figure 21:Routing table after OSPF for router4	14
Figure 22:Routing table after OSPF for router5	14
Figure 23:Routing table after OSPF for router6	14
Figure 24:Set Bandwidth for interfaces in router0	15
Figure 25:Set Bandwidth for interfaces in router1	16
Figure 26:Set Bandwidth for interfaces in router2	17
Figure 27:Set Bandwidth for interfaces in router3	18
Figure 28:Set Bandwidth for interfaces in router4	19
Figure 29:Set Bandwidth for interfaces in router5	20
Figure 30:Set Bandwidth for interfaces in router6	21
Figure 31:traceroute (send packet from router0 to router 6).....	22
Figure 32:the cost (metric) to get from router0 to router6 from rouuting table for router0	23
Figure 33:Find router-id for router0	24
Figure 34:Find router-id for router6	24

Question 1:

1. Find the shortest path from Router 0 to Router 6 using Dijkstra's algorithm. Show your steps.
2. What is the cost of the shortest path from Router 0 to Router 6?

to find shortest path from R_0 to R_6

step	R_0	R_1	R_2	R_3	R_4	R_5	R_6
0	0	∞	∞	∞	∞	∞	∞
1		<u>2, R_0</u>	∞	$8, R_0$	$4, R_0$	∞	∞
2			$4, R_1$	$8, R_0$	<u>$4, R_0$</u>	∞	∞
3			<u>$4, R_1$</u>	$8, R_0$		$12, R_4$	∞
4				<u>$6, R_2$</u>		$12, R_4$	$10, R_2$
5							<u>$8, R_3$</u> the end

so Shortest Path is

$$R_0(0) \rightarrow R_1(2) \rightarrow R_2(2) \rightarrow R_3(2) \rightarrow R_6(2)$$

and the cost for this path is $0 + 2 + 2 + 2 + 2 = 8$

Question 2:

Question 2: Build and configure the above topology using Packet Tracer software based on the following requirements:

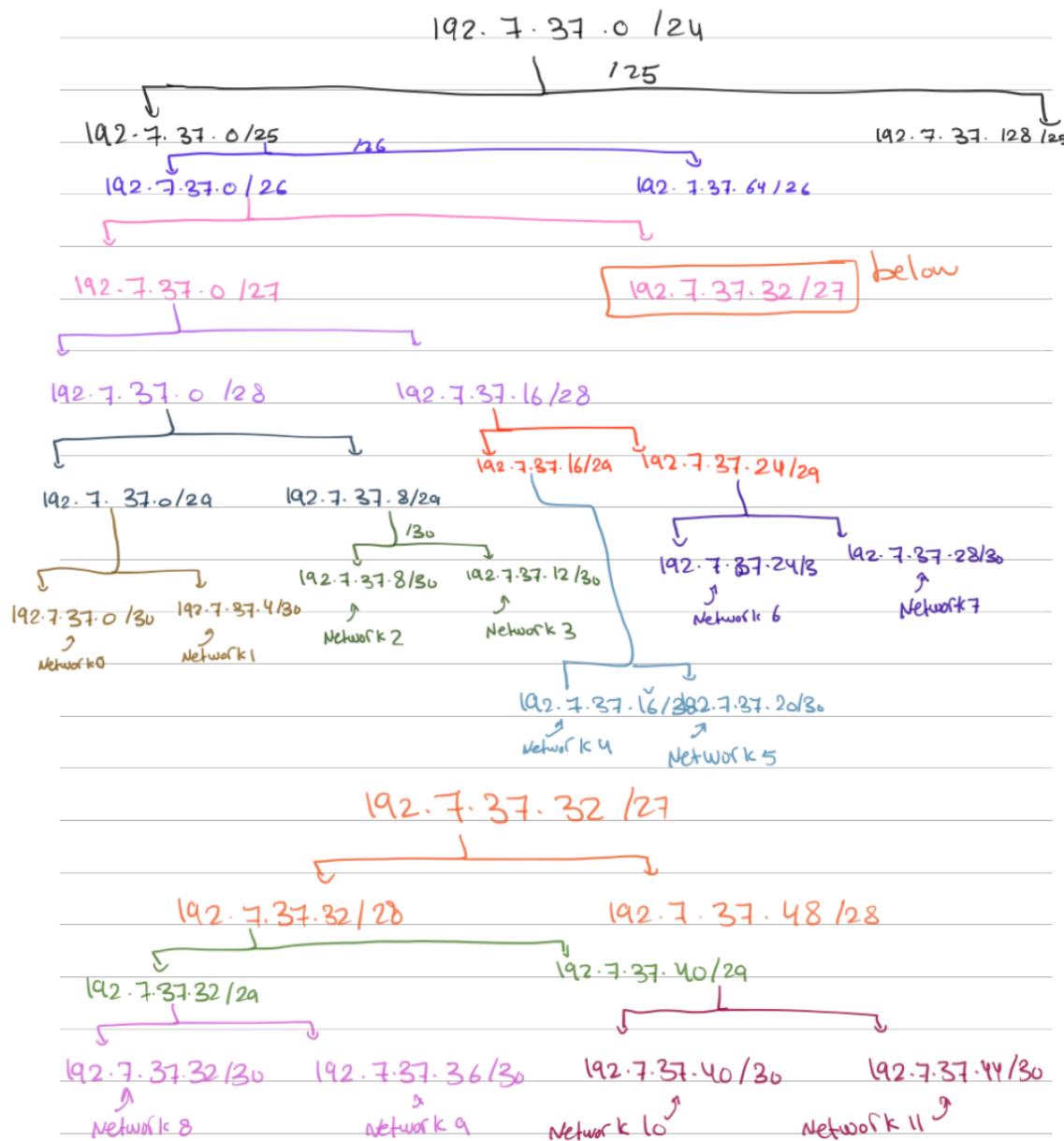
- For addressing the above network use class C address 192.A.B.0 and use it to create networks (subnets) of 2 hosts each. A, and B represent the last four digits of your university ID. For example: if your university ID is 1140302 then (A = 03 = 3) and (B = 02 = 2)

My ID is 1210737

So the IP is 192.7.37.0/24

we have 12 networks, each with 2 host (2 bit for host)

↳ we need 130 (30 bit for network)



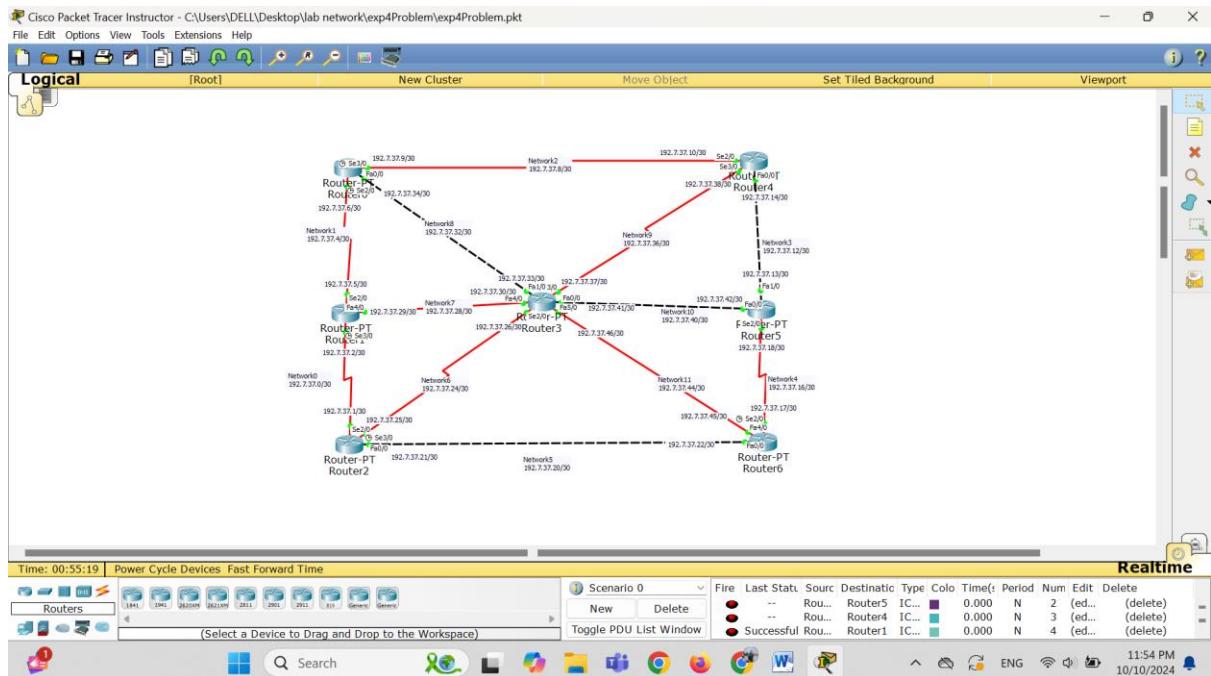


Figure 1:The Topology

```

Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int fa 0/0
Router(config-if)#no shut
Router(config-if)#ip address 192.7.37.35 255.255.255.252
Bad mask /30 for address 192.7.37.35
Router(config-if)#ip address 192.7.37.34 255.255.255.252
Router(config-if)#exit
Router(config)#int se 2/0
Router(config-if)#no shut
Router(config-if)#ip address 192.7.37.6 255.255.255.252
Router(config-if)#exit
Router(config)#int se 3/0
Router(config-if)#ip address 192.7.37.9 255.255.255.252
Router(config-if)#exit
Router(config)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, # - per-user static route, o - ODR
      p - periodic downloaded static route

Gateway of last resort is not set

  192.7.37.0/30 is subnetted, 3 subnets
    192.7.37.4 is directly connected, Serial2/0
    192.7.37.8 is directly connected, Serial13/0
    192.7.37.32 is directly connected, FastEthernet0/0

Router#wr
Building configuration...
[OK]
Router#
Router#
Router#
Router#
Router#

```

Figure 2:Setting IPs for interfaces in router0

```

Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int se 2/0
Router(config-if)#no shut
Router(config-if)#ip address 192.7.37.5 255.255.255.252
Router(config-if)#exit
Router(config)#int se 3/0
Router(config-if)#no shut
Router(config-if)#ip address 192.7.37.2 255.255.255.252
Router(config)#int fa 4/0
Router(config-if)#ip address 192.7.37.29 255.255.255.252
Router(config-if)#no shut
Router(config-if)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is not set

 192.7.37.0/30 is subnetted, 3 subnets
 C   192.7.37.0 is directly connected, Serial3/0
 C   192.7.37.4 is directly connected, Serial12/0
 C   192.7.37.28 is directly connected, FastEthernet4/0

Router#wr
Building configuration...
[OK]
Router#
Router#
Router#
Router#
Router#
Router#

```

Figure 3:Setting IPs for interfaces in router1

```

Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int se 2/0
Router(config-if)#no shut
Router(config-if)#ip address 192.7.37.1 255.255.255.252
Router(config-if)#exit
Router(config)#int se 3/0
Router(config-if)#no shut
Router(config-if)#ip address 192.7.37.25 255.255.255.252
Router(config-if)#exit
Router(config)#int fa 0/0
Router(config-if)#no shut
Router(config-if)#ip address 192.7.37.21 255.255.255.252
Router(config-if)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is not set

 192.7.37.0/30 is subnetted, 3 subnets
 C   192.7.37.0 is directly connected, Serial2/0
 C   192.7.37.20 is directly connected, FastEthernet0/0
 C   192.7.37.24 is directly connected, Serial3/0

Router#wr
Building configuration...
[OK]
Router#
Router#
Router#
Router#
Router#
Router#

```

Figure 4:Setting IPs for interfaces in router2

```

Router>en
Router(config)#
Router(config)#int se 2/0
Router(config-if)#no shut
Router(config-if)#ip address 192.7.37.26 255.255.255.252
Router(config-if)#int fa 4/0
Router(config-if)#no shut
Router(config-if)#ip address 192.7.37.30 255.255.255.252
Router(config-if)#int fa 1/0
Router(config-if)#no shut
Router(config-if)#ip address 192.7.37.33 255.255.255.252
Router(config-if)#int se 3/0
Router(config-if)#no shut
Router(config-if)#ip address 192.7.37.37 255.255.255.252
Router(config-if)#int fa 0/0
Router(config-if)#no shut
Router(config-if)#ip address 192.7.37.41 255.255.255.252
Router(config-if)#int fa 5/0
Router(config-if)#no shut
Router(config-if)#ip address 192.7.37.46 255.255.255.252
Router(config-if)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, E - EIGRP external, L - OSPF, E1 - OSPF external type 1
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is not set

192.7.37.0/30 is subnetted, 6 subnets
C   192.7.37.24 is directly connected, Serial2/0
C   192.7.37.28 is directly connected, FastEthernet4/0

Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, E - EIGRP external, L - OSPF, E1 - OSPF external type 1
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is not set

192.7.37.0/30 is subnetted, 6 subnets
C   192.7.37.24 is directly connected, Serial2/0
C   192.7.37.32 is directly connected, FastEthernet1/0
C   192.7.37.36 is directly connected, Serial3/0
C   192.7.37.40 is directly connected, FastEthernet0/0
C   192.7.37.44 is directly connected, FastEthernet5/0

Router#wr
Building configuration...
[OK]
Router#

```

Figure 5:Setting IPs for interfaces in router3

```

Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int se 2/0
Router(config-if)#no shut
Router(config-if)#ip address 192.7.37.10 255.255.255.252
Router(config-if)#exit
Router(config)#int se 3/0
Router(config-if)#no shut
Router(config-if)#ip address 192.7.37.38 255.255.255.252
Router(config-if)#exit
Router(config)#int fa 0/0
Router(config-if)#no shut
Router(config-if)#ip address 192.7.37.14 255.255.255.252
Router(config-if)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is not set

192.7.37.0/30 is subnetted, 3 subnets
C    192.7.37.8 is directly connected, Serial2/0
C    192.7.37.12 is directly connected, FastEthernet0/0
C    192.7.37.36 is directly connected, Serial3/0
Router#wr
Building configuration...
[OK]
Router#
Router#
Router#
Router#
Router#
Router#

```

Figure 6:Setting IPs for interfaces in router4

```

Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int fa 1/0
Router(config-if)#no shut
Router(config-if)#ip address 192.7.37.13 255.255.255.252
Router(config-if)#exit
Router(config)#int fa 0/0
Router(config-if)#no shut
Router(config-if)#ip address 192.7.37.42 255.255.255.252
Router(config-if)#exit
Router(config)#int se 2/0
Router(config-if)#no shut
Router(config-if)#ip address 192.7.37.18 255.255.255.252
Router(config-if)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is not set

192.7.37.0/30 is subnetted, 3 subnets
C    192.7.37.12 is directly connected, FastEthernet1/0
C    192.7.37.16 is directly connected, Serial2/0
C    192.7.37.40 is directly connected, FastEthernet0/0
Router#wr
Building configuration...
[OK]
Router#

```

Figure 7:Setting IPs for interfaces in router5

Router>en
Router>config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int fa 0/0
Router(config-if)#no shut
Router(config-if)#ip address 192.7.37.22 255.255.255.252
Router(config-if)#
Router(config-if)#int fa 4/0
Router(config-if)#no shut
Router(config-if)#ip address 192.7.37.45 255.255.255.252
Router(config-if)#int se 2/0
Router(config-if)#no shut
Router(config-if)#ip address 192.7.37.17 255.255.255.252
Router(config-if)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

```
Router#sh ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, LA - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is not set

  192.7.37.0/30 is subnetted, 3 subnets
C    192.7.37.16 is directly connected, Serial2/0
C    192.7.37.20 is directly connected, FastEthernet0/0
C    192.7.37.44 is directly connected, FastEthernet4/0
```

Router#
Building configuration...
[OK]
Router#
Router#
Router#
Router#
Router#
Router#

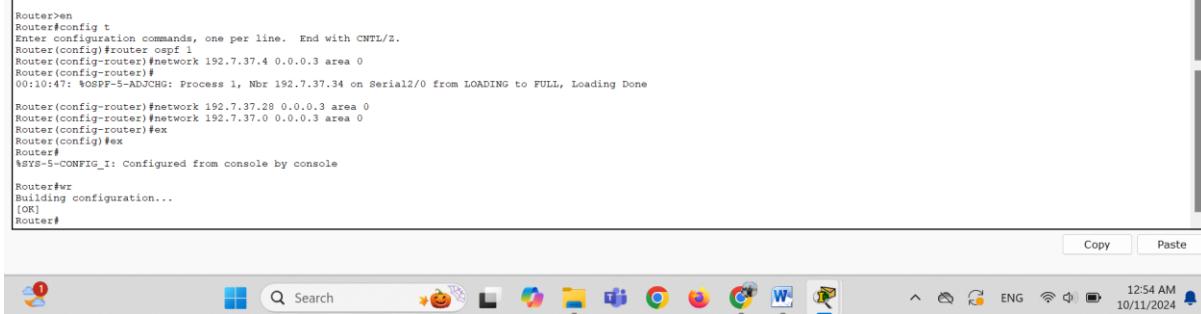
Figure 8:Setting IPs for interfaces in router5

2. Enable OSPF route. Assume all routers are in area 0 (backbone)
3. Configure Router 6 with a loopback IP address 7.7.7.7/24. Advertise this network into the OSPF process.

Router>en
Router>config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router ospf 1
Router(config-router)#network 192.7.37.4 0.0.0.3 area 0
Router(config-router)#network 192.7.37.8 0.0.0.3 area 0
Router(config-router)#network 192.7.37.32 0.0.0.3 area 0
Router(config-router)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

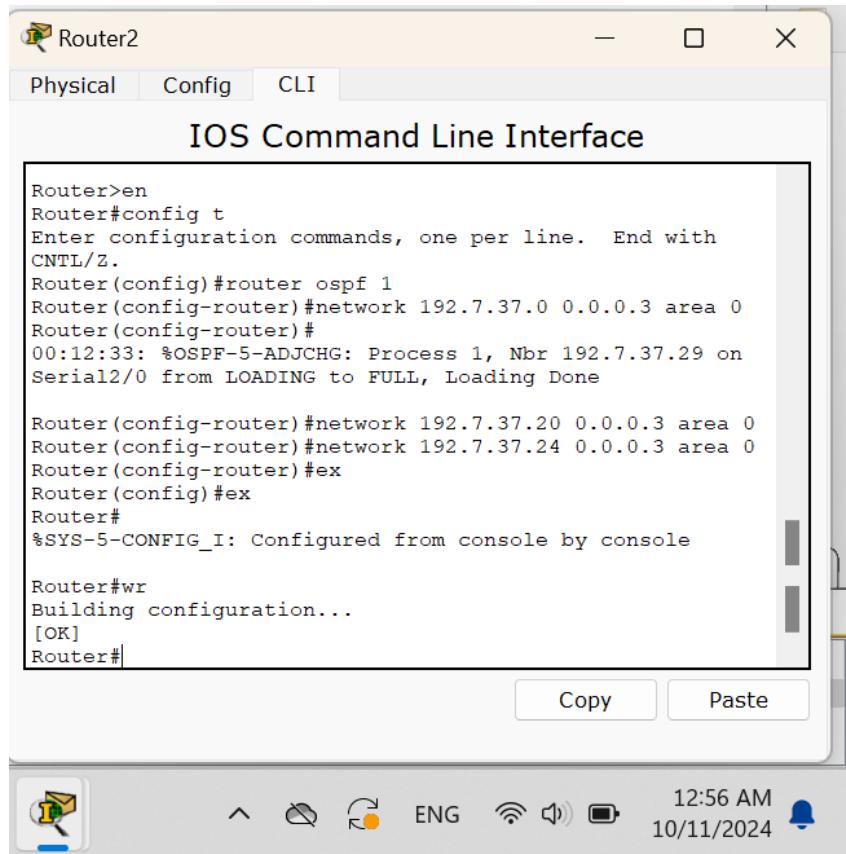
```
Router#wr
Building configuration...  
[OK]  
Router#  
Router#
```

Figure 9:Enable OSPF for router0



```
Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router ospf 1
Router(config-router)#network 192.7.37.4 0.0.0.3 area 0
Router(config-router)#
00:10:47: %OSPF-5-ADJCHG: Process 1, Nbr 192.7.37.34 on Serial2/0 from LOADING to FULL, Loading Done
Router(config-router)#network 192.7.37.28 0.0.0.3 area 0
Router(config-router)#network 192.7.37.0 0.0.0.3 area 0
Router(config-router)#
Router(config)#ex
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#wr
Building configuration...
[OK]
Router#
```

Figure 10:Enable OSPF for router1



```
Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router ospf 1
Router(config-router)#network 192.7.37.0 0.0.0.3 area 0
Router(config-router)#
00:12:33: %OSPF-5-ADJCHG: Process 1, Nbr 192.7.37.29 on
Serial2/0 from LOADING to FULL, Loading Done

Router(config-router)#network 192.7.37.20 0.0.0.3 area 0
Router(config-router)#network 192.7.37.24 0.0.0.3 area 0
Router(config-router)#
Router(config)#ex
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#wr
Building configuration...
[OK]
Router#
```

Figure 11:Enable OSPF for router2

```

Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router ospf 1
Router(config-router)#network 192.7.37.24 0.0.0.3 area 0
Router(config-router)#
00:13:58: %OSPF-5-ADJCHG: Process 1, Nbr 192.7.37.25 on Serial2/0 from LOADING to FULL, Loading Done

Router(config-router)#network 192.7.37.28 0.0.0.3 area 0
Router(config-router)#
00:14:08: %OSPF-5-ADJCHG: Process 1, Nbr 192.7.37.29 on FastEthernet4/0 from LOADING to FULL, Loading Done

Router(config-router)#network 192.7.37.32 0.0.0.3 area 0
Router(config-router)#
00:14:24: %OSPF-5-ADJCHG: Process 1, Nbr 192.7.37.34 on FastEthernet1/0 from LOADING to FULL, Loading Done

Router(config-router)#network 192.7.37.36 0.0.0.3 area 0
Router(config-router)#network 192.7.37.40 0.0.0.3 area 0
Router(config-router)#network 192.7.37.44 0.0.0.3 area 0
Router(config-router)*ex
Router(config)#
Router#
%SYS-5-CONFIG_I: Configured from console by console
wr
Building configuration...
[OK]
Router#

```

Figure 12:Enable OSPF for router3

```

Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router ospf 1
Router(config-router)#network 192.7.37.8 0.0.0.3 area 0
Router(config-router)#
00:15:58: %OSPF-5-ADJCHG: Process 1, Nbr 192.7.37.34 on Serial2/0 from LOADING to FULL, Loading Done

Router(config-router)#network 192.7.37.36 0.0.0.3 area 0
Router(config-router)#
00:16:15: %OSPF-5-ADJCHG: Process 1, Nbr 192.7.37.46 on Serial3/0 from LOADING to FULL, Loading Done

Router(config-router)#network 192.7.37.12 0.0.0.3 area 0
Router(config-router)*ex
Router(config)#
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#
Building configuration...
[OK]
Router#

```

Figure 13:Enable OSPF for router4

```

Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router ospf 1
Router(config-router)#network 192.7.37.40 0.0.0.3 area 0
Router(config-router)#
00:18:23: %OSPF-5-ADJCHG: Process 1, Nbr 192.7.37.46 on FastEthernet0/0 from LOADING to FULL, Loading Done

Router(config-router)#network 192.7.37.12 0.0.0.3 area 0
Router(config-router)#
00:18:33: %OSPF-5-ADJCHG: Process 1, Nbr 192.7.37.38 on FastEthernet1/0 from LOADING to FULL, Loading Done

Router(config-router)#network 192.7.37.16 0.0.0.3 area 0
Router(config-router)*ex
Router(config)#
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#
Building configuration...
[OK]
Router#

```

Figure 14:Enable OSPF for router5

```

Router>en
Router>config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router ospf 1
Router(config-router)#network 192.7.37.20 0.0.0.3 area 0
Router(config-router)#
00:20:55: *0SPPF-5-ADJCHG: Process 1, Nbr 192.7.37.35 on FastEthernet0/0 from LOADING to FULL, Loading Done
Router(config-router)#network 192.7.37.16 0.0.0.3 area 0
Router(config-router)#
00:21:08: *0SPPF-5-ADJCHG: Process 1, Nbr 192.7.37.42 on Serial2/0 from LOADING to FULL, Loading Done
Router(config-router)#
00:21:27: *0SPPF-5-ADJCHG: Process 1, Nbr 192.7.37.46 on FastEthernet4/0 from LOADING to FULL, Loading Done
Router(config-router)#
Router(config)#
Router# %SYS-5-CONFIG_I: Configured from console by console
Router#wr
Building configuration...
[OK]
Router#

```

Figure 15:Enable OSPF for router6

Fire	Last Stat	Sourc	Destinatio	Type	Colo	Time(s)	Period	Num	Edit	Delete
Successful	Rou...	Router5	IC...	0.000	N	0	(ed...)		(delete)	
Successful	Rou...	Router3	IC...	0.000	N	1	(ed...)		(delete)	
Successful	Rou...	Router2	IC...	0.000	N	2	(ed...)		(delete)	

Figure 16:add the loopback0 7.7.7.7/24 to router6 and enable OSPF for it

```

Router#show ip routes
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set
  7.0.0.0/32 is subnetted, 1 subnets
o  7.7.7.7 [110/3] via 192.7.37.33, 00:02:13, FastEthernet0/0
  192.7.37.0/32 is subnetted, 12 subnets
o  192.7.37.0 [110/66] via 192.7.37.33, 00:17:28, FastEthernet0/0
o  192.7.37.1 is directly connected, Serial2/0
o  192.7.37.2 is directly connected, FastEthernet4/0
o  192.7.37.12 [110/3] via 192.7.37.33, 00:13:19, FastEthernet0/0
o  192.7.37.16 [110/66] via 192.7.37.33, 00:13:19, FastEthernet0/0
o  192.7.37.20 [110/3] via 192.7.37.33, 00:10:31, FastEthernet0/0
o  192.7.37.24 [110/65] via 192.7.37.33, 00:17:28, FastEthernet0/0
o  192.7.37.28 [110/3] via 192.7.37.33, 00:17:28, FastEthernet0/0
o  192.7.37.32 is directly connected, FastEthernet0/0
o  192.7.37.36 [110/65] via 192.7.37.33, 00:17:18, FastEthernet0/0
o  192.7.37.40 [110/2] via 192.7.37.33, 00:13:29, FastEthernet0/0
o  192.7.37.44 [110/2] via 192.7.37.33, 00:17:08, FastEthernet0/0
Router#
Router#9

```

Figure 17:Routing table after OSPF for router6

```

Router# show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is not set

 7.0.0.0/32 is subnetted, 1 subnets
  o  7.7.7.7 [110/1] via 192.7.37.30, 00:02:40, FastEthernet4/0
    192.7.37.0/30 is subnetted, 12 subnets
  c   192.7.37.0 is directly connected, Serial3/0
  c   192.7.37.1 is directly connected, Serial2/0
  o   192.7.37.2 [110/10] via 192.7.37.10, 00:10:56, FastEthernet4/0
    192.7.37.12 [110/3] via 192.7.37.12, 00:10:56, FastEthernet4/0
  o   192.7.37.16 [110/66] via 192.7.37.30, 00:13:46, FastEthernet4/0
  o   192.7.37.20 [110/3] via 192.7.37.30, 00:10:59, FastEthernet4/0
  o   192.7.37.24 [110/65] via 192.7.37.30, 00:18:16, FastEthernet4/0
  o   192.7.37.25 [110/1] via 192.7.37.30, 00:17:58, FastEthernet4/0
  o   192.7.37.32 [110/65] via 192.7.37.30, 00:17:46, FastEthernet4/0
  o   192.7.37.40 [110/2] via 192.7.37.30, 00:14:01, FastEthernet4/0
  o   192.7.37.44 [110/2] via 192.7.37.30, 00:17:36, FastEthernet4/0
Router#
Router#

```

Copy Paste

Figure 18: Routing table after OSPF for router1

```

Router# show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is not set

 7.0.0.0/32 is subnetted, 1 subnets
  o  7.7.7.7 [110/1] via 192.7.37.22, 00:02:57, FastEthernet0/0
    192.7.37.0/30 is subnetted, 12 subnets
  c   192.7.37.0 is directly connected, Serial2/0
  o   192.7.37.4 [110/67] via 192.7.37.22, 00:11:12, FastEthernet0/0
  o   192.7.37.8 [110/67] via 192.7.37.22, 00:11:12, FastEthernet0/0
  o   192.7.37.12 [110/65] via 192.7.37.22, 00:11:12, FastEthernet0/0
  o   192.7.37.16 [110/65] via 192.7.37.22, 00:11:12, FastEthernet0/0
  c   192.7.37.20 is directly connected, FastEthernet0/0
  c   192.7.37.24 is directly connected, Serial3/0
  o   192.7.37.28 [110/3] via 192.7.37.22, 00:11:12, FastEthernet0/0
  o   192.7.37.32 [110/3] via 192.7.37.22, 00:11:12, FastEthernet0/0
  o   192.7.37.36 [110/3] via 192.7.37.22, 00:11:12, FastEthernet0/0
  o   192.7.37.40 [110/3] via 192.7.37.22, 00:11:12, FastEthernet0/0
  o   192.7.37.44 [110/2] via 192.7.37.22, 00:11:12, FastEthernet0/0
Router#
Router#

```

Copy Paste

Figure 19: Routing table after OSPF for router2

```

Router# show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is not set

 7.0.0.0/32 is subnetted, 1 subnets
  o  7.7.7.7 [110/2] via 192.7.37.45, 00:03:14, FastEthernet5/0
    192.7.37.0/30 is subnetted, 12 subnets
  o   192.7.37.0 [110/65] via 192.7.37.29, 00:18:45, FastEthernet4/0
  o   192.7.37.4 [110/65] via 192.7.37.29, 00:18:35, FastEthernet4/0
  o   192.7.37.6 [110/65] via 192.7.37.34, 00:18:35, FastEthernet4/0
  o   192.7.37.8 [110/65] via 192.7.37.34, 00:18:35, FastEthernet4/0
  o   192.7.37.12 [110/21] via 192.7.37.42, 00:14:20, FastEthernet0/0
  o   192.7.37.16 [110/65] via 192.7.37.42, 00:11:33, FastEthernet0/0
  o   192.7.37.20 [110/21] via 192.7.37.45, 00:11:33, FastEthernet5/0
  o   192.7.37.24 [110/21] via 192.7.37.45, 00:11:33, FastEthernet5/0
  o   192.7.37.28 is directly connected, FastEthernet4/0
  c   192.7.37.32 is directly connected, FastEthernet1/0
  c   192.7.37.36 is directly connected, Serial3/0
  c   192.7.37.40 is directly connected, FastEthernet0/0
  c   192.7.37.44 is directly connected, FastEthernet5/0
Router#
Router#

```

Copy Paste

Figure 20: Routing table after OSPF for router3

```

Router# show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is not set

7.0.0.0/32 is subnetted, 1 subnets
o 7.7.7.7 [110/4] via 192.7.37.13, 00:00:19, FastEthernet0/0
  192.7.37.0/30 is subnetted, 12 subnets
    o 192.7.37.0 [110/67] via 192.7.37.13, 00:11:30, FastEthernet0/0
    o 192.7.37.4 [110/67] via 192.7.37.13, 00:11:30, FastEthernet0/0
    o 192.7.37.8 [110/67] via 192.7.37.13, 00:11:30, FastEthernet0/0
    o 192.7.37.12 [110/65] is directly connected, Serial1/0/0
    o 192.7.37.16 [110/65] via 192.7.37.13, 00:11:30, FastEthernet0/0
    o 192.7.37.20 [110/4] via 192.7.37.13, 00:08:32, FastEthernet0/0
    o 192.7.37.24 [110/66] via 192.7.37.13, 00:11:30, FastEthernet0/0
    o 192.7.37.28 [110/66] via 192.7.37.13, 00:11:30, FastEthernet0/0
    o 192.7.37.32 [110/31] via 192.7.37.13, 00:11:30, FastEthernet0/0
    C 192.7.37.36 is directly connected, Serial1/0/0
    o 192.7.37.40 [110/2] via 192.7.37.13, 00:11:30, FastEthernet0/0
    o 192.7.37.44 [110/3] via 192.7.37.13, 00:11:30, FastEthernet0/0
Router#
Router#

```

Copy Paste

Figure 21: Routing table after OSPF for router4

```

Router#en
Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is not set

7.0.0.0/32 is subnetted, 1 subnets
o 7.7.7.7 [110/4] via 192.7.37.41, 00:03:59, FastEthernet0/0
  192.7.37.0/30 is subnetted, 12 subnets
    o 192.7.37.0 [110/66] via 192.7.37.41, 00:15:15, FastEthernet0/0
    o 192.7.37.4 [110/66] via 192.7.37.41, 00:15:15, FastEthernet0/0
    o 192.7.37.8 [110/65] via 192.7.37.41, 00:15:05, FastEthernet0/0
    o 192.7.37.12 [110/65] is directly connected, FastEthernet1/0
    o 192.7.37.16 [110/65] via 192.7.37.41, 00:12:17, FastEthernet0/0
    o 192.7.37.20 [110/3] via 192.7.37.41, 00:15:15, FastEthernet0/0
    o 192.7.37.24 [110/65] via 192.7.37.41, 00:15:15, FastEthernet0/0
    o 192.7.37.28 [110/2] via 192.7.37.41, 00:15:15, FastEthernet0/0
    o 192.7.37.32 [110/31] via 192.7.37.41, 00:15:15, FastEthernet0/0
    o 192.7.37.36 [110/65] via 192.7.37.41, 00:15:05, FastEthernet0/0
    C 192.7.37.40 is directly connected, FastEthernet0/0
    o 192.7.37.44 [110/2] via 192.7.37.41, 00:15:15, FastEthernet0/0
Router#
Router#

```

Copy Paste

Figure 22: Routing table after OSPF for router5

```

Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is not set

7.0.0.0/24 is subnetted, 1 subnets
C 7.7.7.0 is directly connected, Loopback0
  192.7.37.0/30 is subnetted, 12 subnets
    o 192.7.37.0 [110/65] via 192.7.37.21, 00:08:51, FastEthernet0/0
    o 192.7.37.4 [110/65] via 192.7.37.21, 00:08:51, FastEthernet4/0
    o 192.7.37.8 [110/65] via 192.7.37.21, 00:08:51, FastEthernet4/0
    o 192.7.37.12 [110/31] via 192.7.37.14, 00:08:18, FastEthernet4/0
    C 192.7.37.16 is directly connected, Serial12/0
    o 192.7.37.20 is directly connected, FastEthernet0/0
    o 192.7.37.24 [110/65] via 192.7.37.14, 00:08:18, FastEthernet4/0
    o 192.7.37.28 [110/2] via 192.7.37.14, 00:08:18, FastEthernet4/0
    o 192.7.37.32 [110/2] via 192.7.37.14, 00:08:18, FastEthernet4/0
    o 192.7.37.36 [110/65] via 192.7.37.14, 00:08:18, FastEthernet4/0
    o 192.7.37.40 [110/2] via 192.7.37.14, 00:08:18, FastEthernet4/0
    C 192.7.37.44 is directly connected, FastEthernet4/0
Router#
Router#

```

Copy Paste

Figure 23: Routing table after OSPF for router6

3. Don't forget to configure bandwidth values between links. These values should reflect the costs that are shown in the network diagram.

To find interface bandwidth we should use this row → cost = $\frac{\text{reference bandwidth}=100\text{Mbps}}{\text{interface bandwidth}}$

For router0:

Se 3/0 :

$$4 = \frac{100\text{Mbps}}{\text{interface bandwidth}} \rightarrow \text{interface B.w} = 25\text{Mbps}$$

Se 2/0 :

$$2 = \frac{100\text{Mbps}}{\text{interface bandwidth}} \rightarrow \text{interface B.w} = 50\text{Mbps}$$

Fa 0/0 :

$$8 = \frac{100\text{Mbps}}{\text{interface bandwidth}} \rightarrow \text{interface B.w} = 12.5\text{Mbps}$$

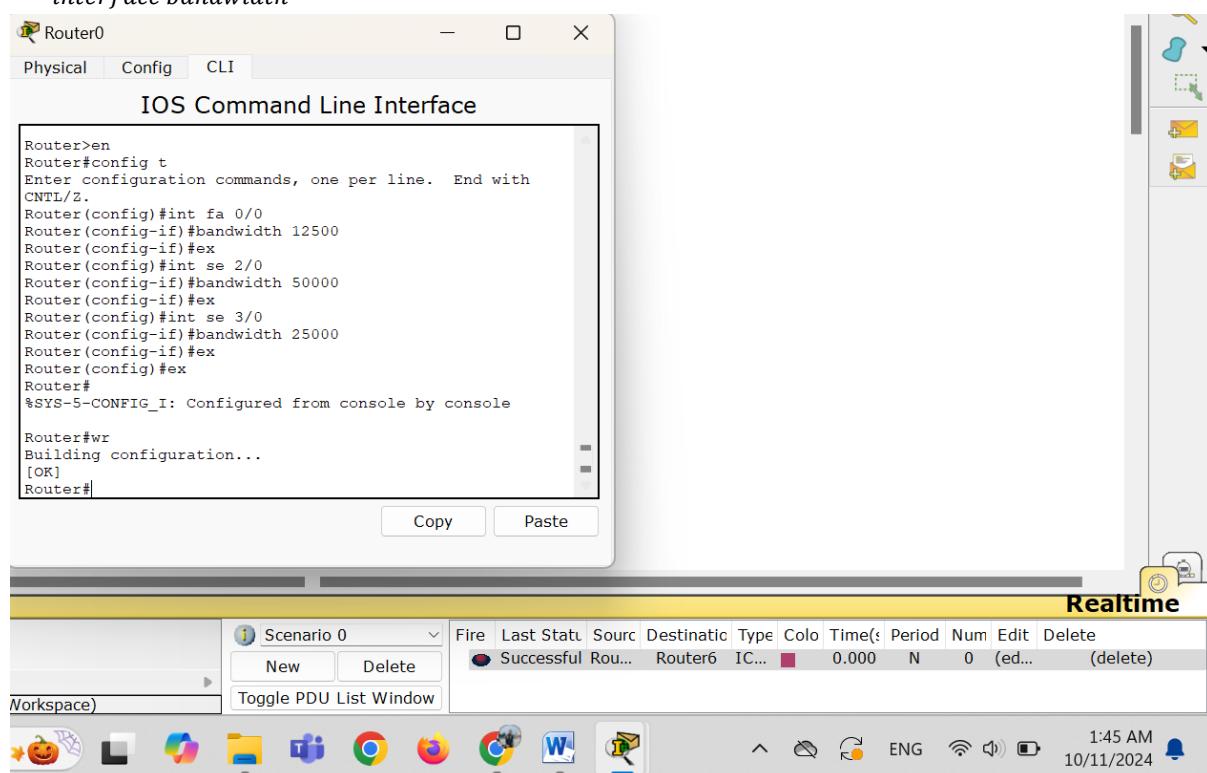


Figure 24: Set Bandwidth for interfaces in router0

For router1:

Se 3/0 :

$$2 = \frac{100\text{Mbps}}{\text{interface bandwidth}} \rightarrow \text{interface B.w} = 50\text{Mbps}$$

Se 2/0 :

$$2 = \frac{100\text{Mbps}}{\text{interface bandwidth}} \rightarrow \text{interface B.w} = 50\text{Mbps}$$

Fa 4/0 :

$$50 = \frac{100\text{Mbps}}{\text{interface bandwidth}} \rightarrow \text{interface B.w} = 2\text{Mbps}$$

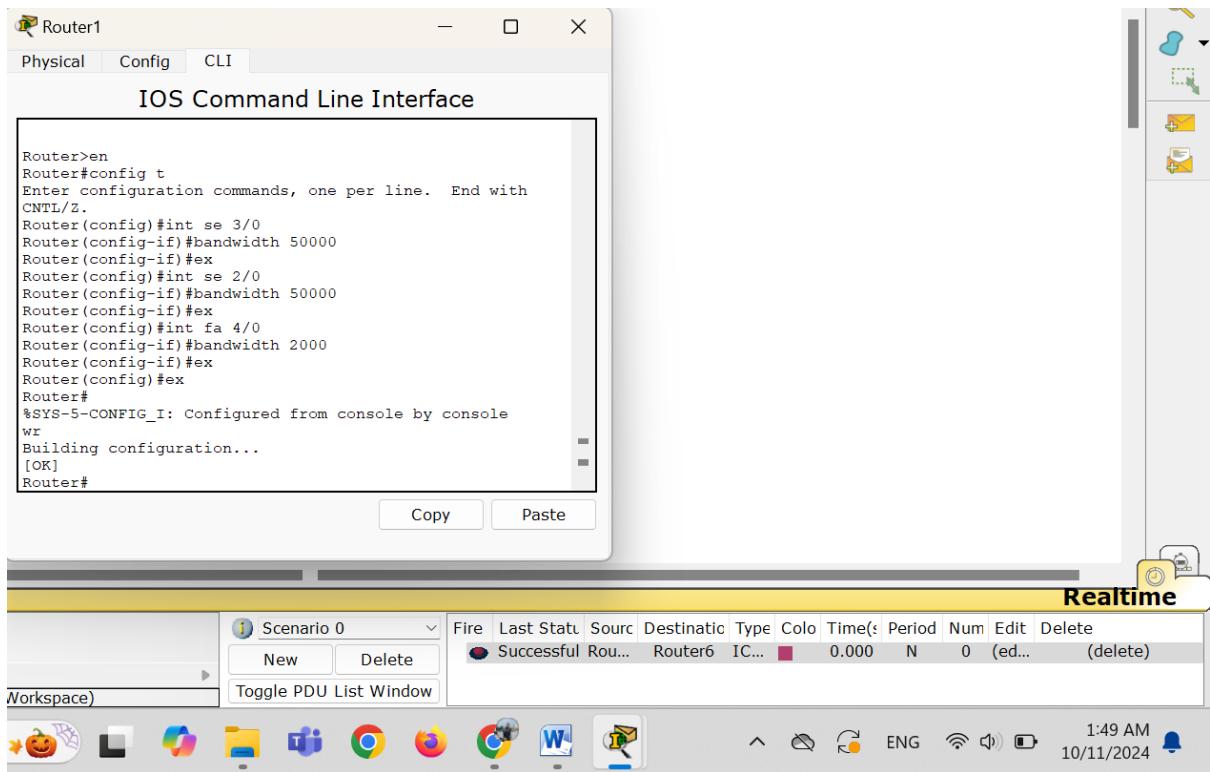


Figure 25: Set Bandwidth for interfaces in router1

For router2:

Se 2/0 :

$$2 = \frac{100\text{Mbps}}{\text{interface bandwidth}} \rightarrow \text{interface B.w} = 50\text{Mbps}$$

Se 3/0 :

$$2 = \frac{100\text{Mbps}}{\text{interface bandwidth}} \rightarrow \text{interface B.w} = 50\text{Mbps}$$

Fa 0/0:

$$100 = \frac{100\text{Mbps}}{\text{interface bandwidth}} \rightarrow \text{interface B.w} = 1\text{Mbps}$$

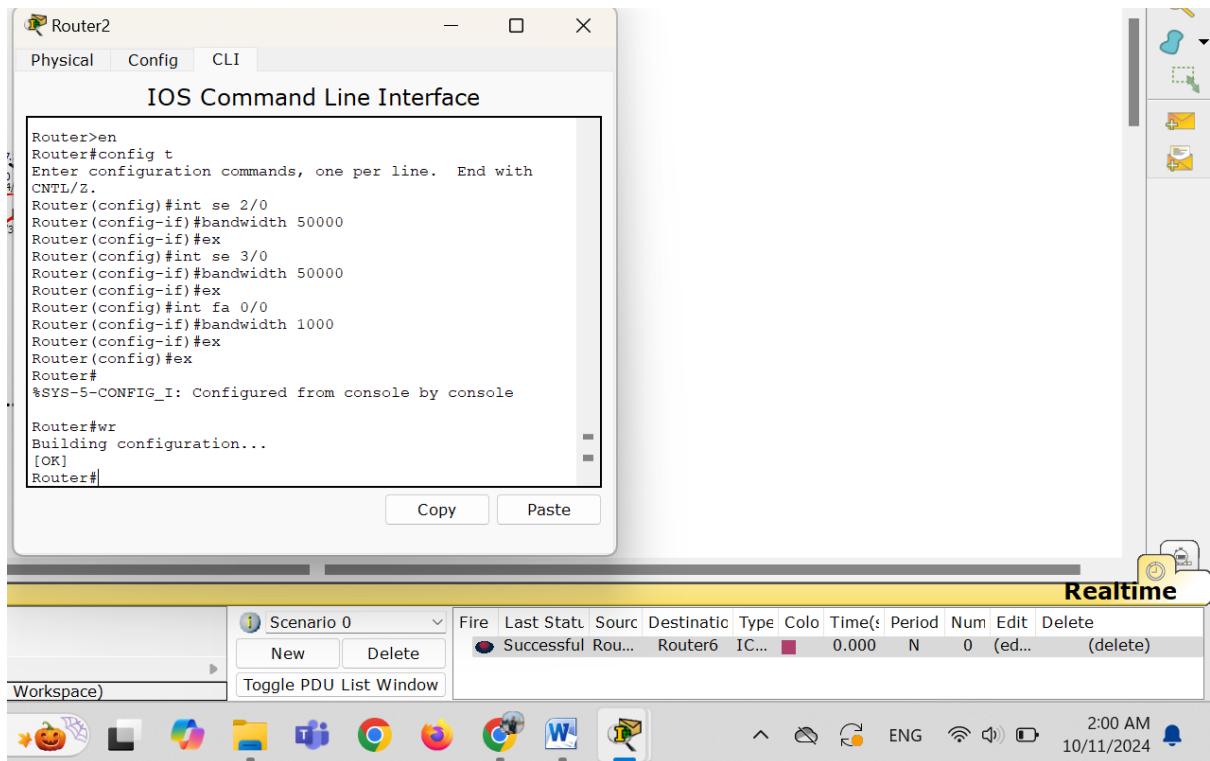


Figure 26: Set Bandwidth for interfaces in router2

For router3:

Se 2/0 :

$$2 = \frac{100\text{Mbps}}{\text{interface bandwidth}} \rightarrow \text{interface B.w} = 50\text{Mbps}$$

Fa 4/0 :

$$50 = \frac{100\text{Mbps}}{\text{interface bandwidth}} \rightarrow \text{interface B.w} = 2\text{Mbps}$$

Fa 1/0 :

$$8 = \frac{100\text{Mbps}}{\text{interface bandwidth}} \rightarrow \text{interface B.w} = 12.5\text{Mbps}$$

Se 3/0 :

$$4 = \frac{100\text{Mbps}}{\text{interface bandwidth}} \rightarrow \text{interface B.w} = 25\text{Mbps}$$

Fa 0/0 :

$$20 = \frac{100\text{Mbps}}{\text{interface bandwidth}} \rightarrow \text{interface B.w} = 5\text{Mbps}$$

Fa 5/0 :

$$2 = \frac{100\text{Mbps}}{\text{interface bandwidth}} \rightarrow \text{interface B.w} = 50\text{Mbps}$$

```

Router>en
Router#config
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int se 2/0
Router(config-if)#bandwidth 5000
Router(config-if)#int fa 4/0
Router(config-if)#bandwidth 2000
Router(config-if)#exit
Router(config)#int fa 1/0
Router(config-if)#bandwidth 12500
Router(config-if)#exit
Router(config)#int se 3/0
Router(config-if)#bandwidth 25000
Router(config-if)#int fa 0/0
Router(config-if)#bandwidth 5000
Router(config-if)#exit
Router(config)#int fa 5/0
Router(config-if)#bandwidth 50000
Router(config-if)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#wr
Building configuration...
[OK]
Router#

```

Copy Paste

Figure 27: Set Bandwidth for interfaces in router3

For router4:

Se 2/0 :

$$4 = \frac{100\text{Mbps}}{\text{interface bandwidth}} \rightarrow \text{interface B.w} = 25\text{Mbps}$$

Fa 0/0 :

$$8 = \frac{100\text{Mbps}}{\text{interface bandwidth}} \rightarrow \text{interface B.w} = 12.5\text{Mbps}$$

Se 3/0 :

$$4 = \frac{100\text{Mbps}}{\text{interface bandwidth}} \rightarrow \text{interface B.w} = 25\text{Mbps}$$

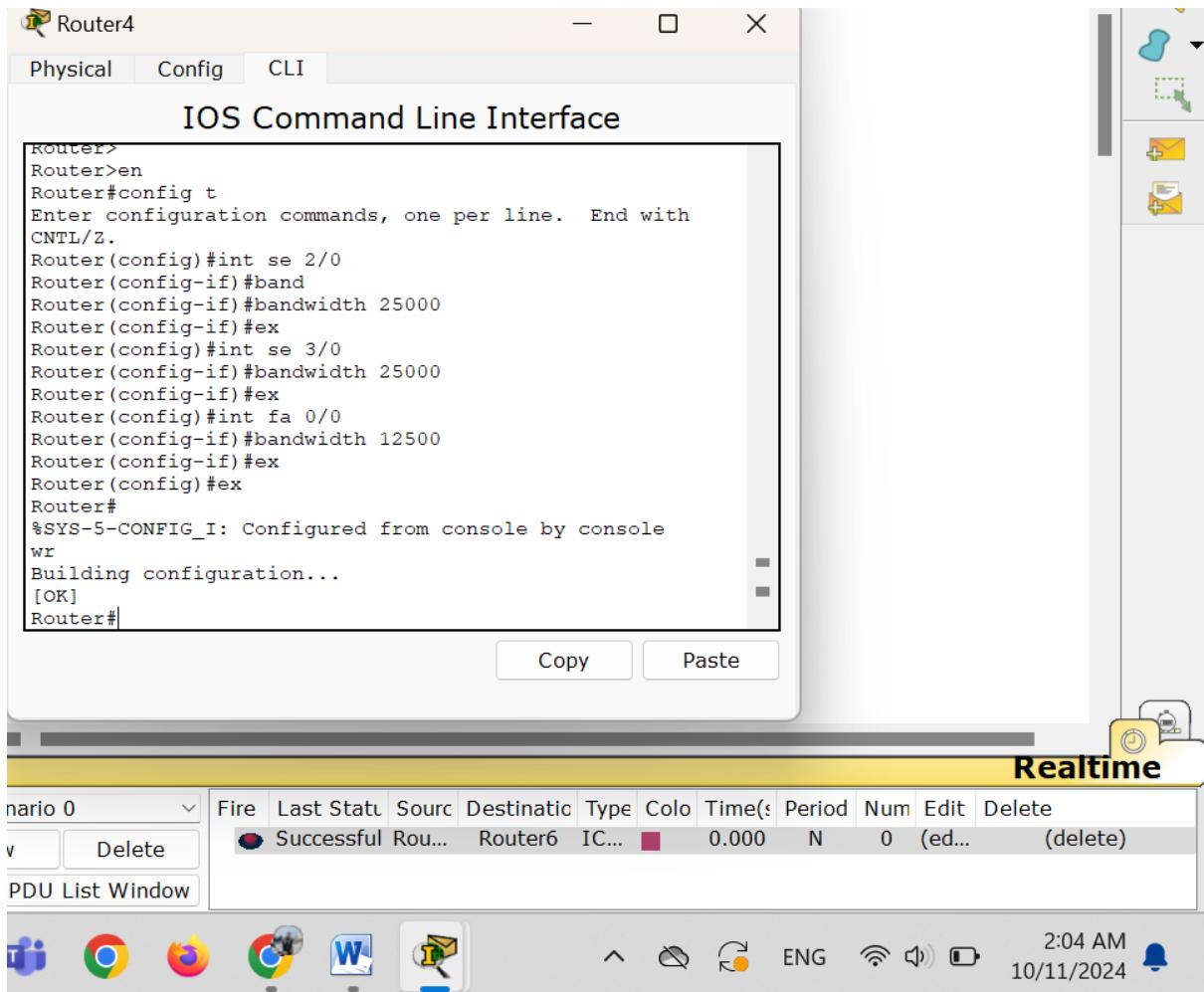


Figure 28: Set Bandwidth for interfaces in router4

For router5:

Se 2/0 :

$$4 = \frac{100\text{Mbps}}{\text{interface bandwidth}} \rightarrow \text{interface B.w} = 25\text{Mbps}$$

Fa 1/0 :

$$8 = \frac{100\text{Mbps}}{\text{interface bandwidth}} \rightarrow \text{interface B.w} = 12.5\text{Mbps}$$

Fa 0/0:

$$20 = \frac{100\text{Mbps}}{\text{interface bandwidth}} \rightarrow \text{interface B.w} = 5\text{Mbps}$$

The screenshot shows the Cisco IOS Command Line Interface (CLI) window titled "Router5". The window has tabs for "Physical", "Config", and "CLI", with "Config" selected. The main area displays the following configuration commands:

```

Router>en
Router#config t
Enter configuration commands, one per line. End with
CTRL/Z.
Router(config)#int fa 0/0
Router(config-if)#ba
Router(config-if)#bandwidth 5000
Router(config-if)#ex
Router(config)#int fa 1/0
Router(config-if)#bandwidth 12500
Router(config-if)#ex
Router(config)#int se 2/0
Router(config-if)#bandwidth 25000
Router(config-if)#ex
Router(config)#ex
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#wr
Building configuration...
[OK]
Router#

```

At the bottom of the window are "Copy" and "Paste" buttons. Below the window is a system tray with icons for network, battery, and time (2:08 AM, 10/11/2024).

Figure 29: Set Bandwidth for interfaces in router5

For router6:

Se 2/0 :

$$4 = \frac{100\text{Mbps}}{\text{interface bandwidth}} \rightarrow \text{interface B.w} = 25\text{Mbps}$$

Fa 4/0 :

$$2 = \frac{100\text{Mbps}}{\text{interface bandwidth}} \rightarrow \text{interface B.w} = 50\text{Mbps}$$

Fa 0/0:

$$100 = \frac{100\text{Mbps}}{\text{interface bandwidth}} \rightarrow \text{interface B.w} = 1\text{Mbps}$$

```
Router>en
Router#config t
Enter configuration commands, one per line. End with
CNTL/Z.
Router(config)#int fa 0/0
Router(config-if)#ba
Router(config-if)#bandwidth 1000
Router(config-if)#ex
Router(config)#int fa 4/0
Router(config-if)#bandwidth 50000
Router(config-if)#ex
Router(config)#int se 2/0
Router(config-if)#bandwidth 25000
Router(config-if)#ex
Router(config)#ex
Router#
SYS-5-CONFIG_I: Configured from console by console
wr
Building configuration...
[OK]
Router#
```

Figure 30: Set Bandwidth for interfaces in router6

4. If a packet is sent from Router 0 to Router 7 (i.e. loopback 7.7.7.7). What routers it passes through until it reaches its destination? Use the traceroute command to test that.

The screenshot shows a window titled "Router0" with three tabs: "Physical", "Config", and "CLI". The "CLI" tab is selected, displaying the "IOS Command Line Interface". The terminal window contains the following command and its output:

```
Router>en
Router#traceroute 7.7.7.7
Type escape sequence to abort.
Tracing the route to 7.7.7.7

 1  192.7.37.5      18 msec    8 msec    14 msec
 2  192.7.37.1      34 msec   16 msec   21 msec
 3  192.7.37.26     28 msec   17 msec   35 msec
 4  192.7.37.45      1 msec    15 msec   61 msec
Router#
```

Below the terminal window are two buttons: "Copy" and "Paste". At the bottom of the window is a toolbar with icons for file operations and system status, including a date and time display showing "2:14 AM 10/11/2024".

Figure 31:traceroute (send packet from router0 to router 6)

The path is exactly the one that I found in part 1 which is :

R0→R1→R2→R3→R6

5. Run the show IP route command on Router 0. From the output result. What is the cost (metric) to get from Router 0 to Router 6? Explain that.

```

Router>en
Router#traceroute 7.7.7.7
Type escape sequence to abort.
Tracing the route to 7.7.7.7

 1  192.7.37.5      18 msec   8 msec   14 msec
 2  192.7.37.1      34 msec   16 msec   21 msec
 3  192.7.37.26     28 msec   17 msec   35 msec
 4  192.7.37.45     1 msec    15 msec   61 msec

Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

 7.0.0.0/32 is subnetted, 1 subnets
O  7.7.7.7 [110/9] via 192.7.37.5, 00:08:52, Serial2/0
 192.7.37.0/30 is subnetted, 12 subnets
O  192.7.37.0 [110/4] via 192.7.37.5, 00:17:49, Serial2/0
C  192.7.37.4 is directly connected, Serial2/0
C  192.7.37.8 is directly connected, Serial3/0
O  192.7.37.12 [110/12] via 192.7.37.10, 00:08:52, Serial13/0
O  192.7.37.16 [110/12] via 192.7.37.5, 00:04:16, Serial2/0
O  192.7.37.20 [110/104] via 192.7.37.5, 00:04:38, Serial2/0
O  192.7.37.24 [110/6] via 192.7.37.5, 00:11:41, Serial2/0
O  192.7.37.28 [110/52] via 192.7.37.5, 00:14:31, Serial2/0
C  192.7.37.32 is directly connected, FastEthernet0/0
O  192.7.37.36 [110/8] via 192.7.37.10, 00:09:02, Serial3/0
O  192.7.37.40 [110/26] via 192.7.37.5, 00:07:01, Serial2/0
O  192.7.37.44 [110/8] via 192.7.37.5, 00:08:52, Serial2/0

Router#
Router#

```

Figure 32:the cost (metric) to get from router0 to router6 from rouuting table for router0

The cost (metric) in OSPF is B in [A/B]

The cost to get from router0 to router6 is 8 which found from 192.7.37.44 [110/8] where 110 is AD for OSPF and 8 is the cost which equal to the one that I found in part1.

6. What is the router-id for Router 0, and Router 6? Verify your answers

To find the router-id we use command `show ip protocols` in privilege mode.

The screenshot shows the Cisco IOS CLI interface for Router0. The command `Router#show ip protocols` is entered, and the output is displayed. The output shows the following information:

```
Router#show ip protocols
Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 192.7.37.34
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    192.7.37.4 0.0.0.3 area 0
    192.7.37.8 0.0.0.3 area 0
    192.7.37.32 0.0.0.3 area 0
  Routing Information Sources:
    Gateway        Distance      Last Update
    192.7.37.25    110          00:17:29
    192.7.37.29    110          00:23:22
    192.7.37.34    110          00:25:34
    192.7.37.38    110          00:14:55
    192.7.37.42    110          00:12:37
    192.7.37.45    110          00:10:21
    192.7.37.46    110          00:19:31
  Distance: (default is 110)
Router#
```

The router-id is highlighted in blue as `Router ID 192.7.37.34`.

Figure 33:Find router-id for router0

Router-id for router0 → 192.7.37.34 which is the highest IP for the physical interface in router0

-for Router6 which it have loopback so the router-id must be the highest IP in loopbacks

The screenshot shows the Cisco IOS CLI interface for Router6. The command `Router(config)#do show ip protocols` is entered, and the output is displayed. The output shows the following information:

```
Router(config)#
Router(config)#
Router(config)#do show ip protocols
Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 7.7.7.7
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    192.7.37.20 0.0.0.3 area 0
    192.7.37.16 0.0.0.3 area 0
    192.7.37.44 0.0.0.3 area 0
    7.7.7.0 0.0.0.255 area 0
  Routing Information Sources:
    Gateway        Distance      Last Update
    7.7.7.7        110          00:05:06
    192.7.37.25    110          00:05:08
    192.7.37.29    110          00:19:21
    192.7.37.34    110          00:21:34
    192.7.37.38    110          00:10:54
    192.7.37.42    110          00:05:06
    192.7.37.45    110          00:06:22
    192.7.37.46    110          00:05:07
  Distance: (default is 110)
Router(config)#

```

Figure 34:Find router-id for router6

Router-id for router6 → 7.7.7.7