VISVESVARAYA TECHNOLOGICAL UNIVERSITY

“JnanaSangama”, Belgaum -590014, Karnataka.

LAB RECORD

Computer Network Lab (23CS5PCCON)

Submitted by

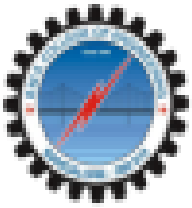
Samraat Dabolay (1BM22CS236)

in partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

in

COMPUTER SCIENCE AND ENGINEERING



B.M.S. COLLEGE OF ENGINEERING

(Autonomous Institution under VTU)

BENGALURU-560019

Academic Year 2024-25 (odd)

B.M.S. College of Engineering

Bull Temple Road, Bangalore 560019

(Affiliated To Visvesvaraya Technological University, Belgaum)

Department of Computer Science and Engineering

CERTIFICATE

This is to certify that the Lab work entitled " Computer Network (23CS5PCCON)" carried out by **Samraat Dabolay (1BM22CS236),** who is a bonafide student of **B.M.S. College of Engineering.** It is in partial fulfilment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum. The Lab report has been approved as it satisfies the academic requirements of the above-mentioned subject and the work prescribed for the said degree.

Ramya K M Assistant Professor Department of CSE, BMSCE	Dr. Kavitha Sooda Professor & HOD Department of CSE, BMSCE

Index

Sl. No.	Date	Experiment Title	Page No.
1	04/10/2024	Create a topology involving multiple hubs and a switch connecting them to simulate with simple PDU.	1
2	18/10/2024	Configure IP address to routers in packet tracer. Explore the following messages: ping responses, destination unreachable, request timed out, reply	5
3	25/10/2024	Configure default route, static route to the router	10
4	08/11/2024	Configure DHCP within a LAN and outside LAN.	17
5	22/11/2024	Configure RIP routing Protocol in Routers	22
6	22/11/2024	Configure OSPF routing protocol	28
7	22/11/2024	Demonstrate the TTL/ Life of a Packet	37
8	08/11/2024	Configure Web Server, DNS within a LAN.	42
9	20/12/2024	To construct simple LAN and understand the concept and operation of Address Resolution Protocol (ARP)	47

10	20/12/2024	To understand the operation of TELNET by accessing the router in server room from a PC in IT office.	51
11	20/12/2024	To construct a VLAN and make the PC's communicate among a VLAN	54

Index-Cycle-II

Sl. No.	**Date**	**Experiment Title**	**Page No.**
1	15/11/2024	Write a program for error detecting code using CRC-CCITT (16-bits).	64
2	15/11/2024	Write a program for congestion control using Leaky bucket algorithm	69
3	20/12/2024	Using TCP/IP sockets, write a client-server program to make client sending the file name and the server to send back the contents of the requested file if present.	73
4	20/12/2024	Using UDP sockets, write a client-server program to make client sending the file name and the server to send back the contents of the requested file if present.	78

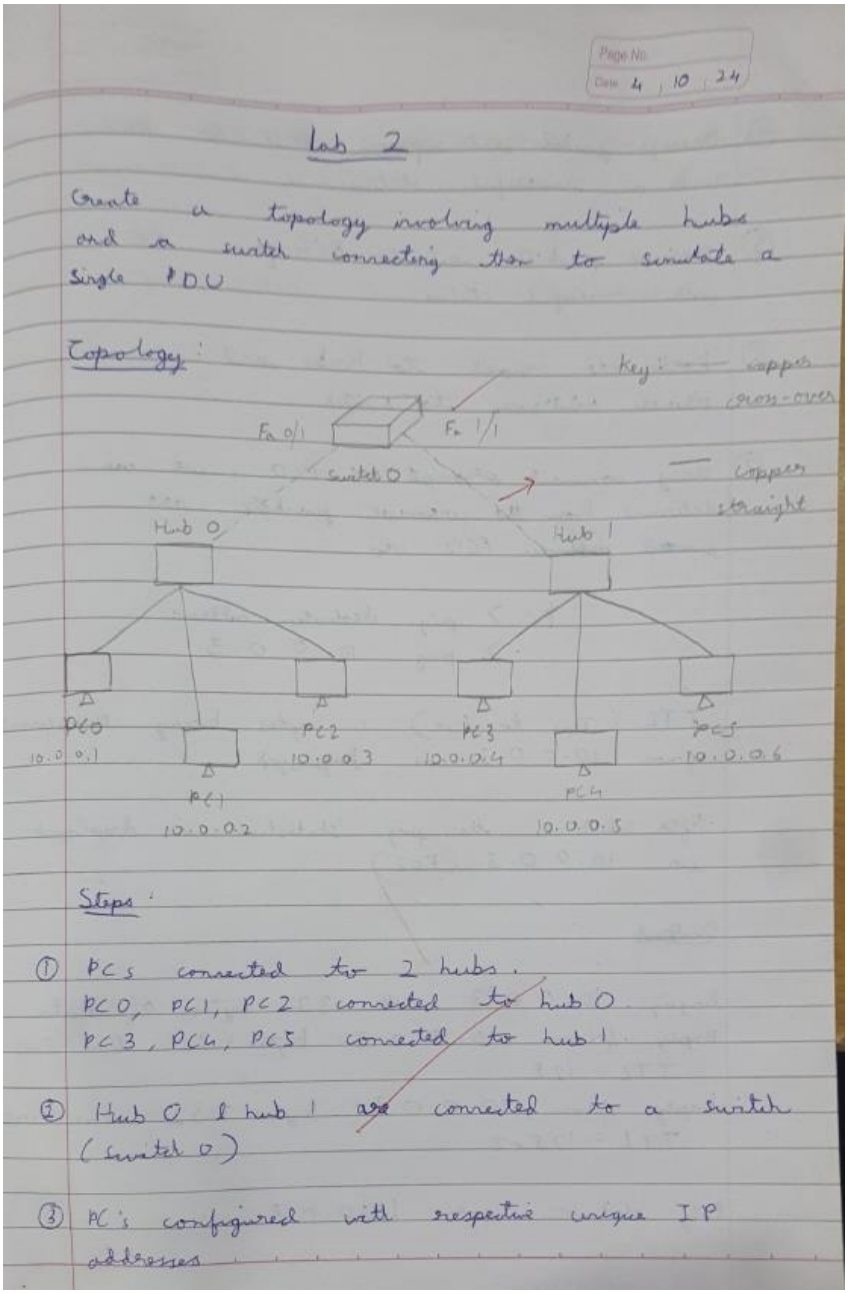
Github Link:
https://github.com/samraatd/CN-LAB

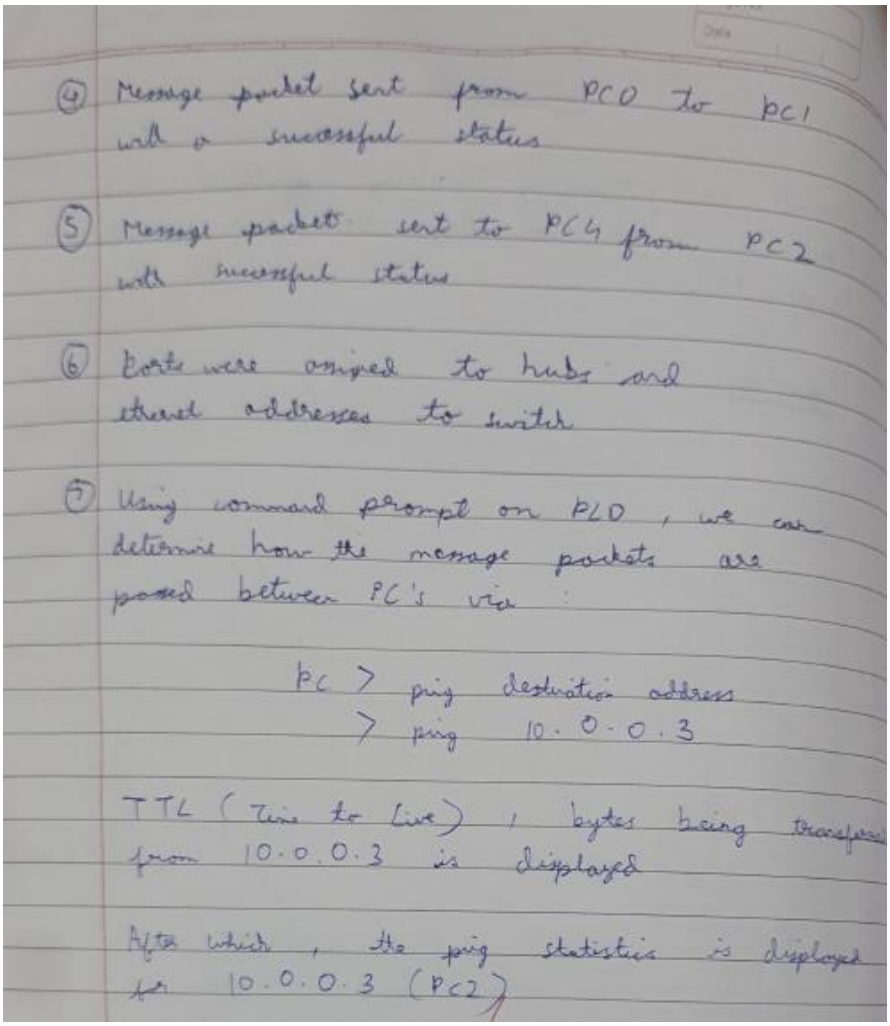
Program 1

i. Aim of the program

Create a topology and simulate sending a simple PDU from source to destination using hub and switch as connecting devices and demonstrate ping messages.

ii. Procedure along with the topology





④ Message packet sent from PC0 to PC1 with a successful status

⑤ Message packet sent to PC4 from PC2 with successful status

⑥ Ports were assigned to hubs and ethernet addresses to switch

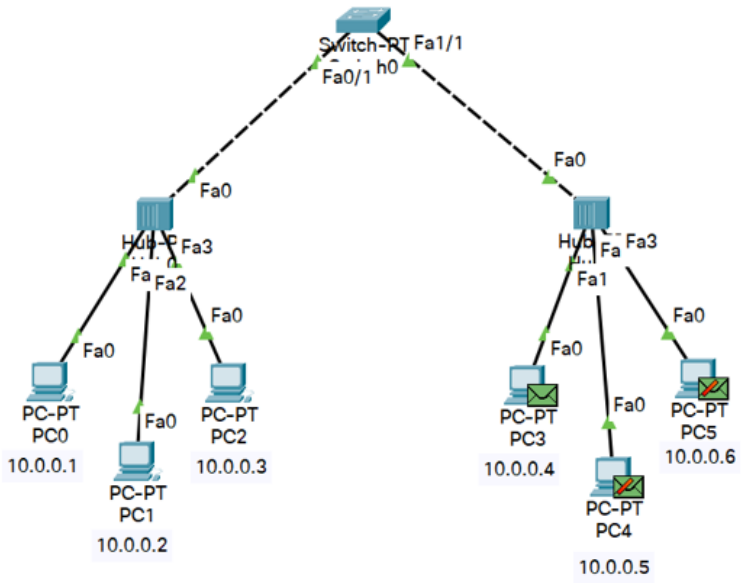
⑦ Using command prompt on PC0, we can determine how the message packets are passed between PC's via :

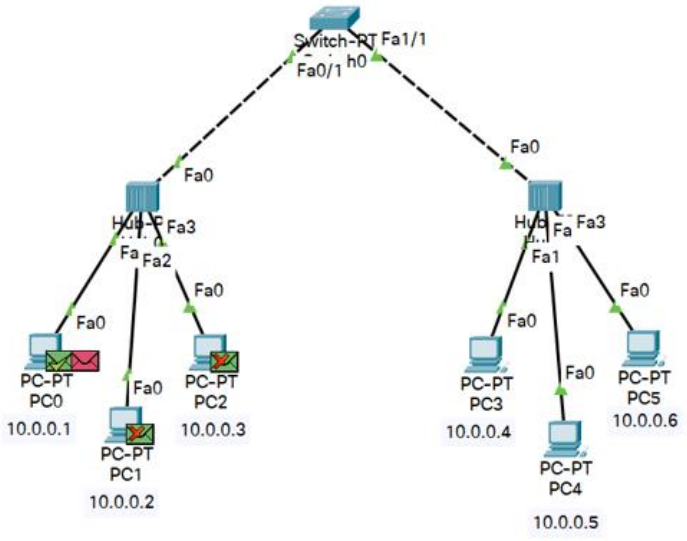
PC > ping destination address
> ping 10.0.0.3

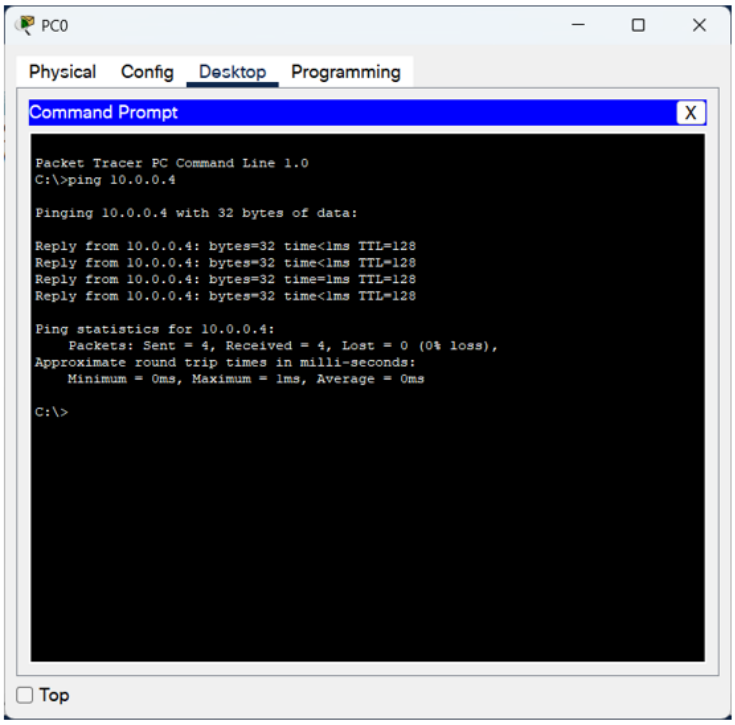
TTL (Time to Live), bytes being transferred from 10.0.0.3 is displayed

After which, the ping statistics is displayed for 10.0.0.3 (PC2)

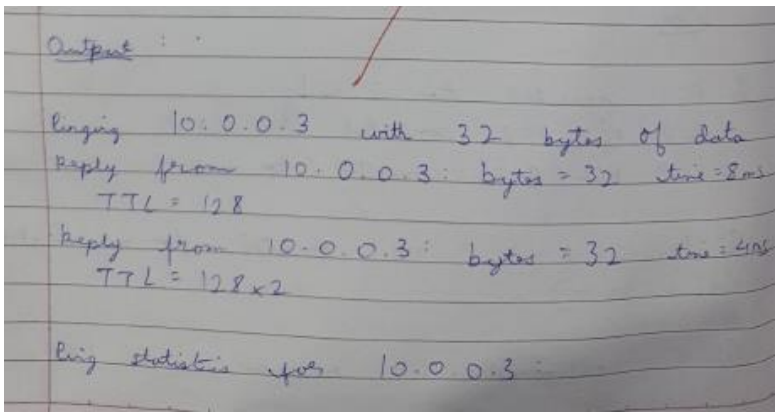
iii. Screen shots/ output

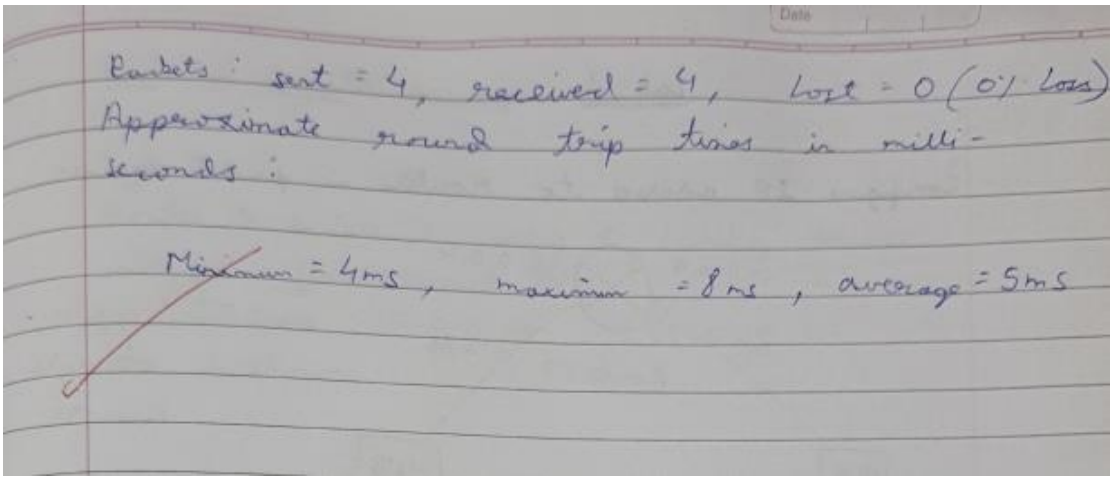






iv. Observation




Packets: sent = 4, received = 4, lost = 0 (0% loss)
Approximate round trip times in milli-seconds:

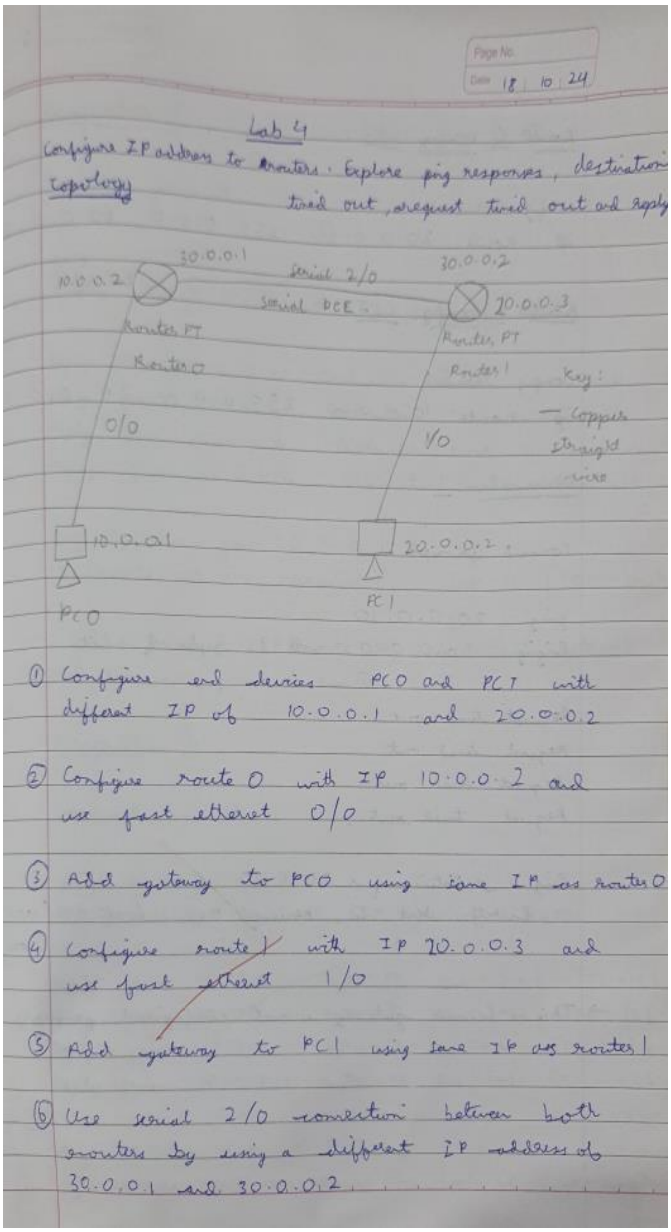
Minimum = 4ms, maximum = 8ms, average = 5ms

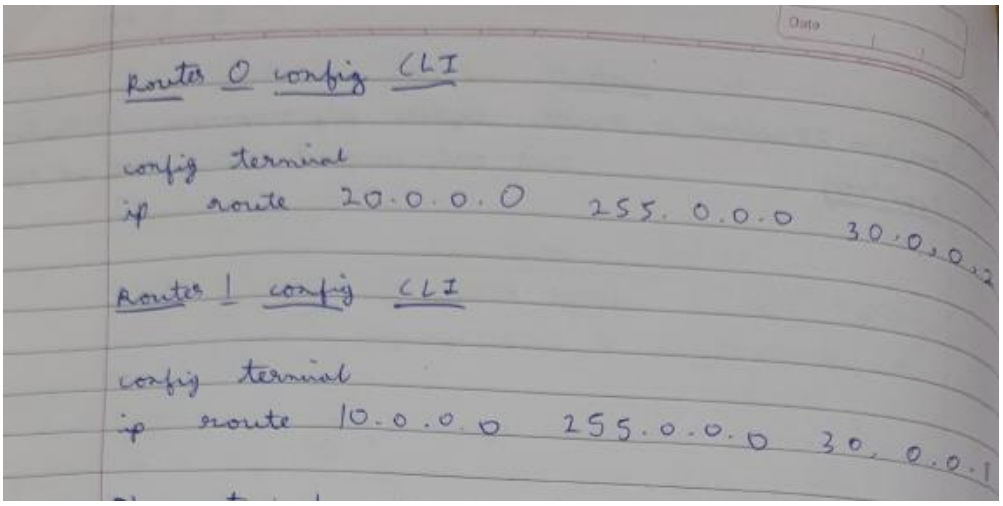
Program 2

i. Aim of the program

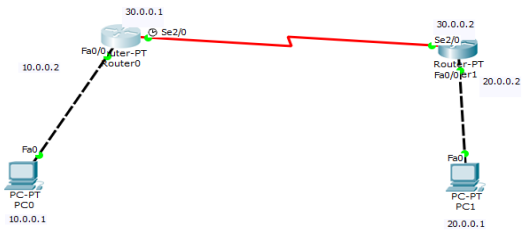
Configure IP address to routers in packet tracer. Explore the following messages: ping responses, destination unreachable, request timed out, reply

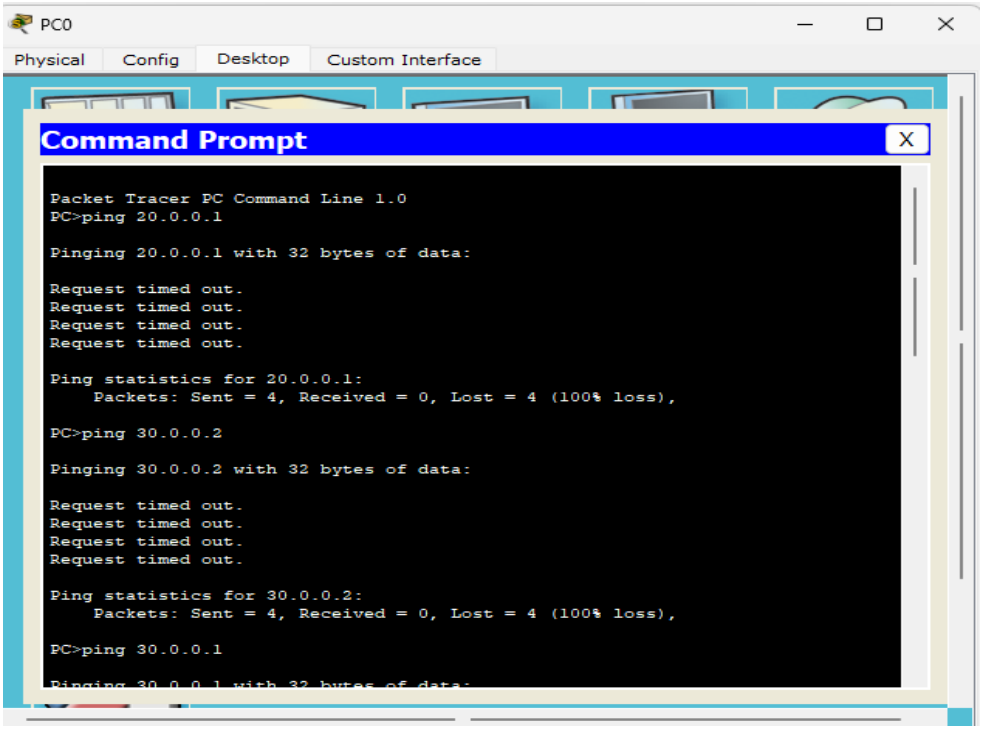
ii. Procedure along with the topology

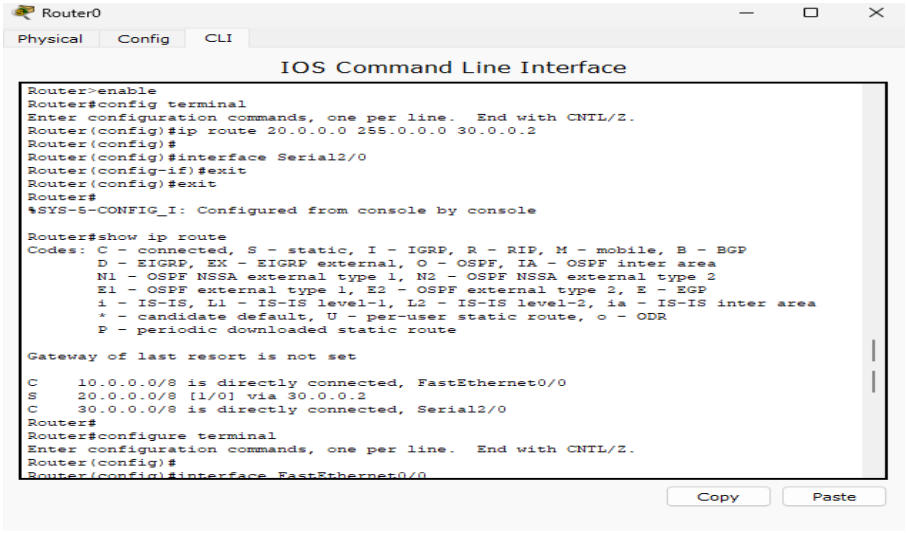


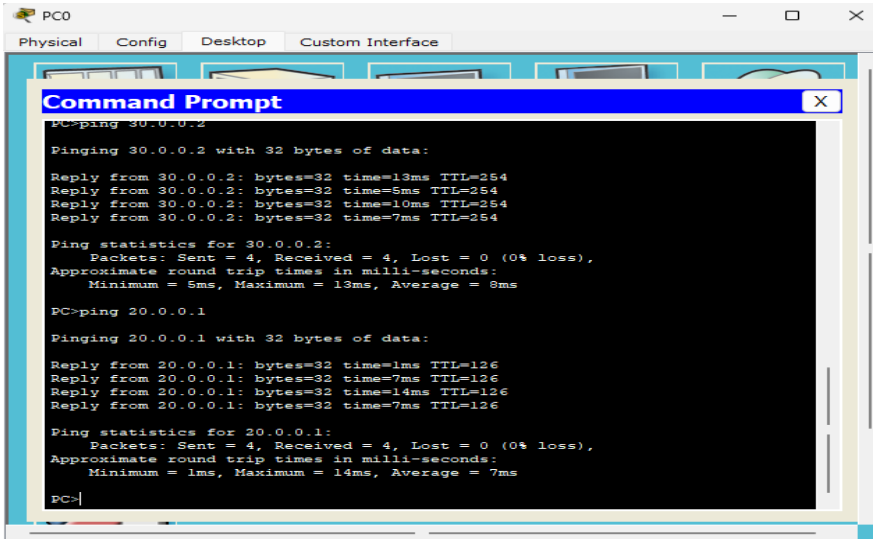


iii. Screen shots/ output

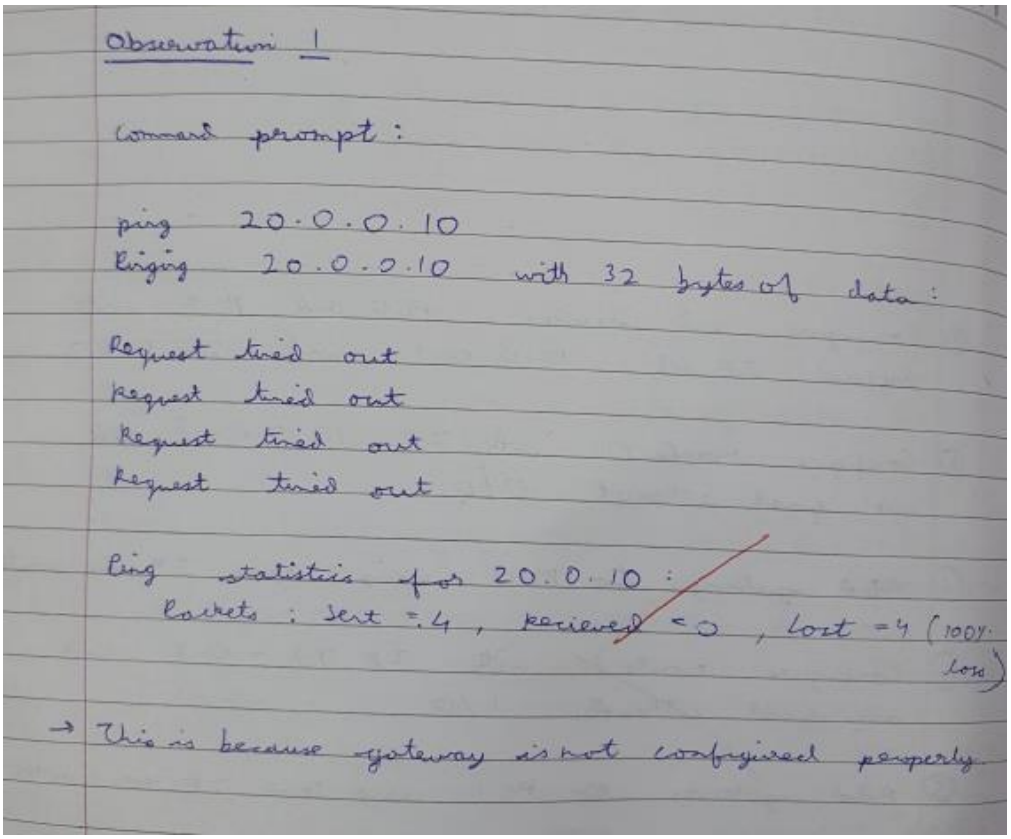





Router0
Physical
Config
CLI
IOS Command Line Interface
Router>enable
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 20.0.0.0 255.0.0.0 30.0.0.2
Router(config)#
Router(config)#interface Serial2/0
Router(config-if)#exit
Router(config)#exit
Router#
%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
C 10.0.0.0/8 is directly connected, FastEthernet0/0
S 20.0.0.0/8 [1/0] via 30.0.0.2
C 30.0.0.0/8 is directly connected, Serial2/0
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#interface FastEthernet0/0
Copy
Paste


PC0
Physical
Config
Desktop
Custom Interface
Command Prompt
PC>ping 30.0.0.2
Pinging 30.0.0.2 with 32 bytes of data:
Reply from 30.0.0.2: bytes=32 time=13ms TTL=254
Reply from 30.0.0.2: bytes=32 time=5ms TTL=254
Reply from 30.0.0.2: bytes=32 time=10ms TTL=254
Reply from 30.0.0.2: bytes=32 time=7ms TTL=254
Ping statistics for 30.0.0.2:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 5ms, Maximum = 13ms, Average = 8ms
PC>ping 20.0.0.1
Pinging 20.0.0.1 with 32 bytes of data:
Reply from 20.0.0.1: bytes=32 time=1ms TTL=126
Reply from 20.0.0.1: bytes=32 time=7ms TTL=126
Reply from 20.0.0.1: bytes=32 time=14ms TTL=126
Reply from 20.0.0.1: bytes=32 time=7ms TTL=126
Ping statistics for 20.0.0.1:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 1ms, Maximum = 14ms, Average = 7ms
PC>

iv. Observation



Observation 1

Command prompt :

ping 20.0.0.10
Pinging 20.0.0.10 with 32 bytes of data :

Request timed out
Request timed out
Request timed out
Request timed out

Ping statistics for 20.0.10 :
Packets : Sent = 4, Recieved = 0, Lost = 4 (100% loss)

→ This is because gateway is not configured properly.

Observation 2

Command prompt :

ping 20.0.0.1
Pinging 20.0.0.1 with 32 bytes of data

Reply from 10.0.0.2 : Destination host unreachable
Reply from 10.0.0.2 : Destination host unreachable
Reply from 10.0.0.2 : Destination host unreachable
Reply from 10.0.0.2 : Destination host unreachable

Ping statistics for 20.0.0.1
Packets: sent = 4, received = 0, lost = 4 (100% loss)

→ This is because IP route of unidentified network not been configured in router CLI.

Observation 3

Command prompt :

ping 10.0.0.1
Pinging 10.0.0.1 with 32 bytes of data

Reply from 10.0.0.1 : bytes = 32 time = 5 ms TTL = 126
Reply from 10.0.0.1 : bytes = 32 time = 5ms TTL = 126
Reply from 10.0.0.1 : bytes = 32 time = 6ms TTL = 126
Reply from 10.0.0.1 : bytes = 32 time = 5ms TTL = 126

Ping statistics for 10.0.0.1 :
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss)

Approximate round trip times in milli-seconds :
Minimum = 5ms, Maximum = 6 ms, Average = 5 ms

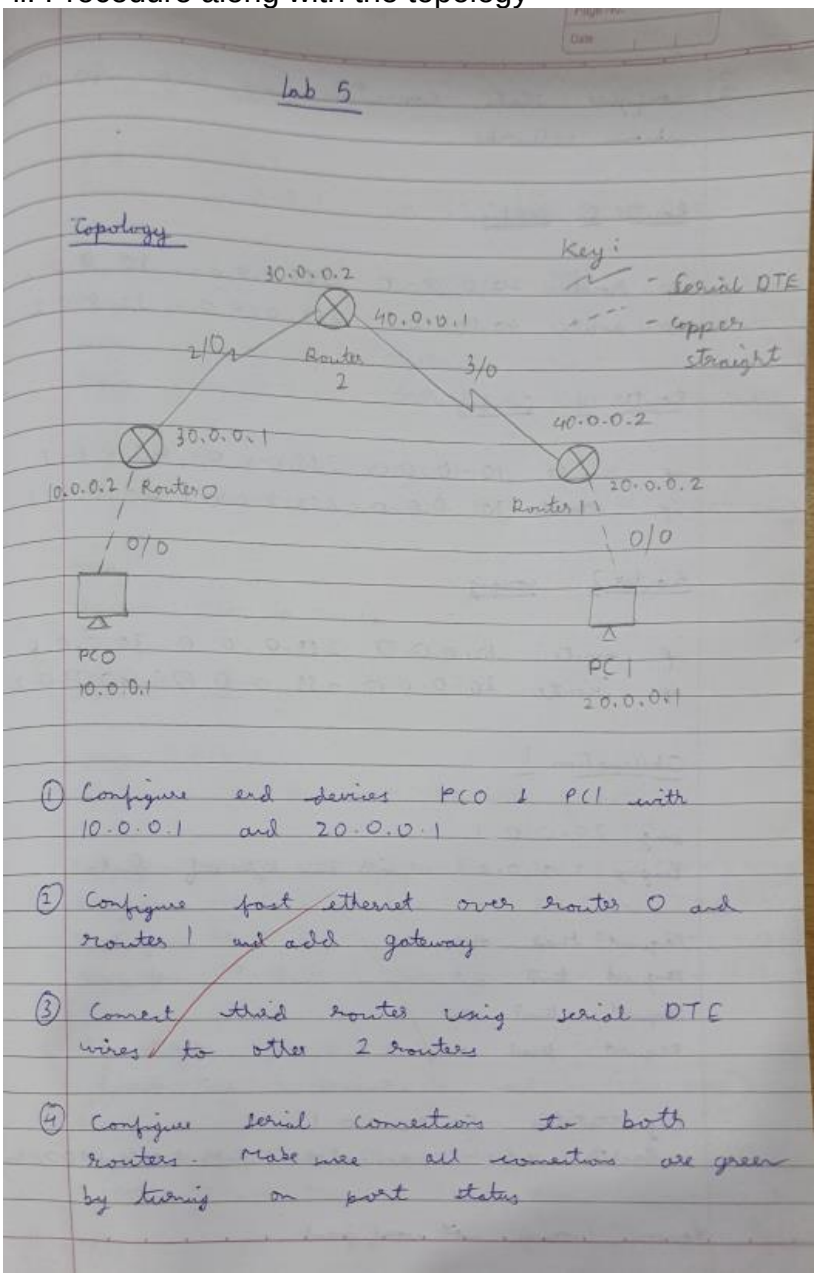
18/10

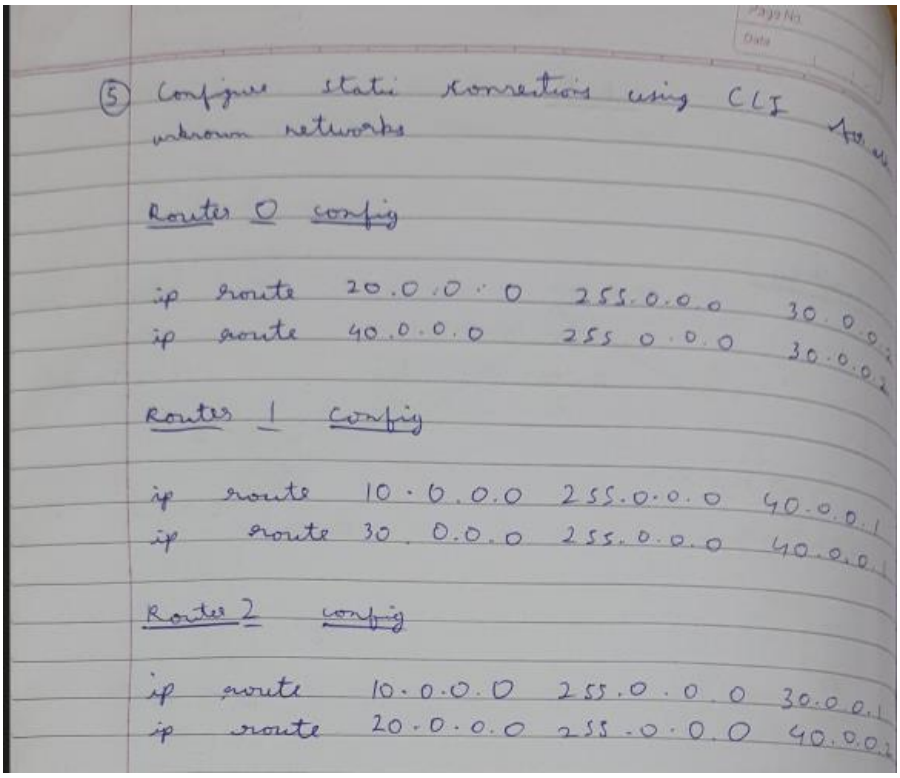
Program 3

i. Aim of the program

Configure default route, static route to the Route

ii. Procedure along with the topology





⑤ Configure static routes using CLI for unknown networks

Router 0 config

ip route 20.0.0.0 255.0.0.0 30.0.0.2
ip route 40.0.0.0 255.0.0.0 30.0.0.2

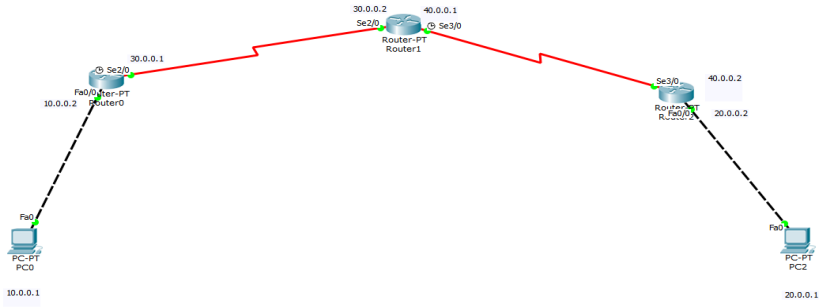
Router 1 config

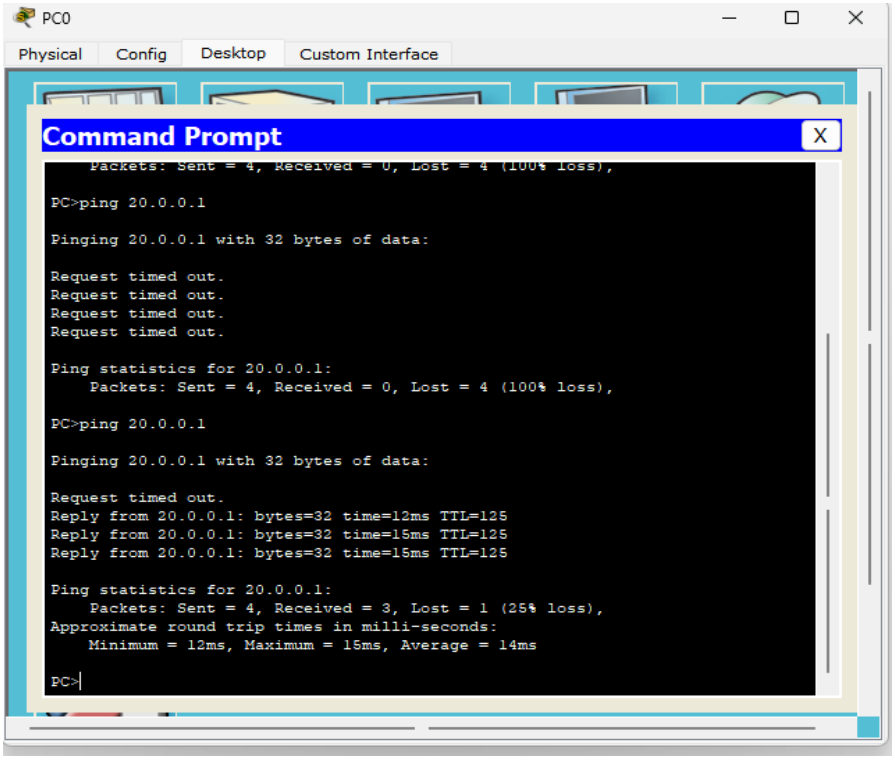
ip route 10.0.0.0 255.0.0.0 40.0.0.1
ip route 30.0.0.0 255.0.0.0 40.0.0.1

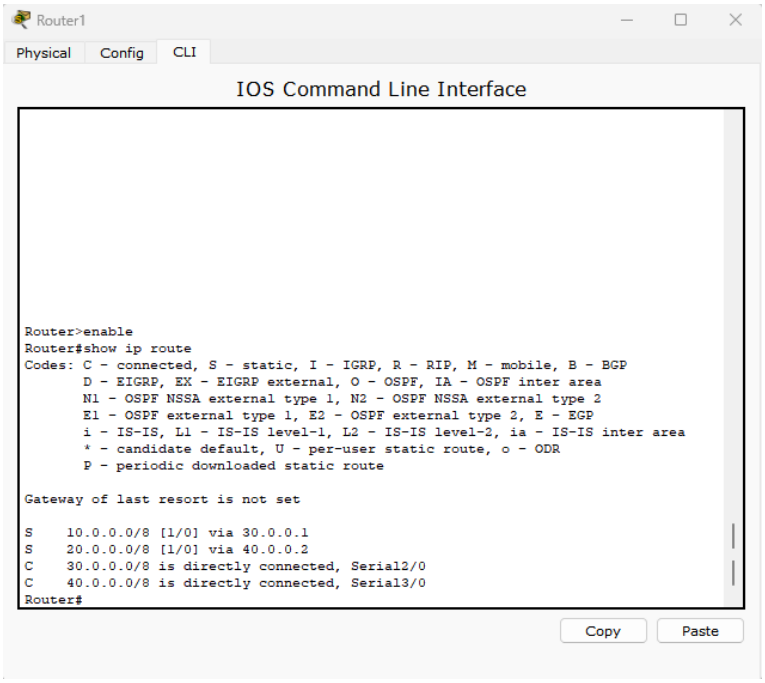
Router 2 config

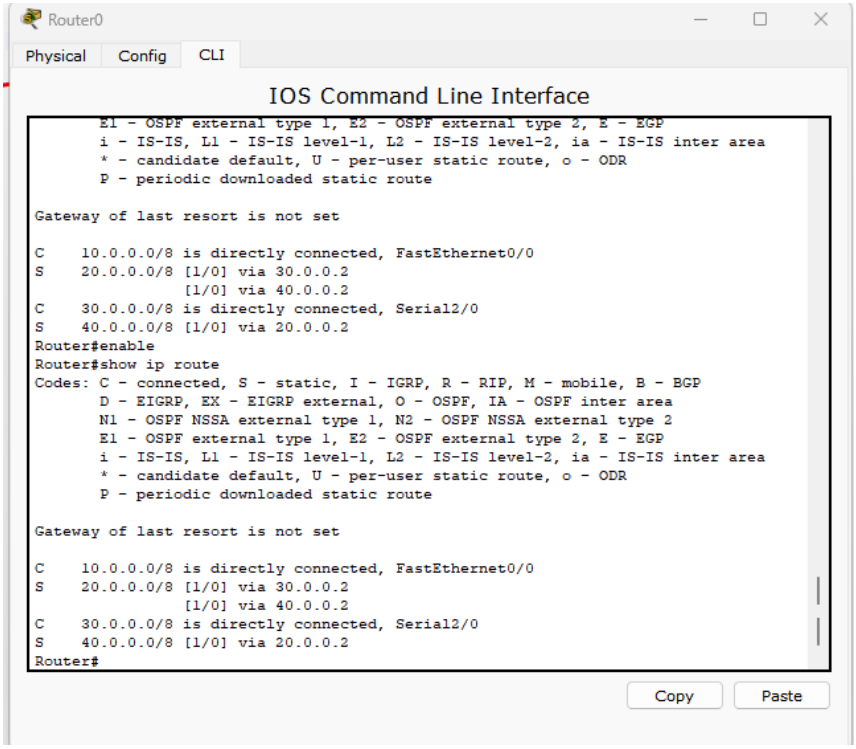
ip route 10.0.0.0 255.0.0.0 30.0.0.1
ip route 20.0.0.0 255.0.0.0 40.0.0.2

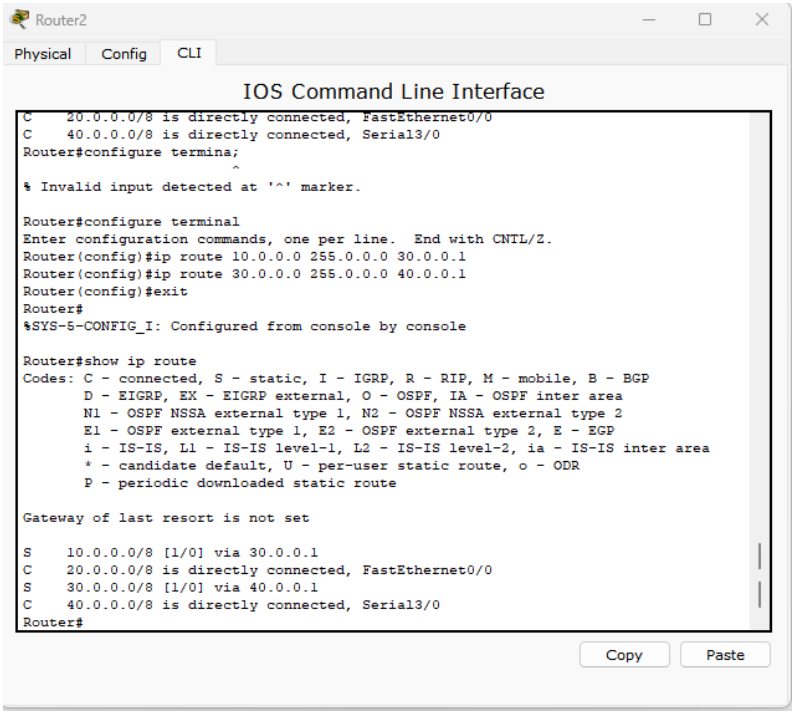
iii. Screen shots/ output




PC0
Physical
Config
Desktop
Custom Interface
Command Prompt
X
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
PC>ping 20.0.0.1
Pinging 20.0.0.1 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Ping statistics for 20.0.0.1:
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
PC>ping 20.0.0.1
Pinging 20.0.0.1 with 32 bytes of data:
Request timed out.
Reply from 20.0.0.1: bytes=32 time=12ms TTL=125
Reply from 20.0.0.1: bytes=32 time=15ms TTL=125
Reply from 20.0.0.1: bytes=32 time=15ms TTL=125
Ping statistics for 20.0.0.1:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 12ms, Maximum = 15ms, Average = 14ms
PC>


Router1
Physical
Config
CLI
IOS Command Line Interface
Router>enable
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
S 10.0.0.0/8 [1/0] via 30.0.0.1
S 20.0.0.0/8 [1/0] via 40.0.0.2
C 30.0.0.0/8 is directly connected, Serial2/0
C 40.0.0.0/8 is directly connected, Serial3/0
Router#
Copy
Paste


Router0
Physical
Config
CLI
IOS Command Line Interface
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
C 10.0.0.0/8 is directly connected, FastEthernet0/0
S 20.0.0.0/8 [1/0] via 30.0.0.2
[1/0] via 40.0.0.2
C 30.0.0.0/8 is directly connected, Serial2/0
S 40.0.0.0/8 [1/0] via 20.0.0.2
Router#enable
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
C 10.0.0.0/8 is directly connected, FastEthernet0/0
S 20.0.0.0/8 [1/0] via 30.0.0.2
[1/0] via 40.0.0.2
C 30.0.0.0/8 is directly connected, Serial2/0
S 40.0.0.0/8 [1/0] via 20.0.0.2
Router#
Copy
Paste


Router2
Physical
Config
CLI
IOS Command Line Interface
C 20.0.0.0/8 is directly connected, FastEthernet0/0
C 40.0.0.0/8 is directly connected, Serial3/0
Router#configure termina;
^
% Invalid input detected at '^' marker.
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 10.0.0.0 255.0.0.0 30.0.0.1
Router(config)#ip route 30.0.0.0 255.0.0.0 40.0.0.1
Router(config)#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
S 10.0.0.0/8 [1/0] via 30.0.0.1
C 20.0.0.0/8 is directly connected, FastEthernet0/0
S 30.0.0.0/8 [1/0] via 40.0.0.1
C 40.0.0.0/8 is directly connected, Serial3/0
Router#
Copy
Paste

Default Routing:

Router0

Physical | Config | CLI

IOS Command Line Interface

```
Router(config)#interface FastEthernet0/0
Router(config-if)#ip address 10.0.0.2 255.0.0.0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial2/0
Router(config-if)#ip address 20.0.0.1 255.0.0.0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet0/0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

Router(config-if)#exit
Router(config)#interface Serial2/0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface Serial2/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up

Router(config-if)#exit
Router(config)#configure terminal
                ^
% Invalid input detected at '^' marker.

Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#ip route 0.0.0.0 0.0.0.0 20.0.0.2
Router(config)#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 20.0.0.2 to network 0.0.0.0

C    10.0.0.0/8 is directly connected, FastEthernet0/0
C    20.0.0.0/8 is directly connected, Serial2/0
S*   0.0.0.0/0 [1/0] via 20.0.0.2
Router#
```

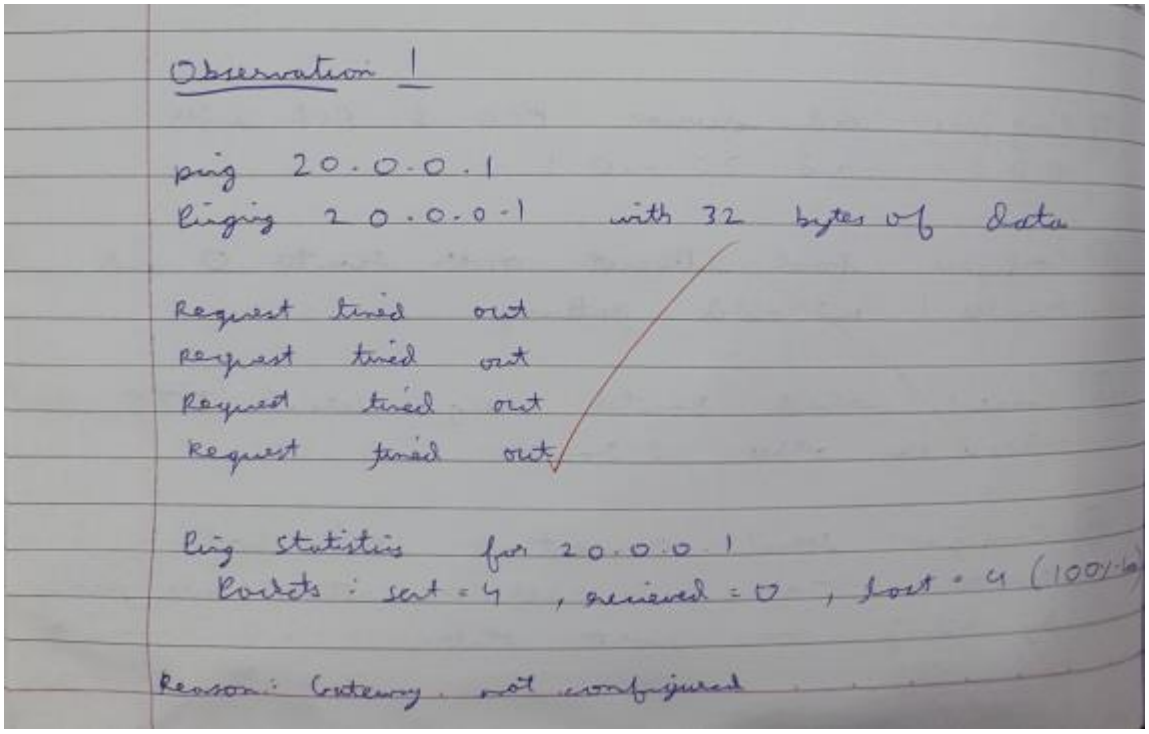
Router1

Physical | Config | CLI

IOS Command Line Interface

```
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet1/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial2/0
Router(config-if)#ip address 20.0.0.2 255.0.0.0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial3/0
Router(config-if)#ip address 30.0.0.1 255.0.0.0
Router(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial3/0, changed state to down
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet1/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial2/0
Router(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial2/0, changed state to down
Router(config-if)#
%LINK-5-CHANGED: Interface Serial3/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to up

%LINK-5-CHANGED: Interface Serial2/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up

Router(config-if)#exit
Router(config)#ip route 10.0.0.0 255.0.0.0 20.0.0.1
Router(config)#ip route 40.0.0.0 255.0.0.0 30.0.0.2
Router(config)#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

S    10.0.0.0/8 [1/0] via 20.0.0.1
C    20.0.0.0/8 is directly connected, Serial2/0
C    30.0.0.0/8 is directly connected, Serial3/0
S    40.0.0.0/8 [1/0] via 30.0.0.2
Router#
```

iv. Observation



Observation 2

ping 20.0.0.1
Pinging 20.0.0.1 with 32 bytes of data

Reply from 10.0.0.1 : Destination host unreachable
Reply from 10.0.0.1 : Destination host unreachable
Reply from 10.0.0.1 : Destination host unreachable
Reply from 10.0.0.1 : Destination host unreachable

Ping Statistics for 20.0.0.1
Packets: Sent = 4, received = 0, lost = 4 (100% loss)

Reason: No ip route

Observation 3

ping 20.0.0.1
Pinging 20.0.0.1 with 32 bytes of data

Reply from 20.0.0.1: bytes=32 time=2ms TTL=12
Reply from 20.0.0.1: bytes=32 time=2ms TTL=12
Reply from 20.0.0.1: bytes=32 time=9ms TTL=12
Reply from 20.0.0.1: bytes=32 time=13ms TTL=12

Ping Statistics for 20.0.0.1
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss)

23/10

Approx. round trip times in ms:
Minimum = 2ms, Maximum = 13ms, Average = 6ms

Default routes config

ip route 0.0.0.0 0.0.0.0 10.0.0.1
ip route 0.0.0.0 0.0.0.0 20.0.0.1

Can't find a route in routing table, useful for large networks

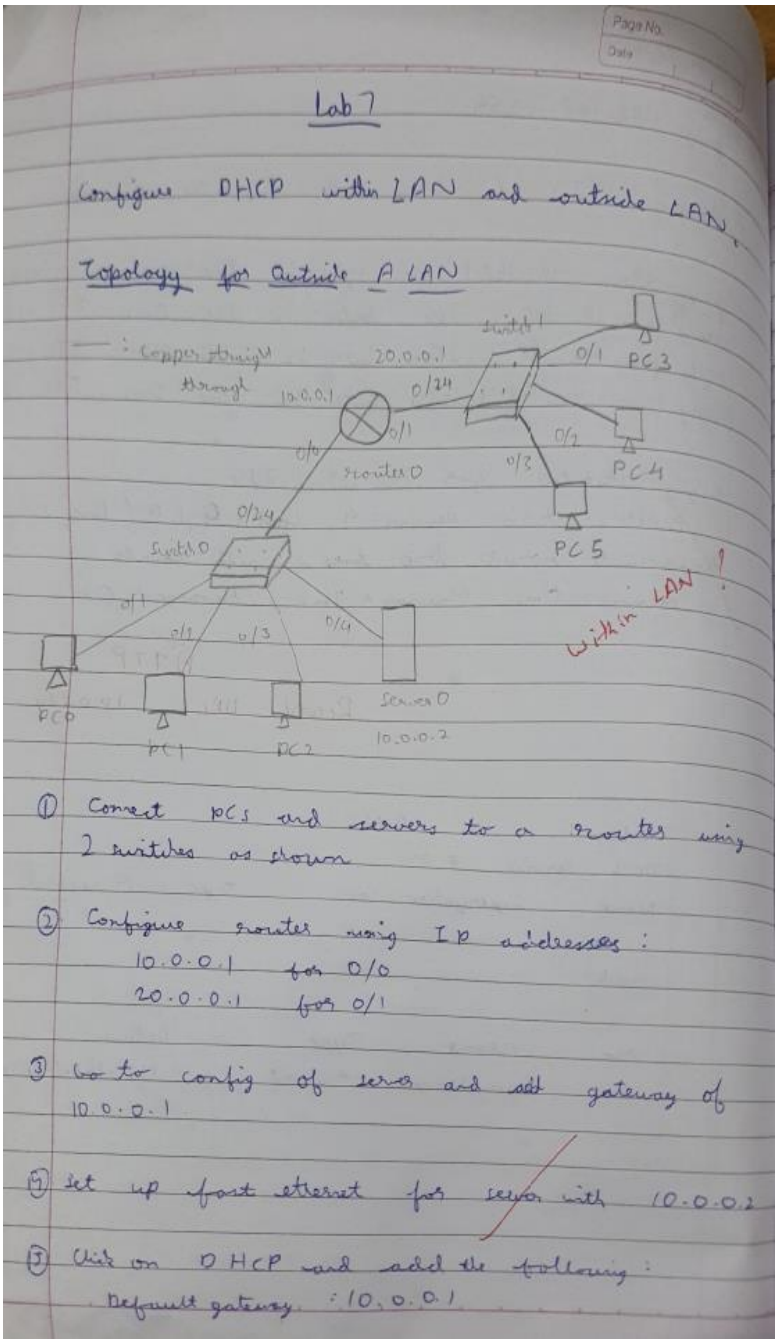
3/11

Program 4

i. Aim of the program

Configure DHCP within a LAN and outside LAN.

ii. Procedure along with the topology



DNS server: 10.0.0.2
IP address from 10.0.0.10 to 10.0.0.20
TFTP server : 10.0.0.2

⑥ Click on any PC → Desktop → IP config → Choose DHCP

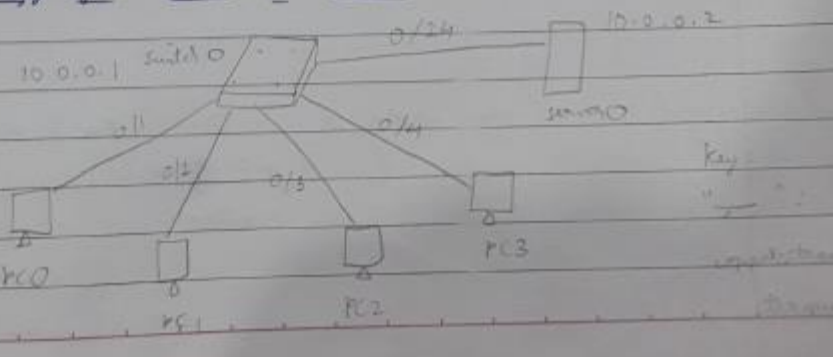
⑦ Add other network by adding DHCP server with different pool name and change to:
Default Gateway 20.0.0.1
DNS server : 10.0.0.2
Start IP address : 20.0.0.10
Max users : 100
TFTP server: 10.0.0.2

⑧ Configure router and give helper ip address

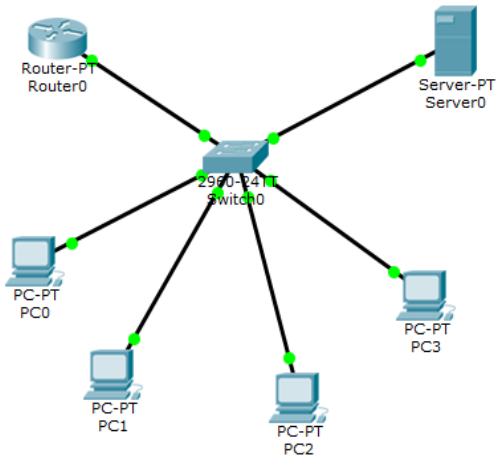
interface fastethernet 0/1
ip helper-address 10.0.0.2
exit

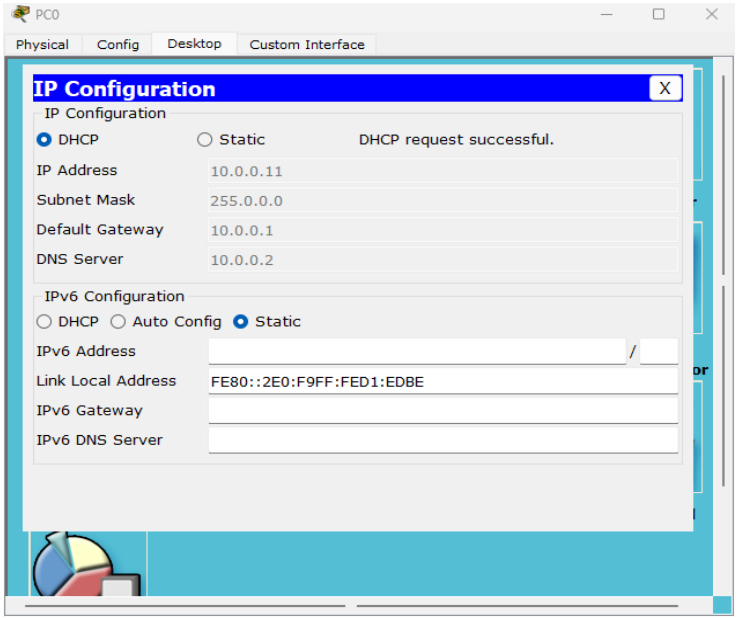
⑨ Click on any PC and change IP config DHCP server

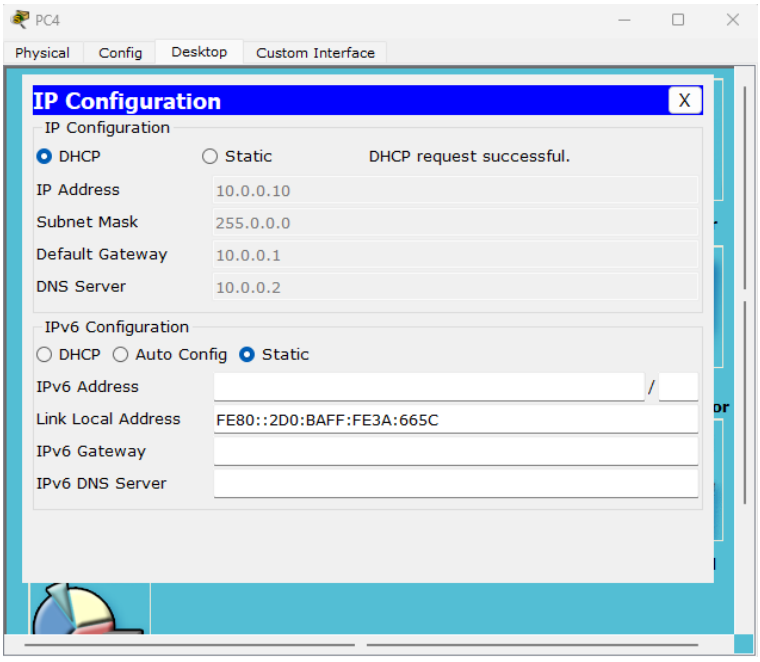
Topology for within a LAN



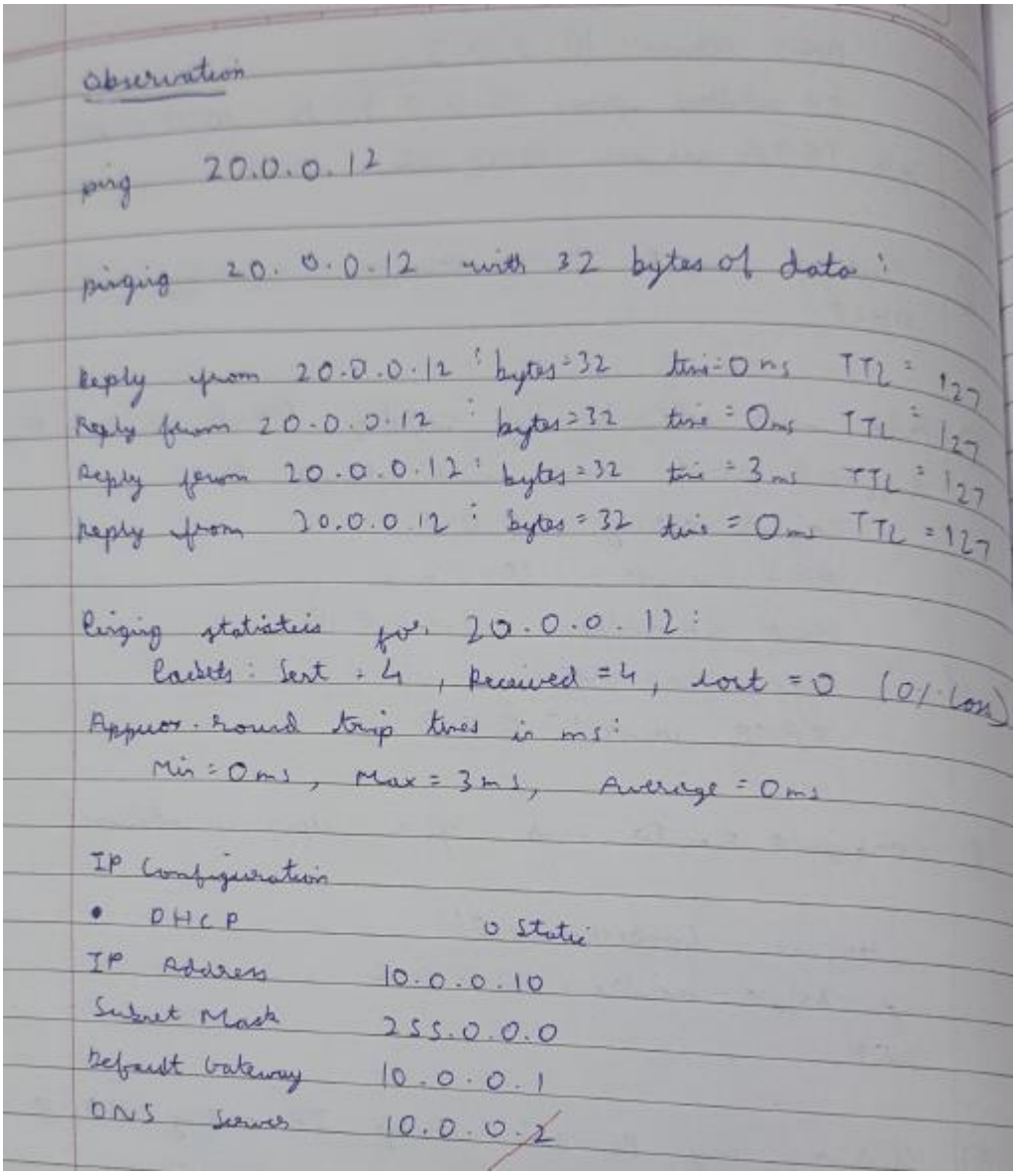
iii. Screen shots/ output




PC0
Physical
Config
Desktop
Custom Interface
IP Configuration
X
IP Configuration
DHCP
Static
DHCP request successful.
IP Address
10.0.0.11
Subnet Mask
255.0.0.0
Default Gateway
10.0.0.1
DNS Server
10.0.0.2
IPv6 Configuration
DHCP
Auto Config
Static
IPv6 Address
Link Local Address
FE80::2E0:F9FF:FED1:EDBE
IPv6 Gateway
IPv6 DNS Server


PC4
Physical
Config
Desktop
Custom Interface
IP Configuration
X
IP Configuration
DHCP
Static
DHCP request successful.
IP Address
10.0.0.10
Subnet Mask
255.0.0.0
Default Gateway
10.0.0.1
DNS Server
10.0.0.2
IPv6 Configuration
DHCP
Auto Config
Static
IPv6 Address
Link Local Address
FE80::2D0:BAFF:FE3A:665C
IPv6 Gateway
IPv6 DNS Server

iv. Observation



Observation

ping 20.0.0.12

pinging 20.0.0.12 with 32 bytes of data:

Reply from 20.0.0.12 : bytes=32 time=0ms TTL = 127
Reply from 20.0.0.12 : bytes=32 time=0ms TTL = 127
Reply from 20.0.0.12 : bytes=32 time=3ms TTL = 127
Reply from 20.0.0.12 : bytes=32 time=0ms TTL = 127

Ping statistics for 20.0.0.12:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss)
Approx. round trip times in ms:
Min = 0ms, Max = 3ms, Average = 0ms

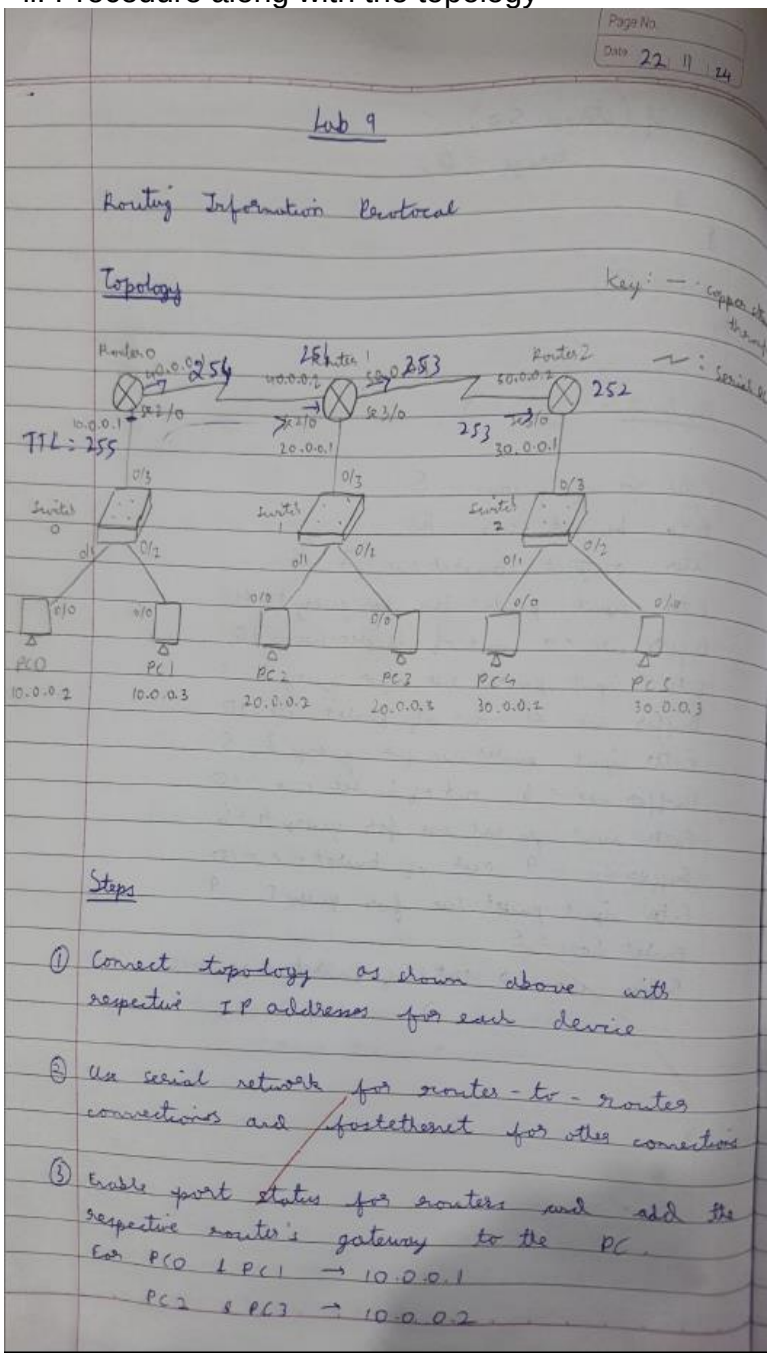
IP Configuration
• DHCP ○ Static
IP Address 10.0.0.10
Subnet Mask 255.0.0.0
Default Gateway 10.0.0.1
DNS Server 10.0.0.2

Program 5

i. Aim of the program

Configure RIP routing Protocol in Routers

ii. Procedure along with the topology



PC4 & PC5 → 10.0.0.3

④ Connect routers with serial network & IP of 40.0.0.1 & 40.0.0.2. The other 2 routers as 50.0.0.1 & 50.0.0.2.

⑤ Add network to all routers using RIP in CLI:

~~Router 0~~:

>enable
#configure terminal
#routes rip

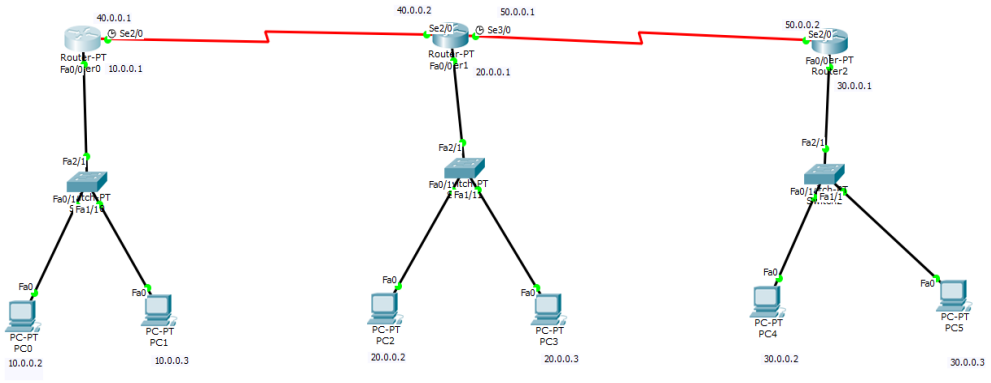
For routers 0:
#network 10.0.0.0
#network 40.0.0.0

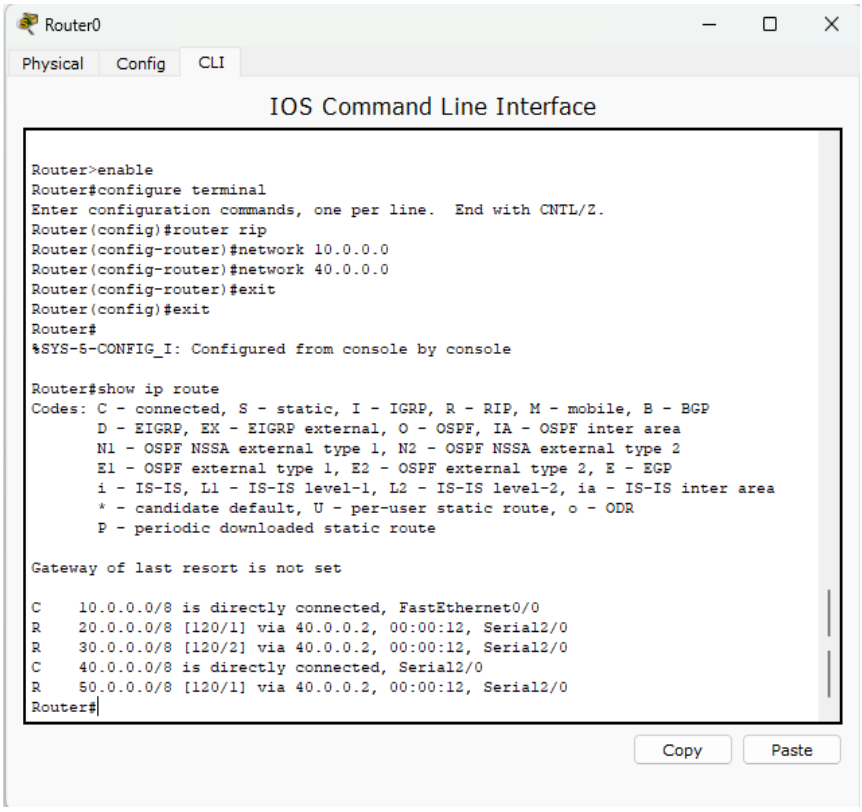
For routes 1:
#network 20.0.0.0
#network 40.0.0.0
#network 50.0.0.0

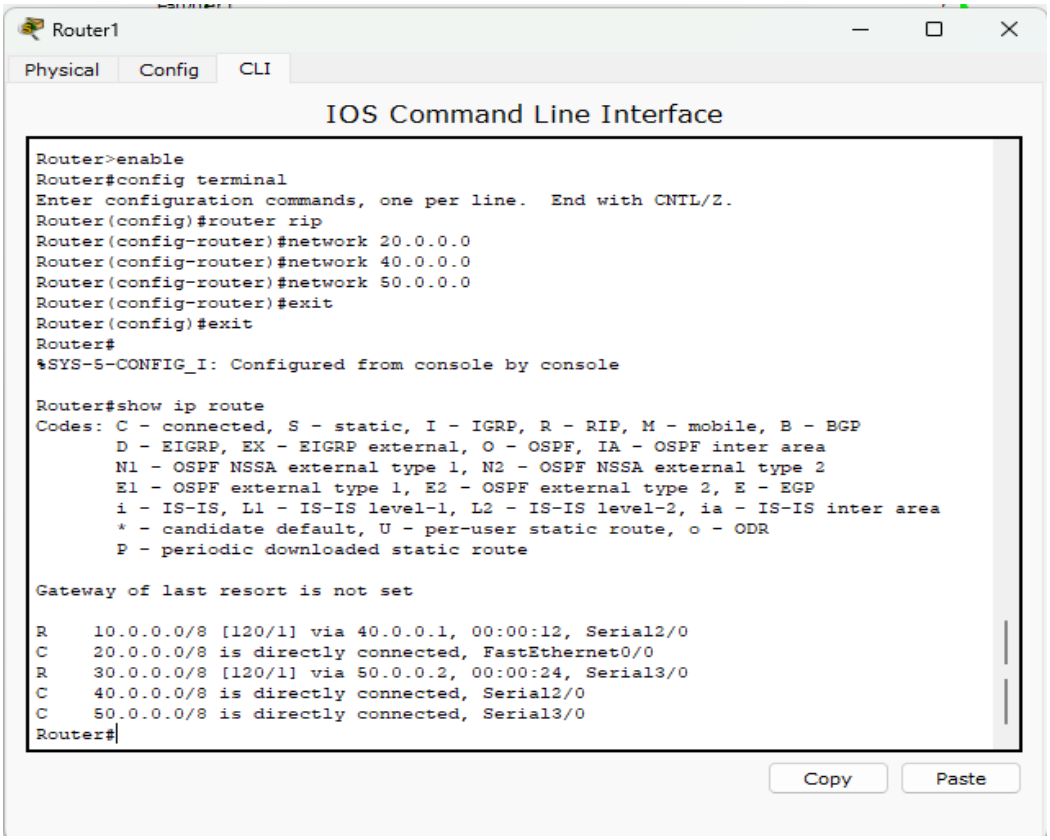
Routes 2 RIP:
#network 30.0.0.0
#network 50.0.0.0

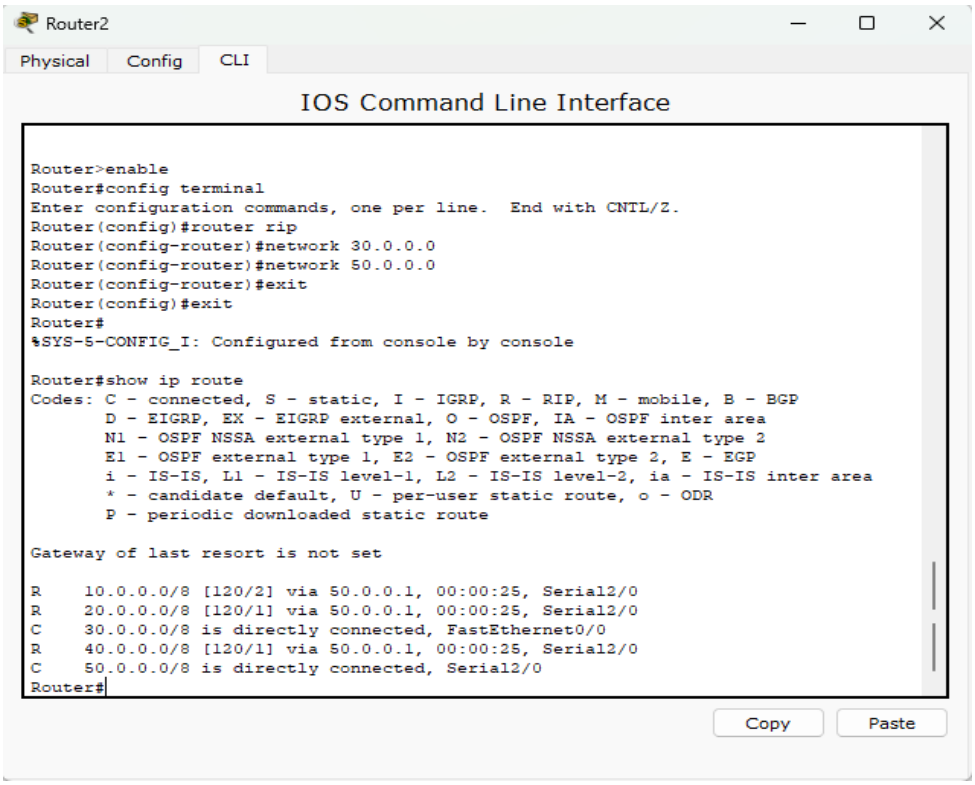
⑥ Check if network addresses are assigned by using command in CLI:
#show ip route

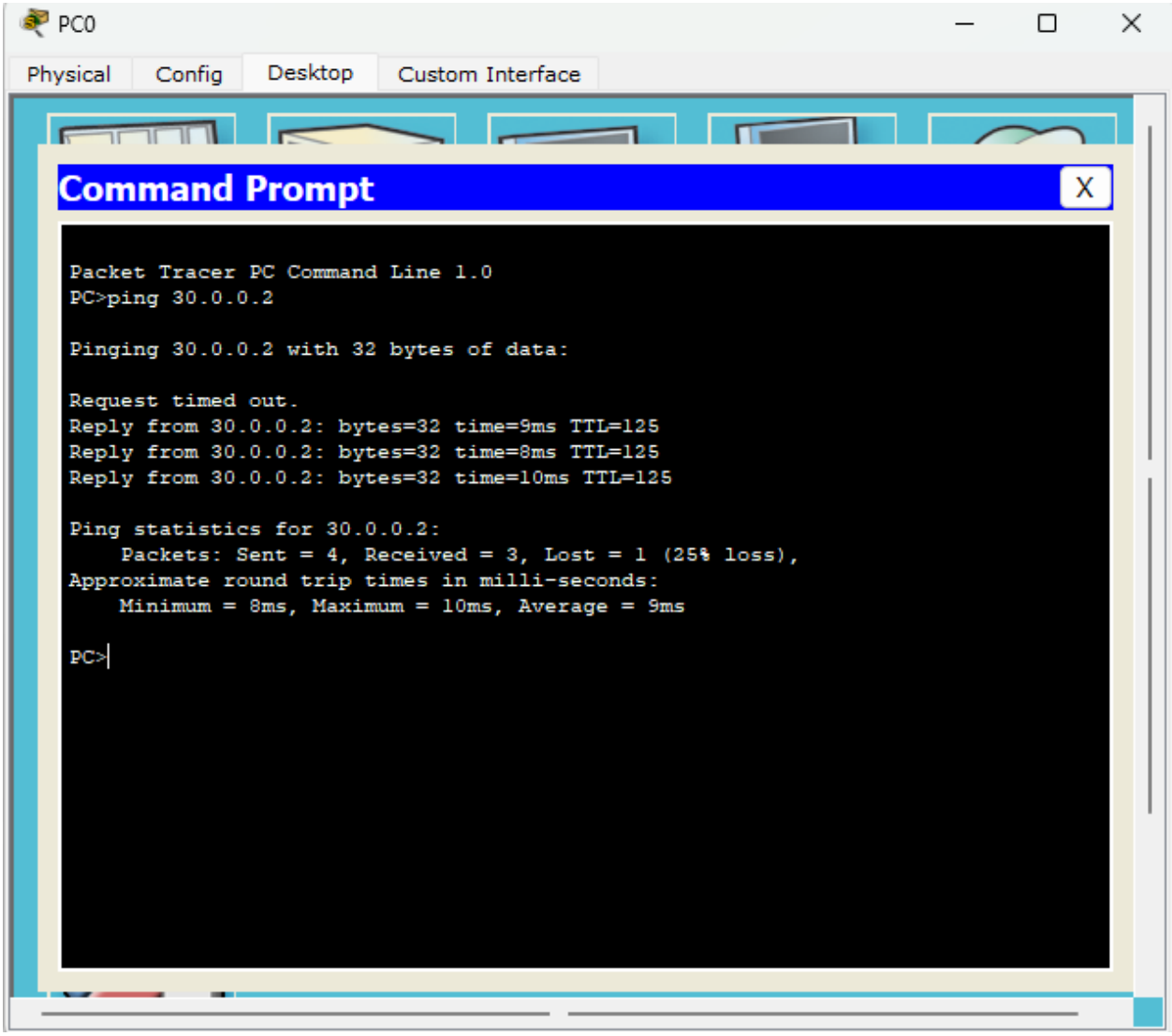
iii. Screen shots/ output



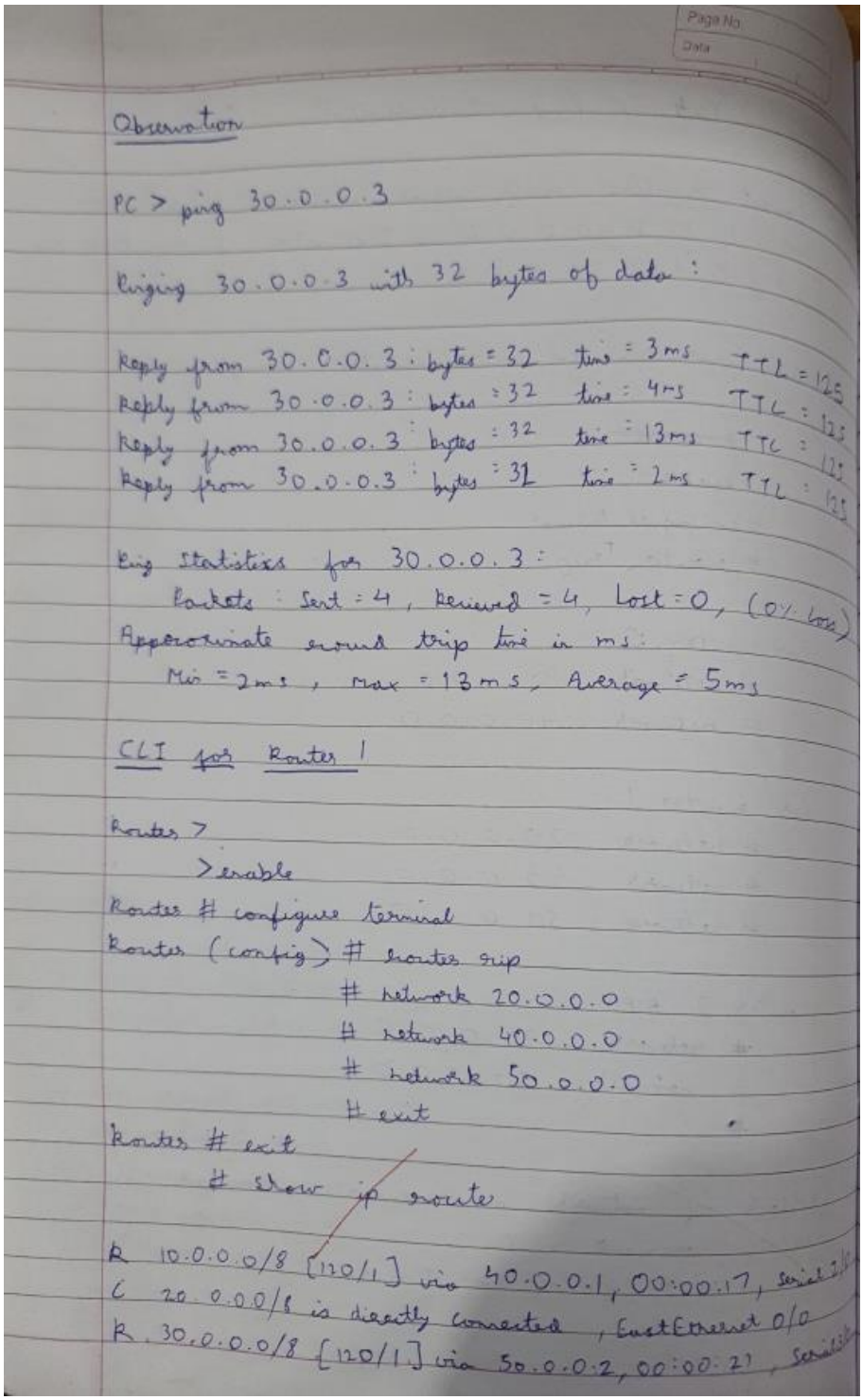



Router1
Physical
Config
CLI
IOS Command Line Interface
Router>enable
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 20.0.0.0
Router(config-router)#network 40.0.0.0
Router(config-router)#network 50.0.0.0
Router(config-router)#exit
Router(config)#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
R 10.0.0.0/8 [120/1] via 40.0.0.1, 00:00:12, Serial2/0
C 20.0.0.0/8 is directly connected, FastEthernet0/0
R 30.0.0.0/8 [120/1] via 50.0.0.2, 00:00:24, Serial3/0
C 40.0.0.0/8 is directly connected, Serial2/0
C 50.0.0.0/8 is directly connected, Serial3/0
Router#
Copy
Paste


Router2
Physical
Config
CLI
IOS Command Line Interface
Router>enable
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 30.0.0.0
Router(config-router)#network 50.0.0.0
Router(config-router)#exit
Router(config)#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
R 10.0.0.0/8 [120/2] via 50.0.0.1, 00:00:25, Serial2/0
R 20.0.0.0/8 [120/1] via 50.0.0.1, 00:00:25, Serial2/0
C 30.0.0.0/8 is directly connected, FastEthernet0/0
R 40.0.0.0/8 [120/1] via 50.0.0.1, 00:00:25, Serial2/0
C 50.0.0.0/8 is directly connected, Serial2/0
Router#
Copy
Paste


PC0
Physical
Config
Desktop
Custom Interface
Command Prompt
X
Packet Tracer PC Command Line 1.0
PC>ping 30.0.0.2
Pinging 30.0.0.2 with 32 bytes of data:
Request timed out.
Reply from 30.0.0.2: bytes=32 time=9ms TTL=125
Reply from 30.0.0.2: bytes=32 time=8ms TTL=125
Reply from 30.0.0.2: bytes=32 time=10ms TTL=125
Ping statistics for 30.0.0.2:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 8ms, Maximum = 10ms, Average = 9ms
PC>

iv. Observation



Observation

PC > ping 30.0.0.3

Pinging 30.0.0.3 with 32 bytes of data :

Reply from 30.0.0.3 : bytes = 32 time = 3ms TTL = 125
Reply from 30.0.0.3 : bytes = 32 time = 4ms TTL = 125
Reply from 30.0.0.3 : bytes = 32 time = 13ms TTL = 125
Reply from 30.0.0.3 : bytes = 32 time = 2ms TTL = 125

Ping Statistics for 30.0.0.3 :
Packets : Sent = 4, Received = 4, Lost = 0, (0% loss)
Approximate round trip time in ms :
Min = 2ms, max = 13ms, Average = 5ms

CLI for Router 1

Router >
>enable
Router # configure terminal
Router (config) # router rip
network 20.0.0.0
network 40.0.0.0
network 50.0.0.0
exit
Router # exit
show ip route

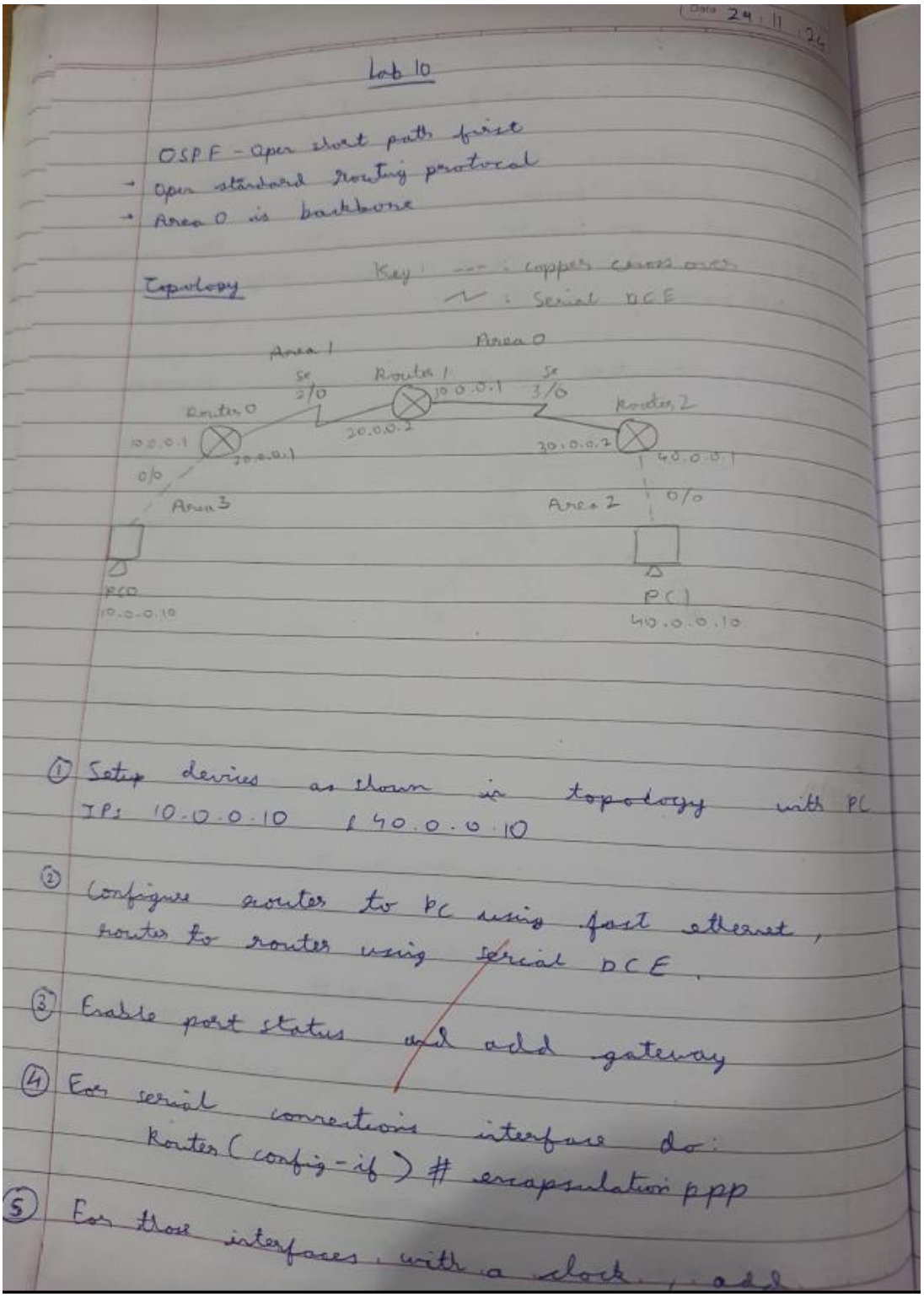
R 10.0.0.0/8 [120/1] via 40.0.0.1, 00:00:17, Serial 2/0
C 20.0.0.0/8 is directly connected, FastEthernet 0/0
R 30.0.0.0/8 [120/1] via 50.0.0.2, 00:00:21, Serial 3/0

Program 6

i. Aim of the program

Configure OSPF routing protocol

ii. Procedure along with the topology



rate

Router (config-if) # clock ^ 6400

⑥ Enable ip routing by configuration ospf routing protocal by following commands.

Router (config) # router ospf 1

R1 : Router (config-if) # router-id 1.1.1.1
network 10.0.0.0 0.255.255.2
area 3
network 20.0.0.0 0.255.255.255
area 1

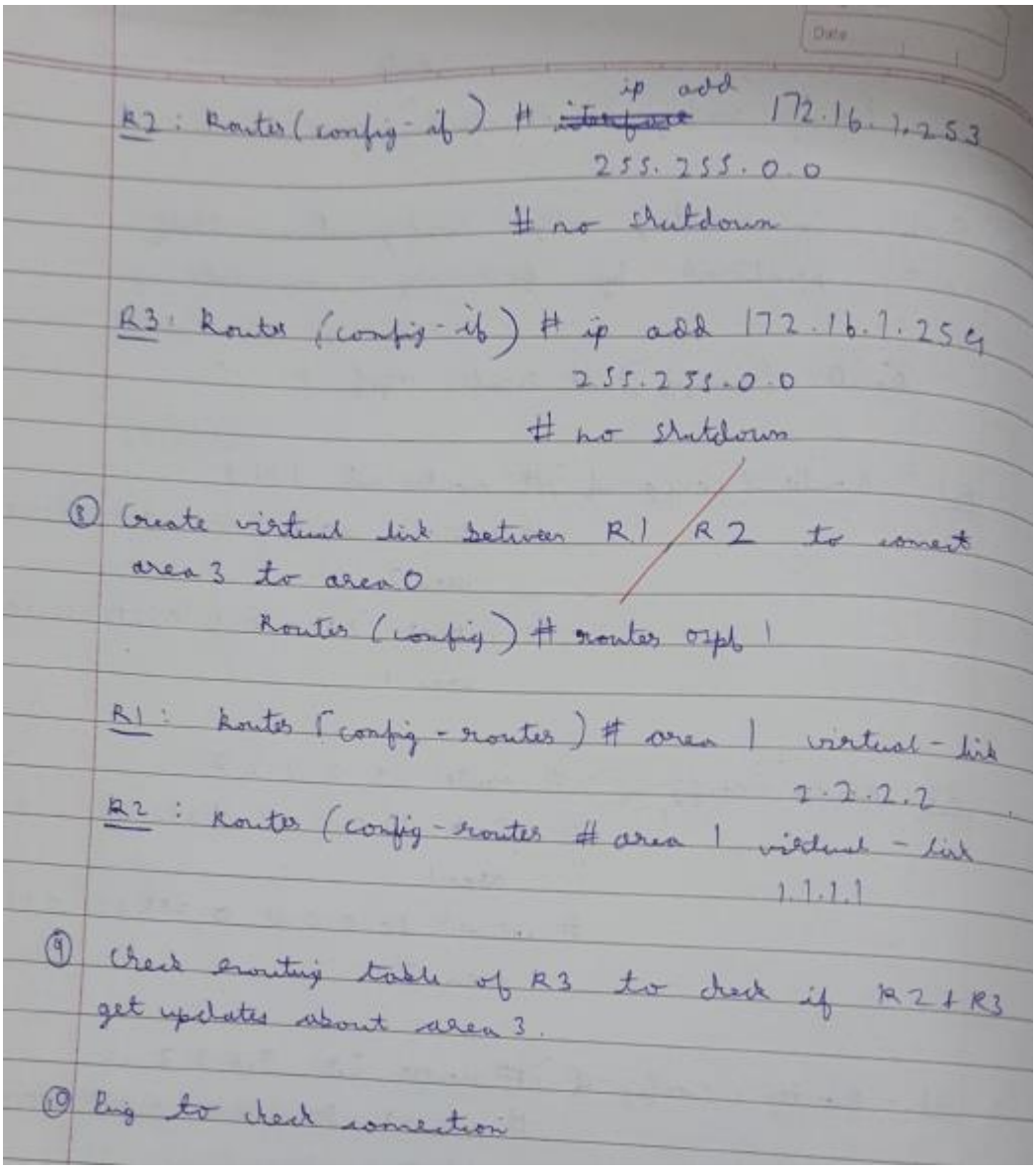
R2 : Router (config-if) # router-id 2.2.2.2
network 20.0.0.0 0.255.255.255
area 1
network 30.0.0.0 0.255.255.255
area 0

R3 : Router (config-if) # router-id 3.3.3.3
network 30.0.0.0 0.255.255.255
area 0
network 40.0.0.0 0.255.255.255
area 2

⑦ Make interface to keep ospf process running using

Router (config) # interface Loopback 0

R1 : Router (config-if) # ip add 172.16.1.252
255.255.0.0
no shutdown



R2 : Router (config-if) # ip add 172.16.1.253
255.255.0.0
no shutdown

R3 : Router (config-if) # ip add 172.16.1.254
255.255.0.0
no shutdown

⑧ Create virtual link between R1 & R2 to convert area 3 to area 0
Router (config) # router ospf 1

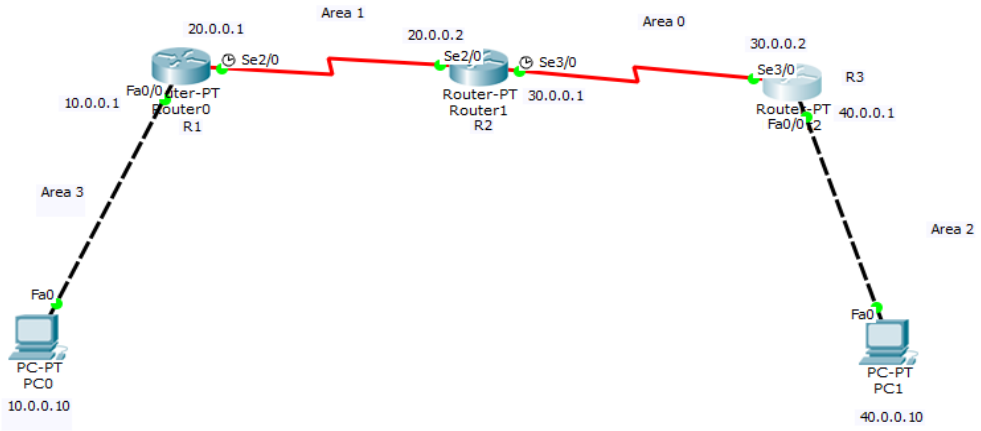
R1 : Router (config-router) # area 1 virtual-link 2.2.2.2

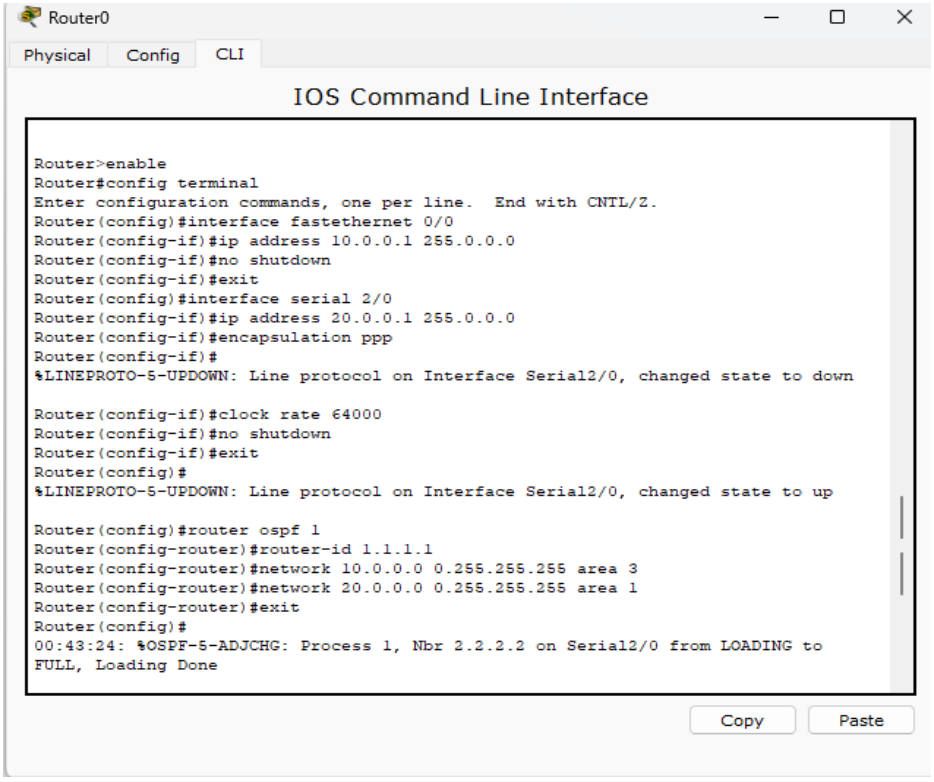
R2 : Router (config-router # area 1 virtual-link 1.1.1.1

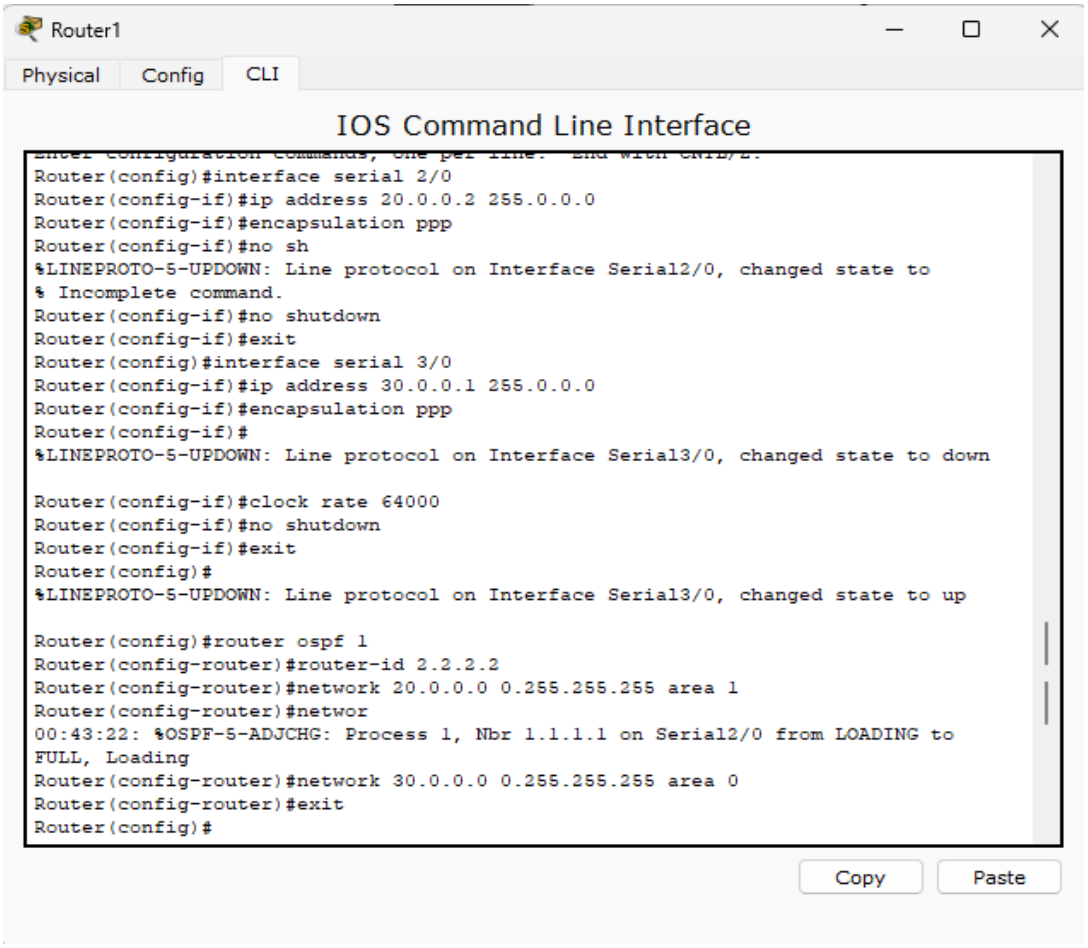
⑨ Check routing table of R3 to check if R2 & R3 get updates about area 3.

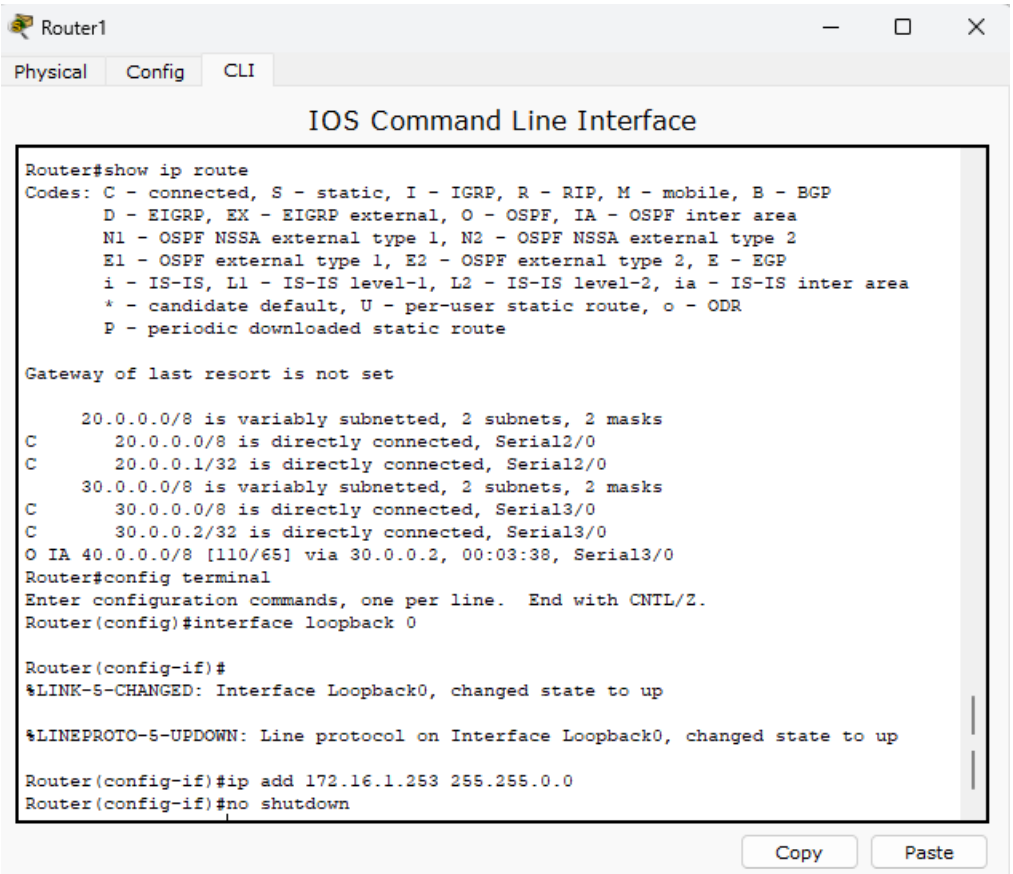
⑩ Ping to check connection

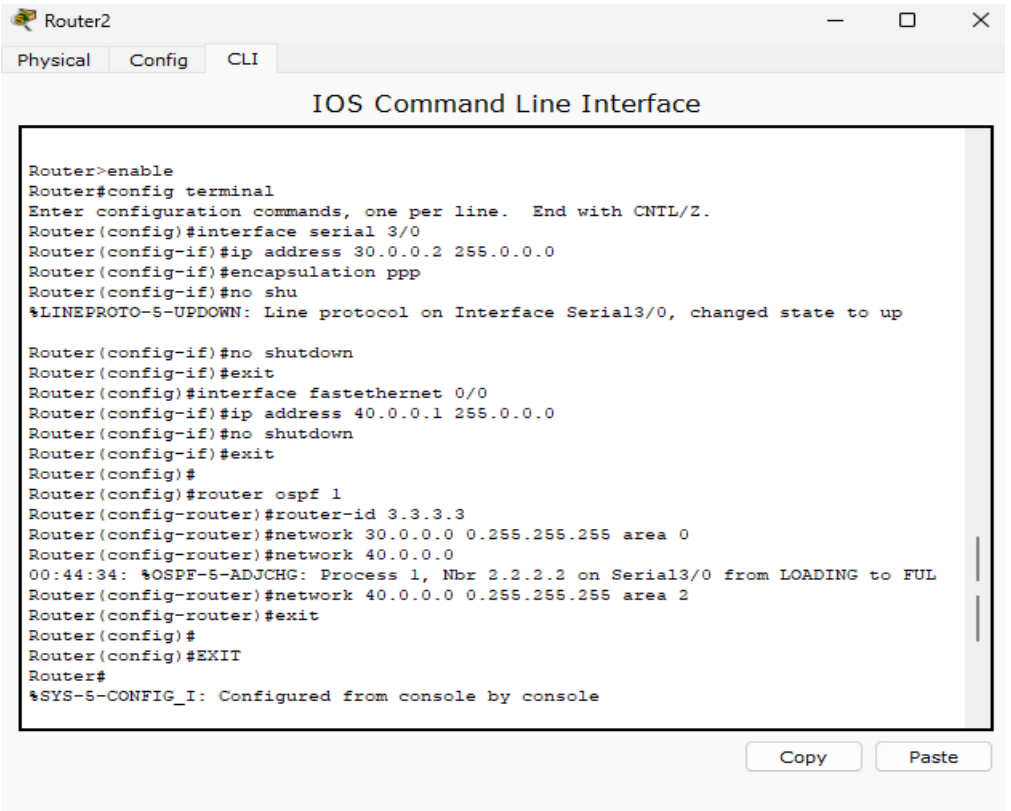
iii. Screen shots/ output

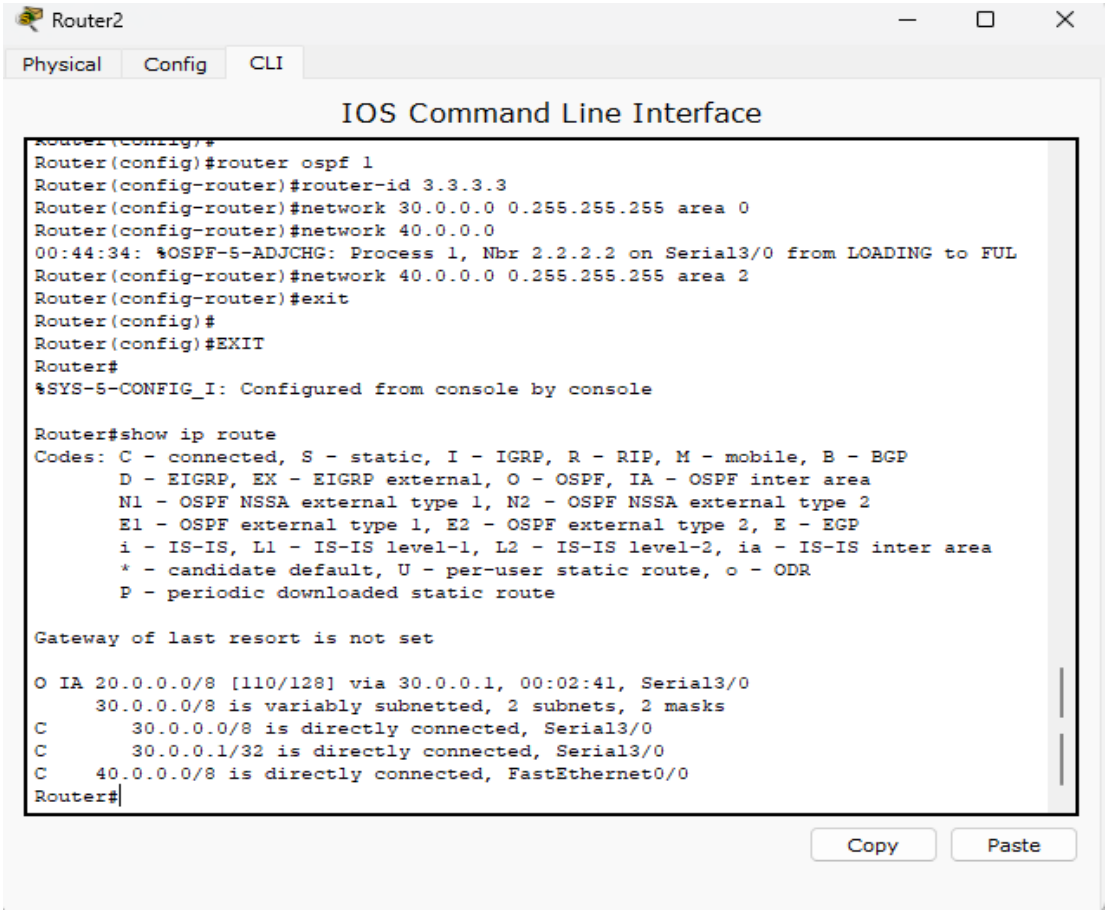


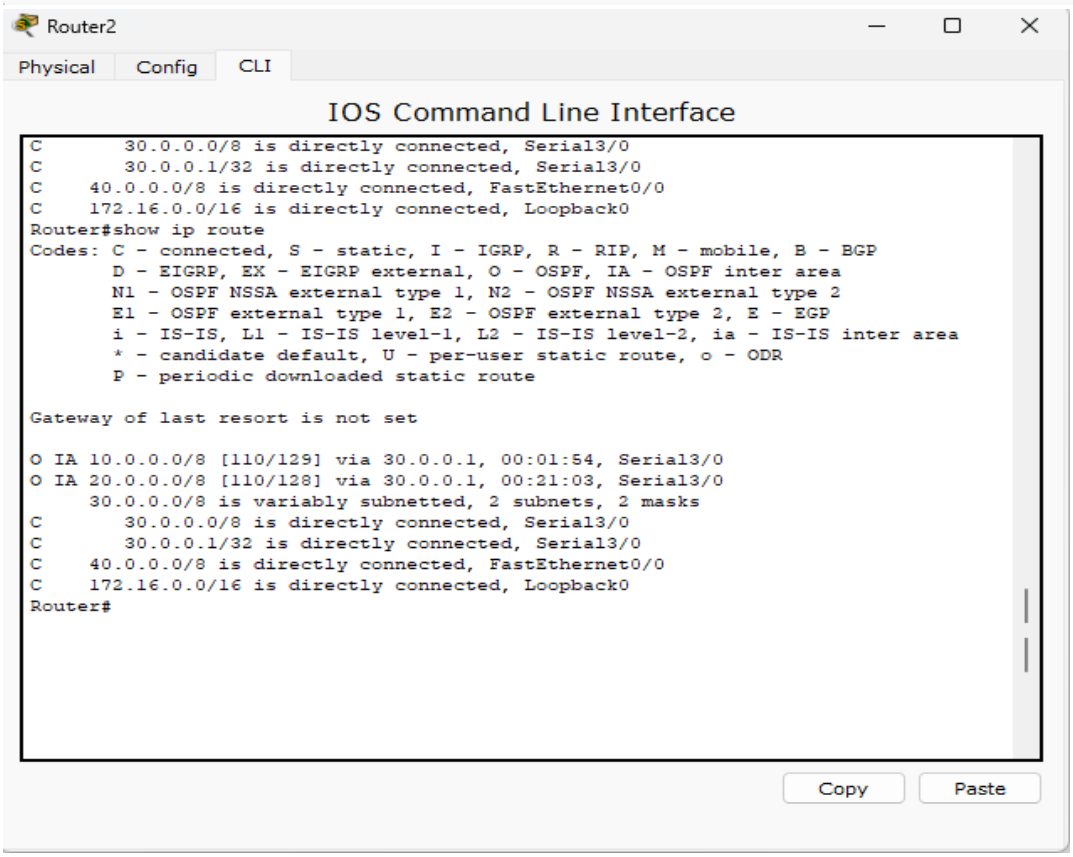


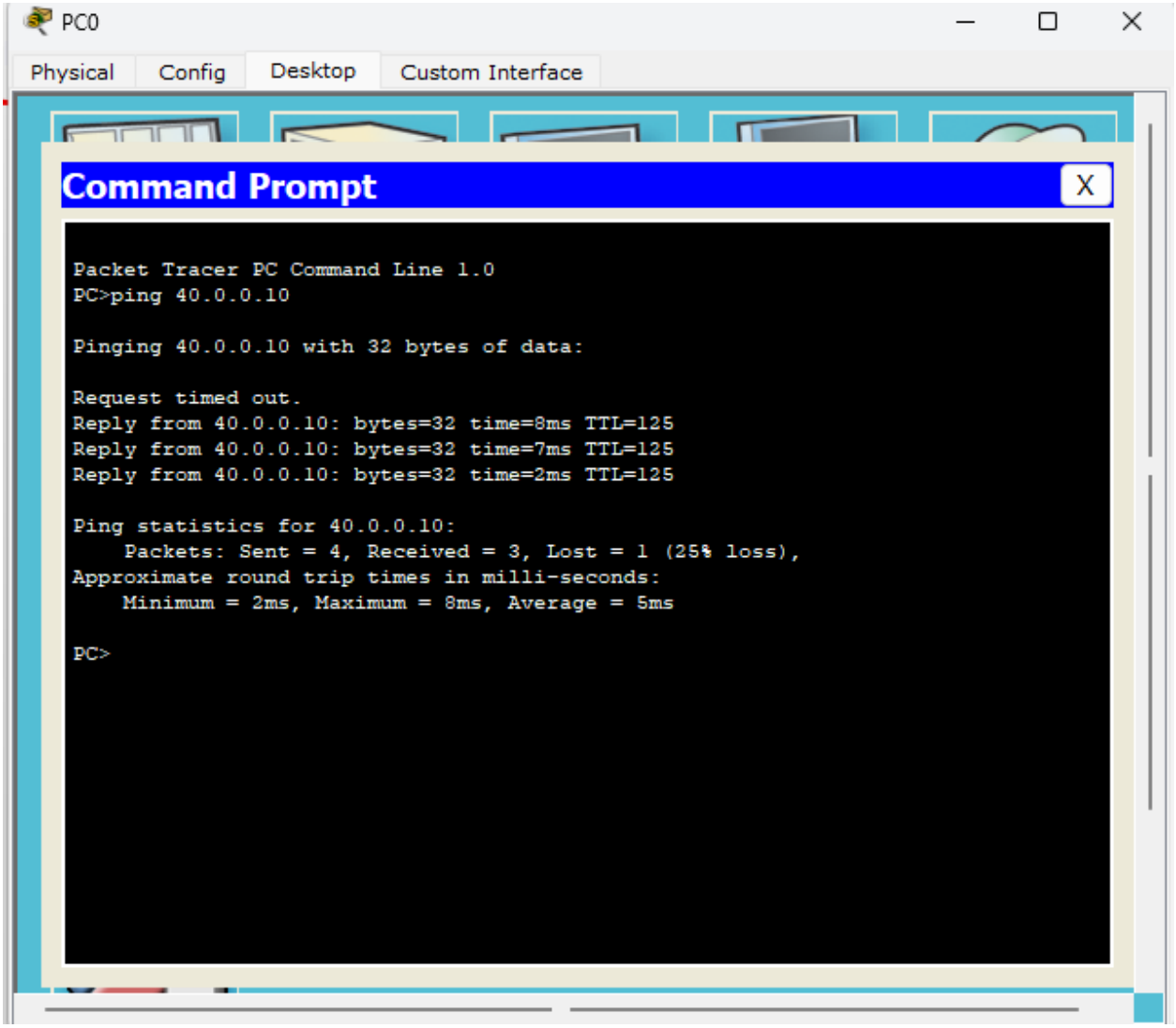

Router1
Physical
Config
CLI
IOS Command Line Interface
Router(config)#interface serial 2/0
Router(config-if)#ip address 20.0.0.2 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#no sh
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to
% Incomplete command.
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#interface serial 3/0
Router(config-if)#ip address 30.0.0.1 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to down
Router(config-if)#clock rate 64000
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to up
Router(config)#router ospf 1
Router(config-router)#router-id 2.2.2.2
Router(config-router)#network 20.0.0.0 0.255.255.255 area 1
Router(config-router)#networ
00:43:22: %OSPF-5-ADJCHG: Process 1, Nbr 1.1.1.1 on Serial2/0 from LOADING to
FULL, Loading
Router(config-router)#network 30.0.0.0 0.255.255.255 area 0
Router(config-router)#exit
Router(config)#
Copy
Paste


Router1
Physical
Config
CLI
IOS Command Line Interface
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
20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 20.0.0.0/8 is directly connected, Serial2/0
C 20.0.0.1/32 is directly connected, Serial2/0
30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 30.0.0.0/8 is directly connected, Serial3/0
C 30.0.0.2/32 is directly connected, Serial3/0
O IA 40.0.0.0/8 [110/65] via 30.0.0.2, 00:03:38, Serial3/0
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface loopback 0
Router(config-if)#
%LINK-5-CHANGED: Interface Loopback0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up
Router(config-if)#ip add 172.16.1.253 255.255.0.0
Router(config-if)#no shutdown
Copy
Paste

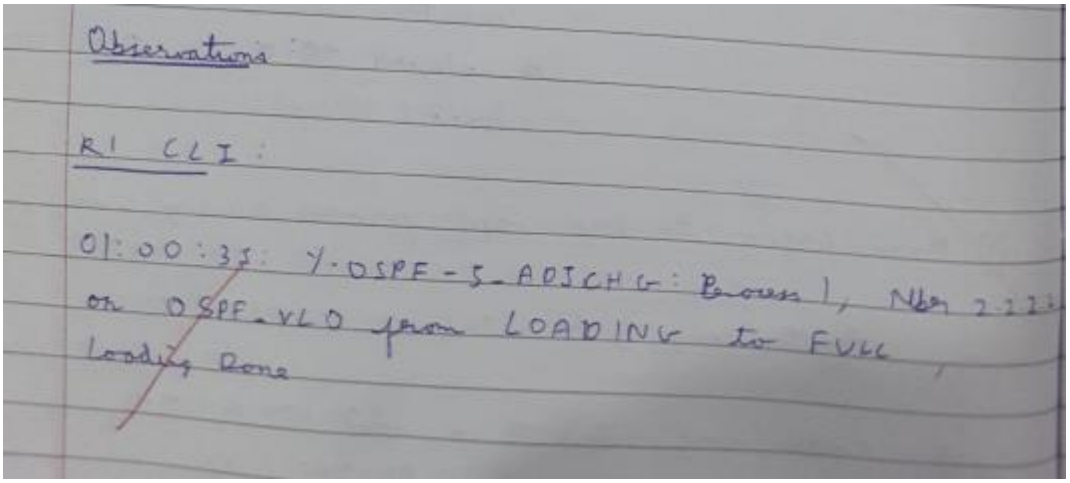

Router2
Physical
Config
CLI
IOS Command Line Interface
Router>enable
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface serial 3/0
Router(config-if)#ip address 30.0.0.2 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#no shu
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to up
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#interface fastethernet 0/0
Router(config-if)#ip address 40.0.0.1 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#
Router(config)#router ospf 1
Router(config-router)#router-id 3.3.3.3
Router(config-router)#network 30.0.0.0 0.255.255.255 area 0
Router(config-router)#network 40.0.0.0
00:44:34: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on Serial3/0 from LOADING to FUL
Router(config-router)#network 40.0.0.0 0.255.255.255 area 2
Router(config-router)#exit
Router(config)#
Router(config)#EXIT
Router#
%SYS-5-CONFIG_I: Configured from console by console
Copy
Paste


Router2
Physical
Config
CLI
IOS Command Line Interface
Router(config)#router ospf 1
Router(config-router)#router-id 3.3.3.3
Router(config-router)#network 30.0.0.0 0.255.255.255 area 0
Router(config-router)#network 40.0.0.0
00:44:34: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on Serial3/0 from LOADING to FUL
Router(config-router)#network 40.0.0.0 0.255.255.255 area 2
Router(config-router)#exit
Router(config)#
Router(config)#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
O IA 20.0.0.0/8 [110/128] via 30.0.0.1, 00:02:41, Serial3/0
30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 30.0.0.0/8 is directly connected, Serial3/0
C 30.0.0.1/32 is directly connected, Serial3/0
C 40.0.0.0/8 is directly connected, FastEthernet0/0
Router#
Copy
Paste


Router2
Physical
Config
CLI
IOS Command Line Interface
C 30.0.0.0/8 is directly connected, Serial3/0
C 30.0.0.1/32 is directly connected, Serial3/0
C 40.0.0.0/8 is directly connected, FastEthernet0/0
C 172.16.0.0/16 is directly connected, Loopback0
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
O IA 10.0.0.0/8 [110/129] via 30.0.0.1, 00:01:54, Serial3/0
O IA 20.0.0.0/8 [110/128] via 30.0.0.1, 00:21:03, Serial3/0
30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 30.0.0.0/8 is directly connected, Serial3/0
C 30.0.0.1/32 is directly connected, Serial3/0
C 40.0.0.0/8 is directly connected, FastEthernet0/0
C 172.16.0.0/16 is directly connected, Loopback0
Router#
Copy
Paste



iv. Observation



CMD of PC0

PC > ping 40.0.0.10
Pinging 40.0.0.10 with 32 bytes of data:

Reply from 40.0.0.10: bytes=32 time=5ms TTL=125
Reply from 40.0.0.10: bytes=32 time=6ms TTL=125
Reply from 40.0.0.10: bytes=32 time=5ms TTL=125
Reply from 40.0.0.10: bytes=32 time=2ms TTL=125

Ping statistics for 40.0.0.10
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss)
Approx round trip in ms:
Min = 2ms, Max = 6ms, Average = 4ms

CLI of R3

Router # show ip route

O IA 10.0.0.0/8 [110/129] via 30.0.0.1 00:00:26
Serial 3/0
O IA 20.0.0.0/8 [110/128] via 30.0.0.1 00:00:26
Serial 3/0
30.0.0.0/8 is variably subnetted, 2 subnets, 2 mask
C 30.0.0.0/8 is directly connected, Serial 3/0
C 30.0.0.1/32 is directly connected, Serial 3/0
C 40.0.0.0/8 is directly connected, FastEthernet 0/0
C 172.16.0.0/16 is directly connected, Loopback 0

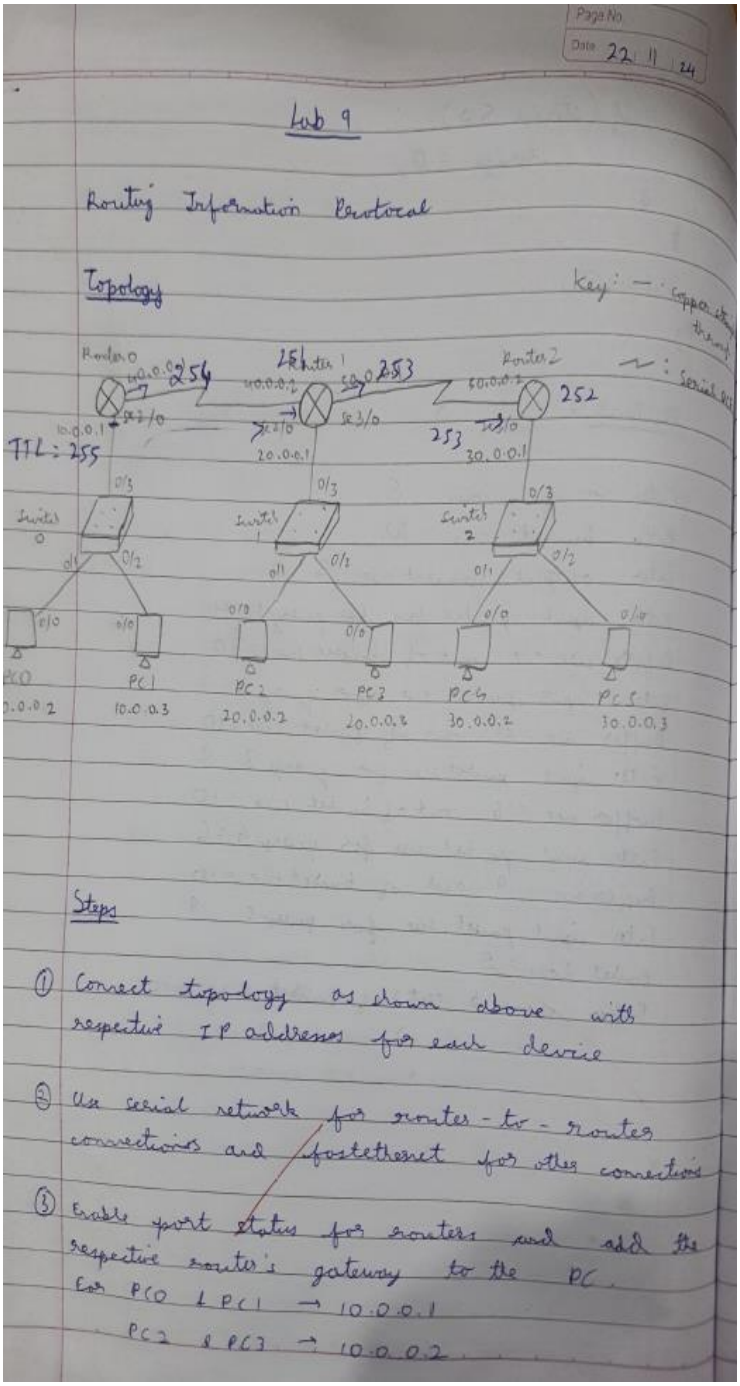
29/11

Program 7

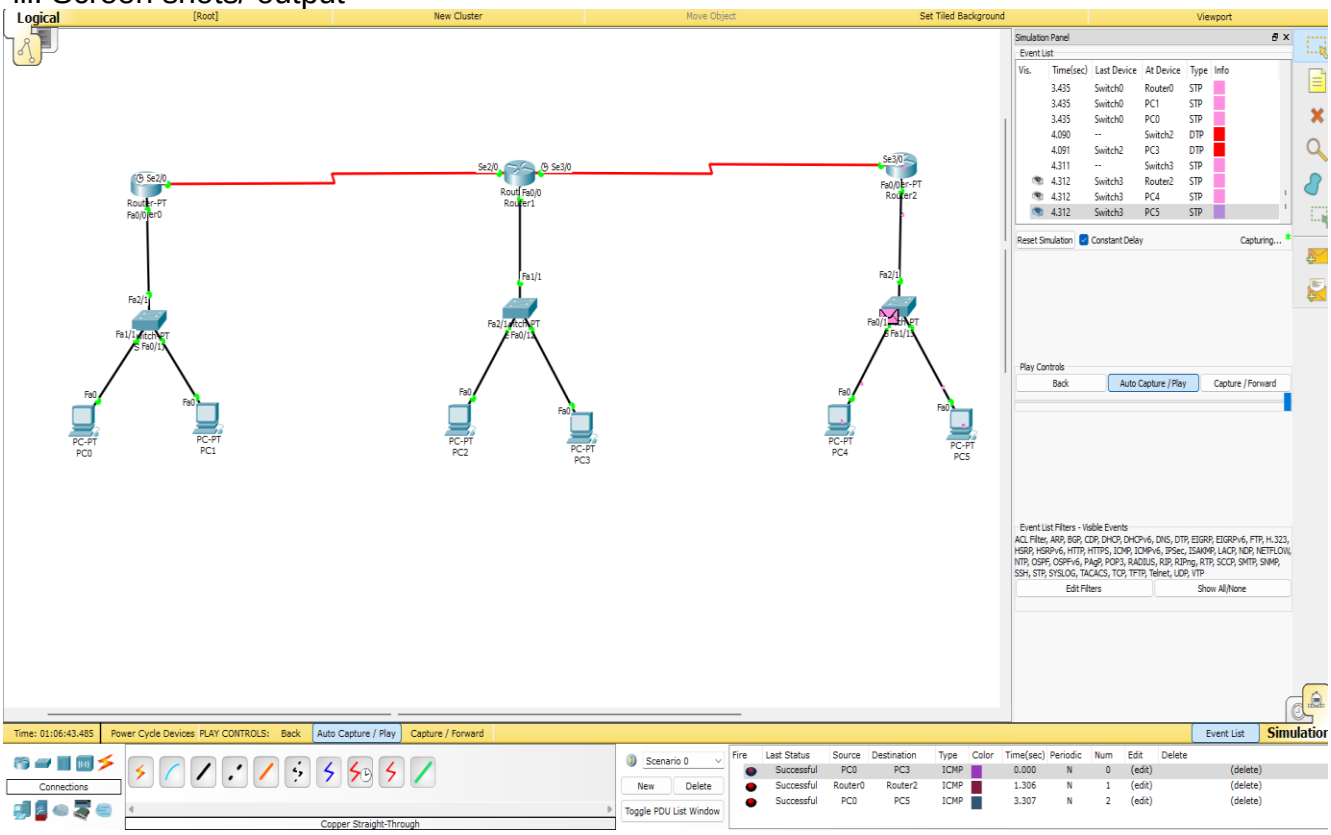
i. Aim of the program

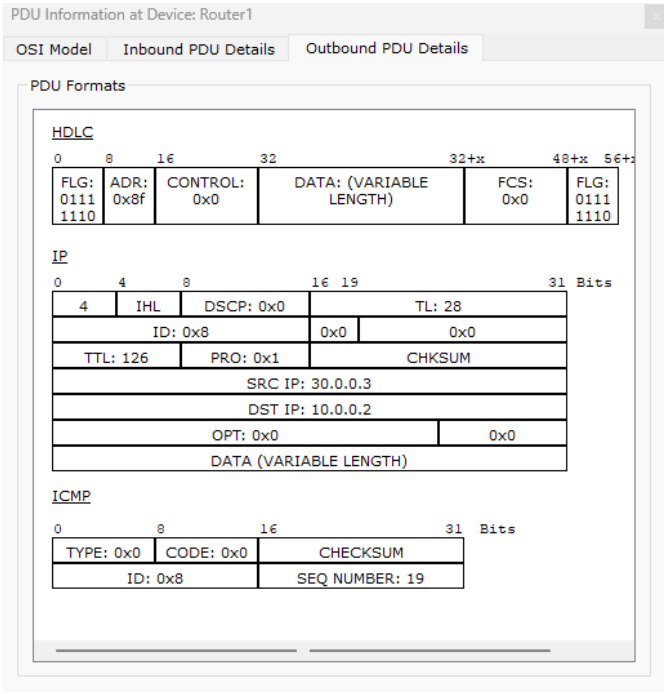
Demonstrate the TTL/ Life of a Packet

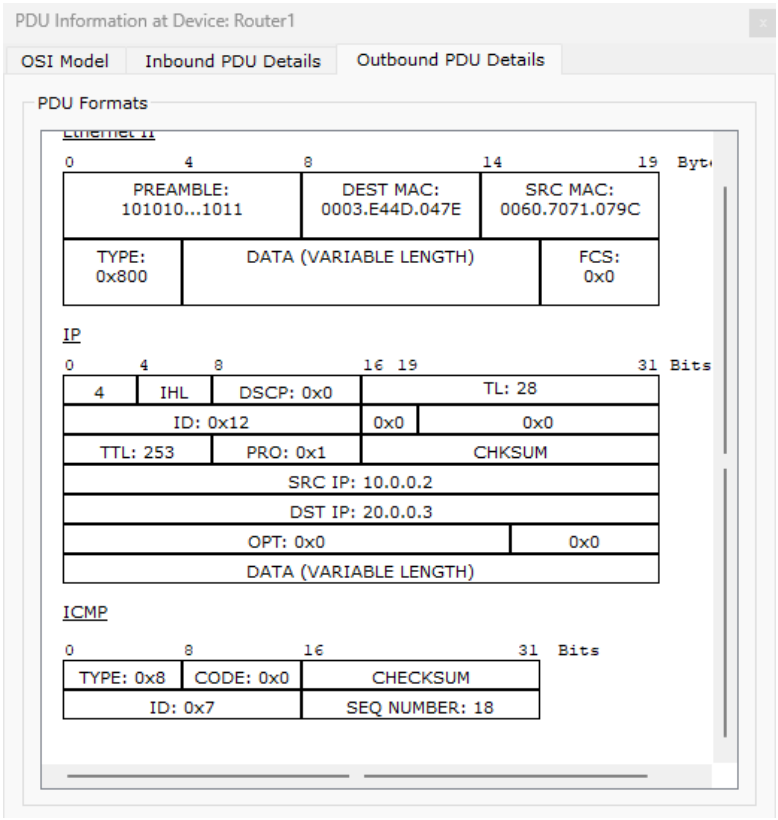
ii. Procedure along with the topology

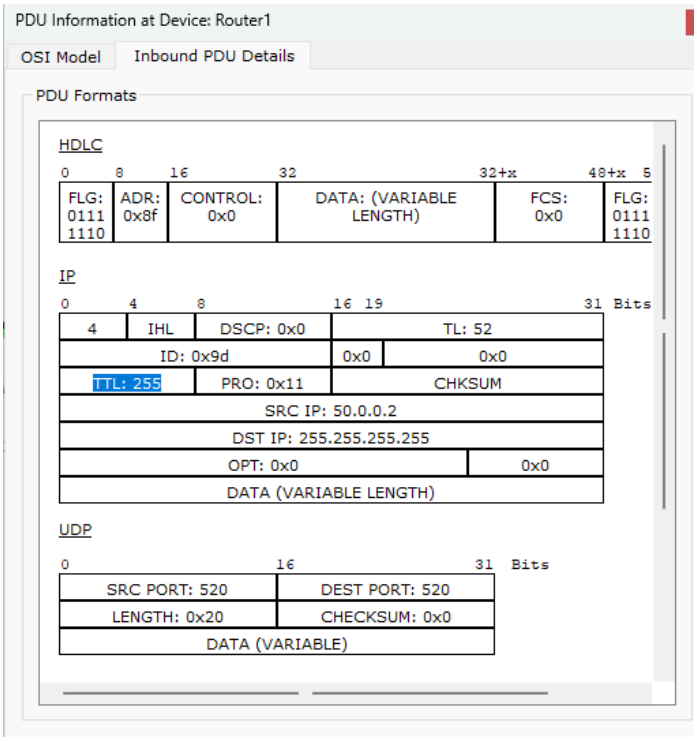


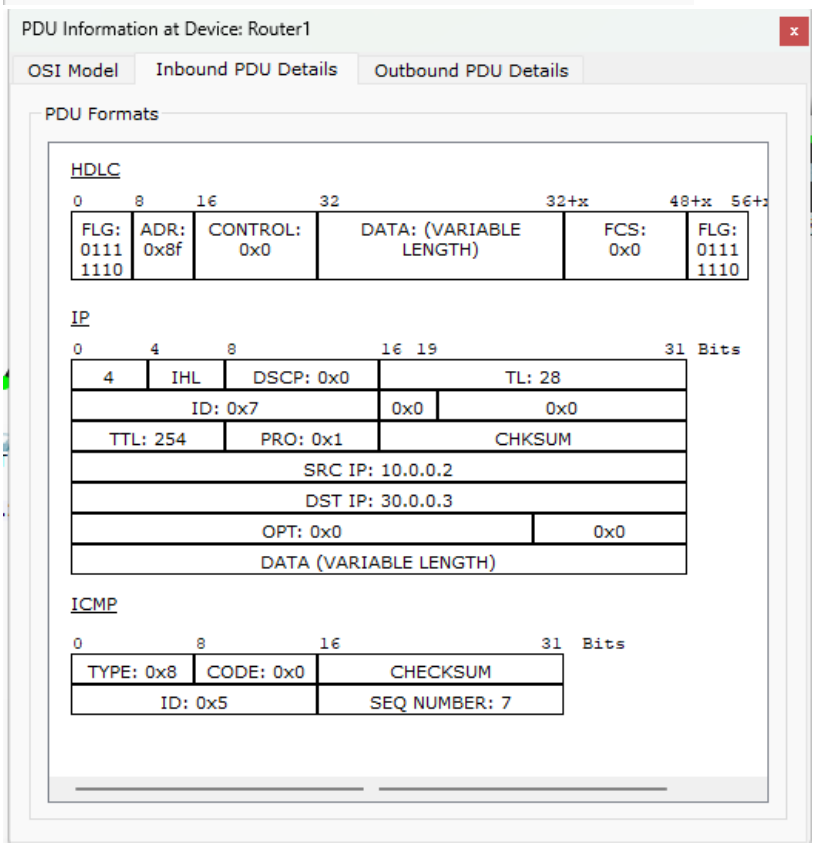
iii. Screen shots/ output



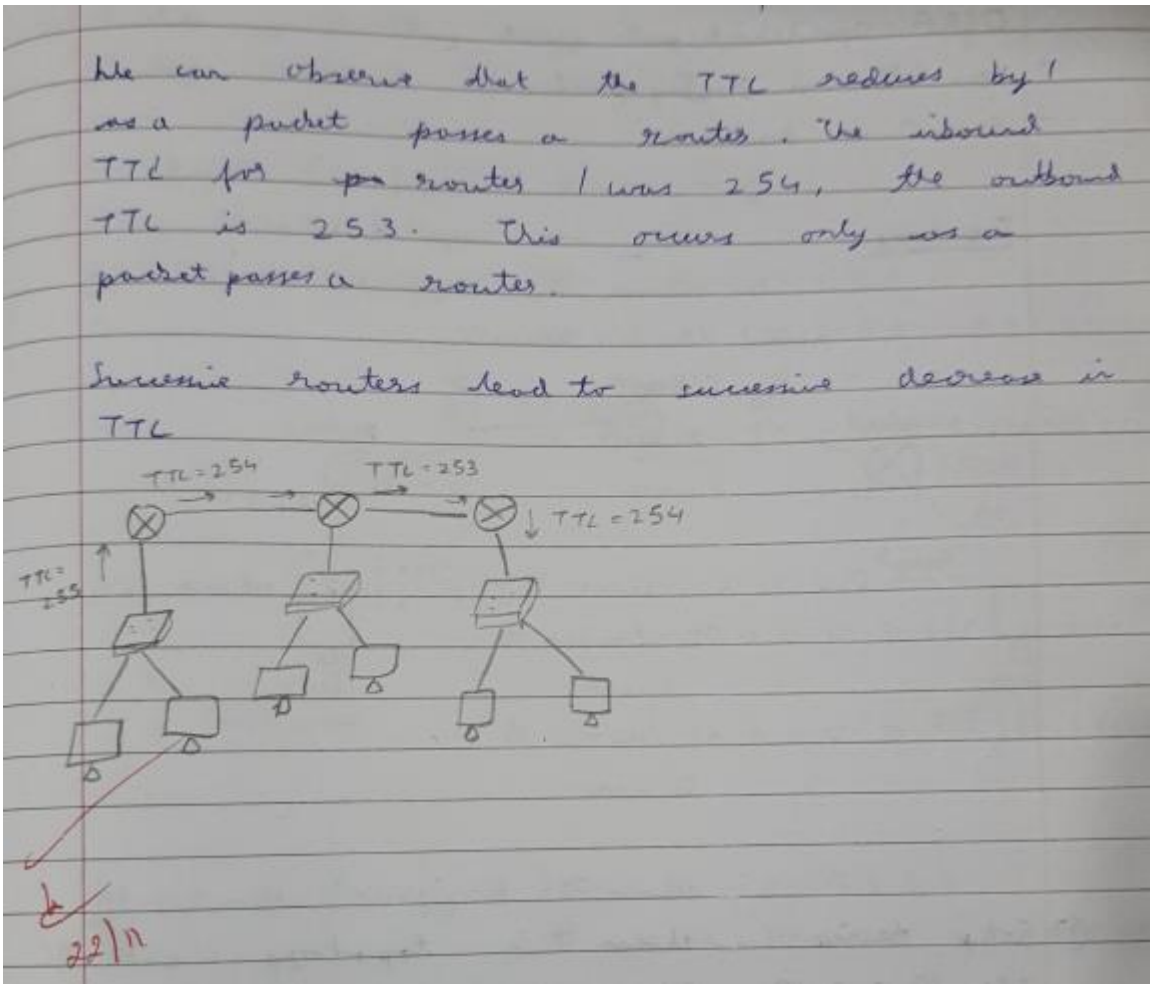

PDU Information at Device: Router1
OSI Model
Inbound PDU Details
Outbound PDU Details
PDU Formats
HDLC
0 8 16 32 32+x 48+x 56+x
FLG: 0111 1110
ADR: 0x8f
CONTROL: 0x0
DATA: (VARIABLE LENGTH)
FCS: 0x0
FLG: 0111 1110
IP
0 4 8 16 19 31 Bits
4
IHL
DSCP: 0x0
TL: 28
ID: 0x8
0x0
0x0
TTL: 126
PRO: 0x1
CHKSUM
SRC IP: 30.0.0.3
DST IP: 10.0.0.2
OPT: 0x0
0x0
DATA (VARIABLE LENGTH)
ICMP
0 8 16 31 Bits
TYPE: 0x0
CODE: 0x0
CHECKSUM
ID: 0x8
SEQ NUMBER: 19


PDU Information at Device: Router1
OSI Model
Inbound PDU Details
Outbound PDU Details
PDU Formats
Ethernet II
0 4 8 14 19 Byt
PREAMBLE: 101010...1011
DEST MAC: 0003.E44D.047E
SRC MAC: 0060.7071.079C
TYPE: 0x800
DATA (VARIABLE LENGTH)
FCS: 0x0
IP
0 4 8 16 19 31 Bits
4
IHL
DSCP: 0x0
TL: 28
ID: 0x12
0x0
0x0
TTL: 253
PRO: 0x1
CHKSUM
SRC IP: 10.0.0.2
DST IP: 20.0.0.3
OPT: 0x0
0x0
DATA (VARIABLE LENGTH)
ICMP
0 8 16 31 Bits
TYPE: 0x8
CODE: 0x0
CHECKSUM
ID: 0x7
SEQ NUMBER: 18


PDU Information at Device: Router1
OSI Model
Inbound PDU Details
PDU Formats
HDLC
0 8 16 32 32+x 48+x 5
FLG: 0111 1110
ADR: 0x8f
CONTROL: 0x0
DATA: (VARIABLE LENGTH)
FCS: 0x0
FLG: 0111 1110
IP
0 4 8 16 19 31 Bits
4
IHL
DSCP: 0x0
TL: 52
ID: 0x9d
0x0
0x0
TTL: 255
PRO: 0x11
CHKSUM
SRC IP: 50.0.0.2
DST IP: 255.255.255.255
OPT: 0x0
0x0
DATA (VARIABLE LENGTH)
UDP
0 16 31 Bits
SRC PORT: 520
DEST PORT: 520
LENGTH: 0x20
CHECKSUM: 0x0
DATA (VARIABLE)


PDU Information at Device: Router1
OSI Model
Inbound PDU Details
Outbound PDU Details
PDU Formats
HDLC
0 8 16 32 32+x 48+x 56+x
FLG: 0111 1110
ADR: 0x8f
CONTROL: 0x0
DATA: (VARIABLE LENGTH)
FCS: 0x0
FLG: 0111 1110
IP
0 4 8 16 19 31 Bits
4
IHL
DSCP: 0x0
TL: 28
ID: 0x7
0x0
0x0
TTL: 254
PRO: 0x1
CHKSUM
SRC IP: 10.0.0.2
DST IP: 30.0.0.3
OPT: 0x0
0x0
DATA (VARIABLE LENGTH)
ICMP
0 8 16 31 Bits
TYPE: 0x8
CODE: 0x0
CHECKSUM
ID: 0x5
SEQ NUMBER: 7

iv. Observation

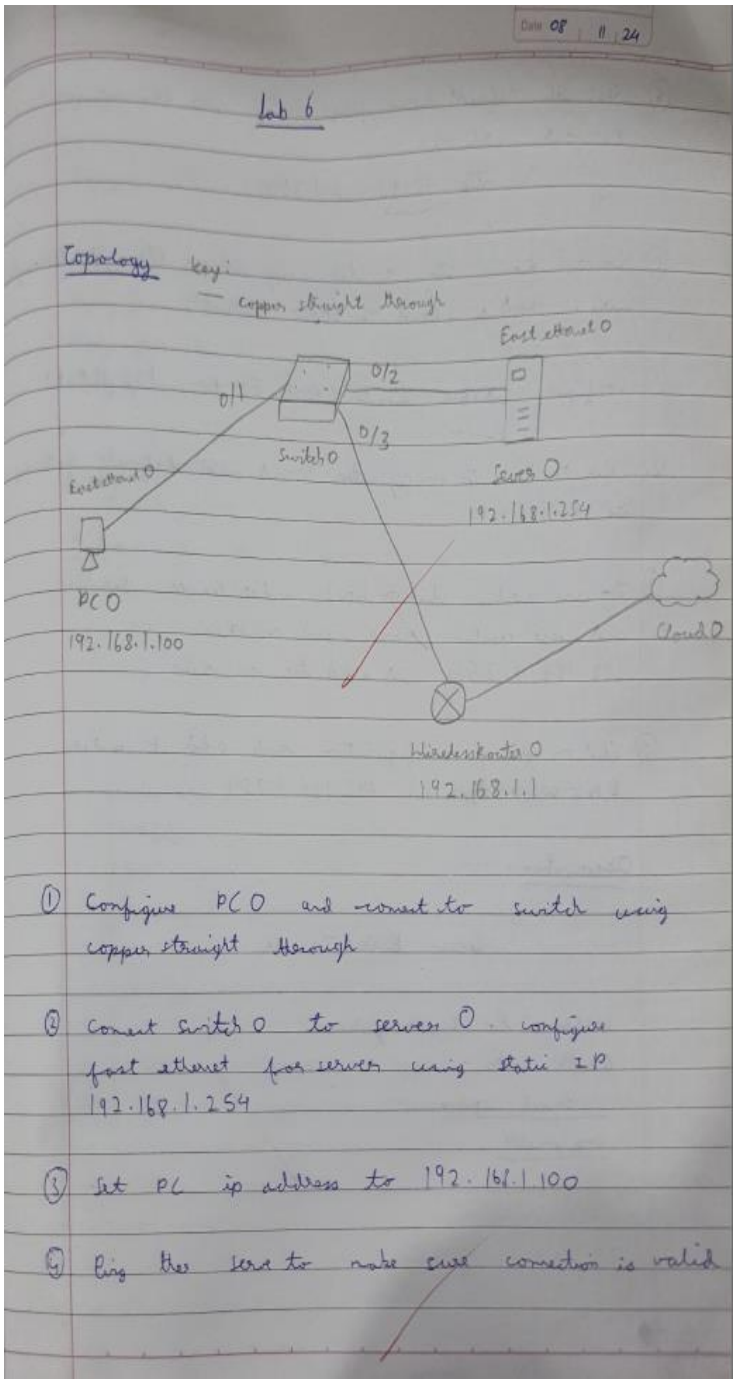


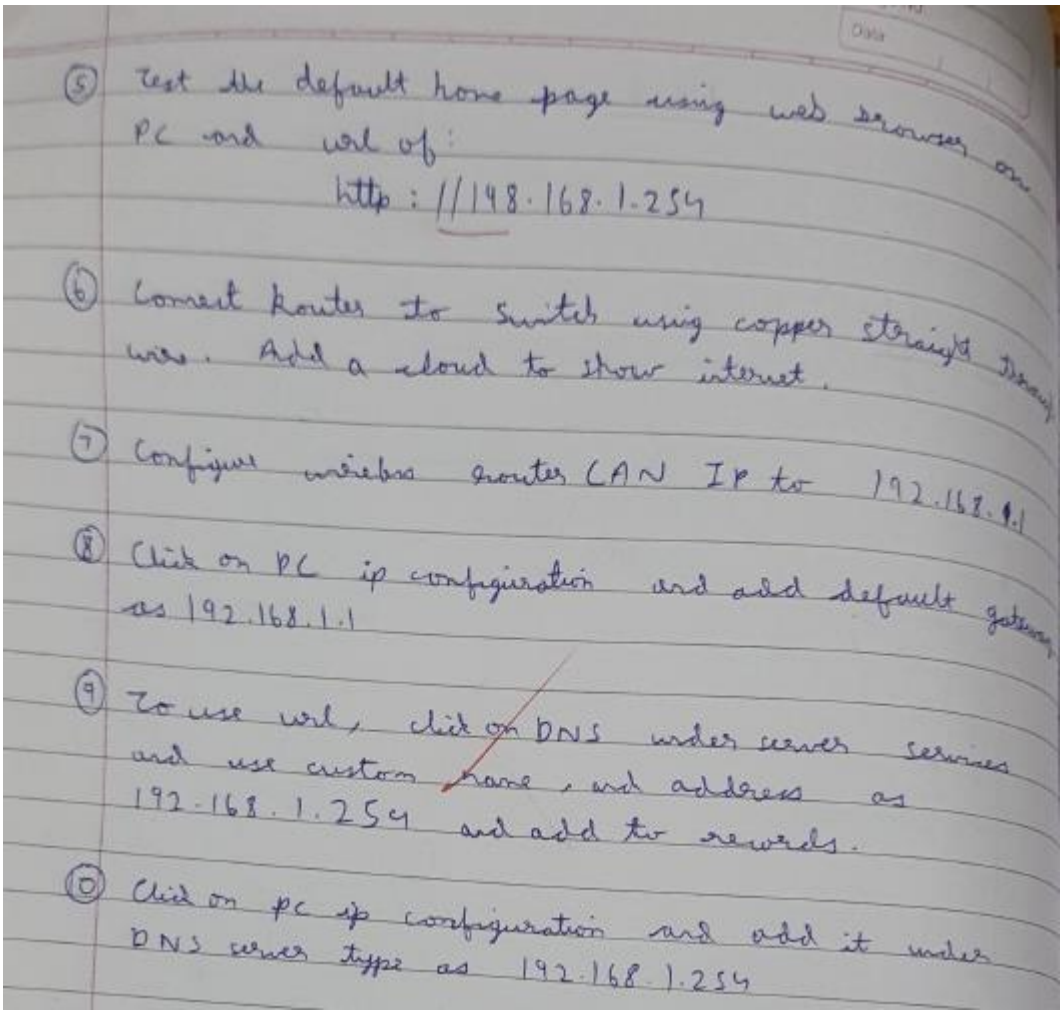
Program 8

i. Aim of the program

Configure Web Server, DNS within a LAN.

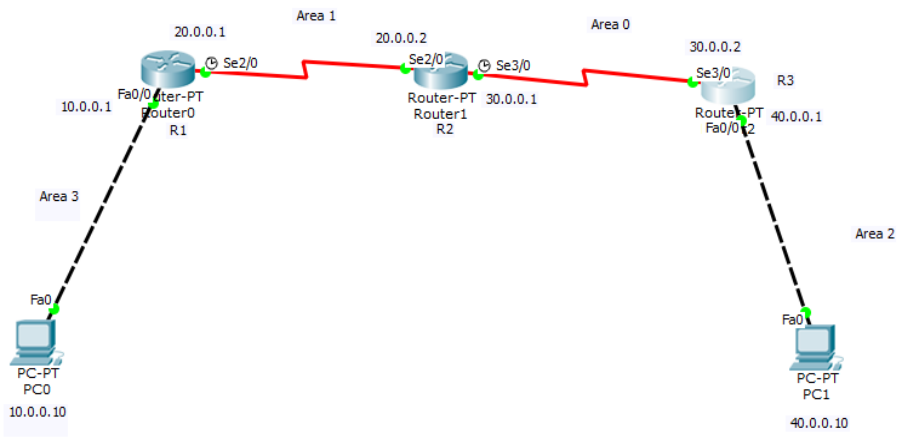
ii. Procedure along with the topology

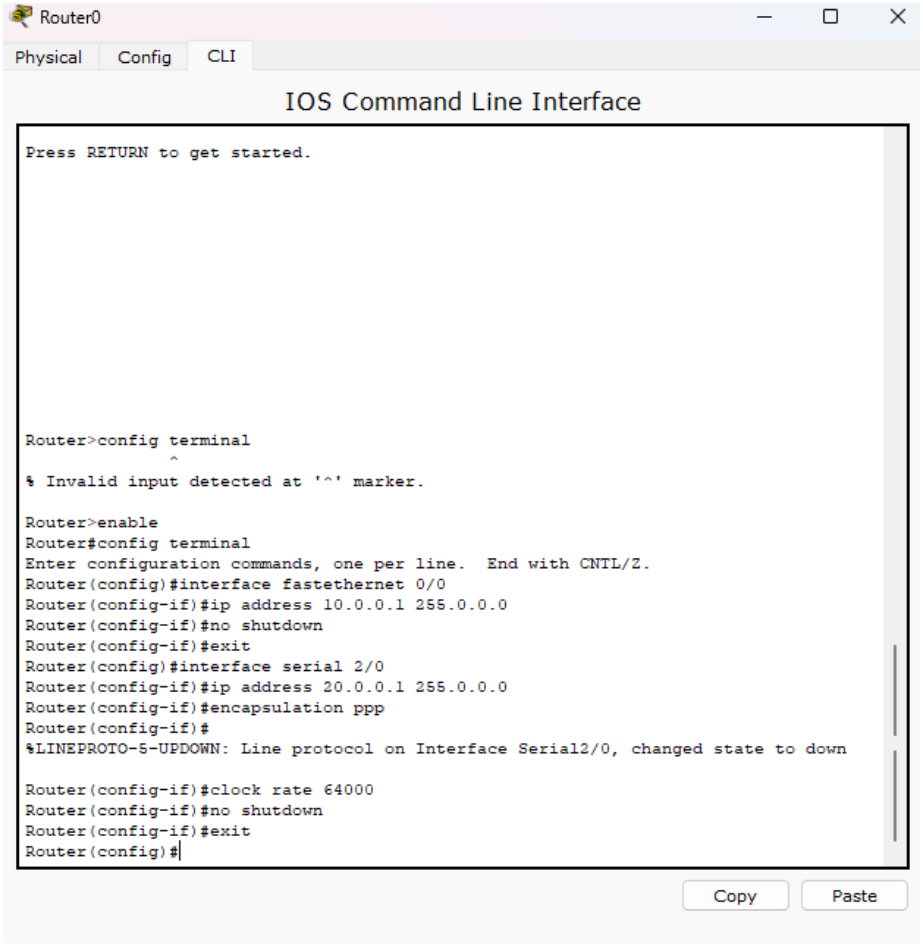


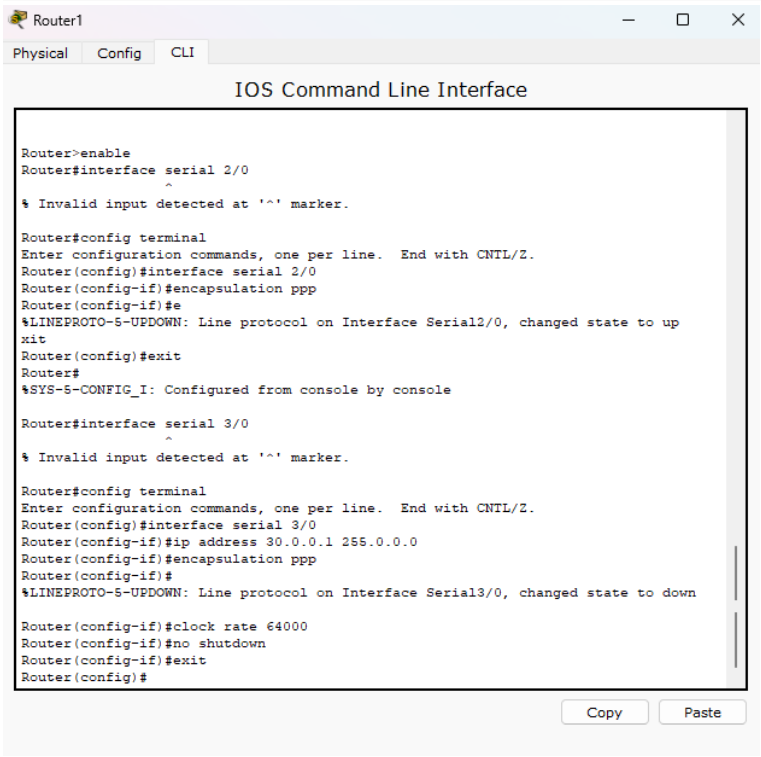


5. Test the default home page using web browser on PC and url of:
   http://198.168.1.254
6. Convert Router to Switch using copper straight through wire. Add a cloud to show internet.
7. Configure wireless router LAN IP to 192.168.1.1
8. Click on PC ip configuration and add default gateway as 192.168.1.1
9. To use url, click on DNS under server services and use custom name, and address as 192.168.1.254 and add to records.
10. Click on pc ip configuration and add it under DNS server type as 192.168.1.254

iii. Screen shots/ output

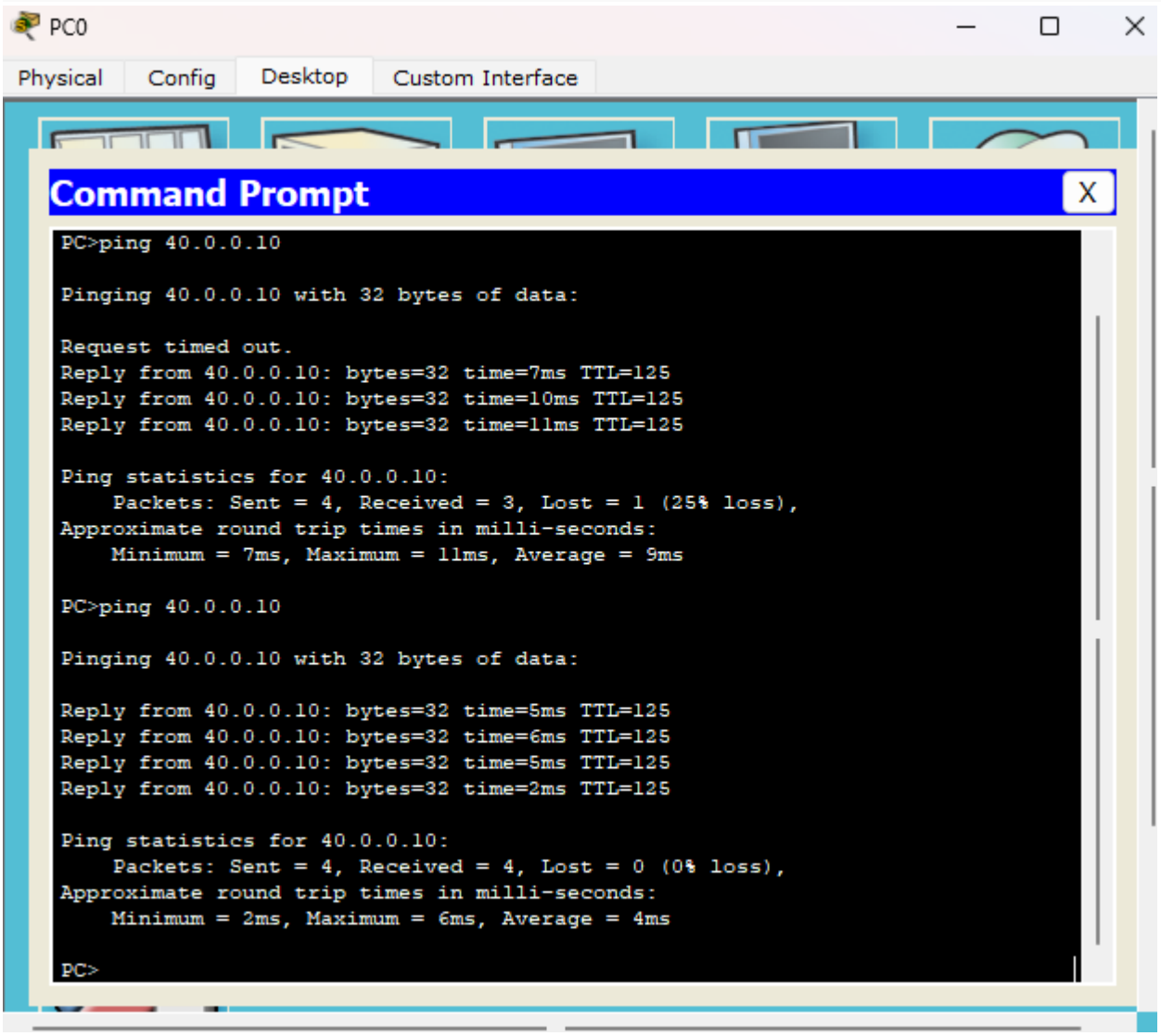



Router0
Physical
Config
CLI
IOS Command Line Interface
Press RETURN to get started.
Router>config terminal
^
% Invalid input detected at '^' marker.
Router>enable
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface fastethernet 0/0
Router(config-if)#ip address 10.0.0.1 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#interface serial 2/0
Router(config-if)#ip address 20.0.0.1 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to down
Router(config-if)#clock rate 64000
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#
Copy
Paste

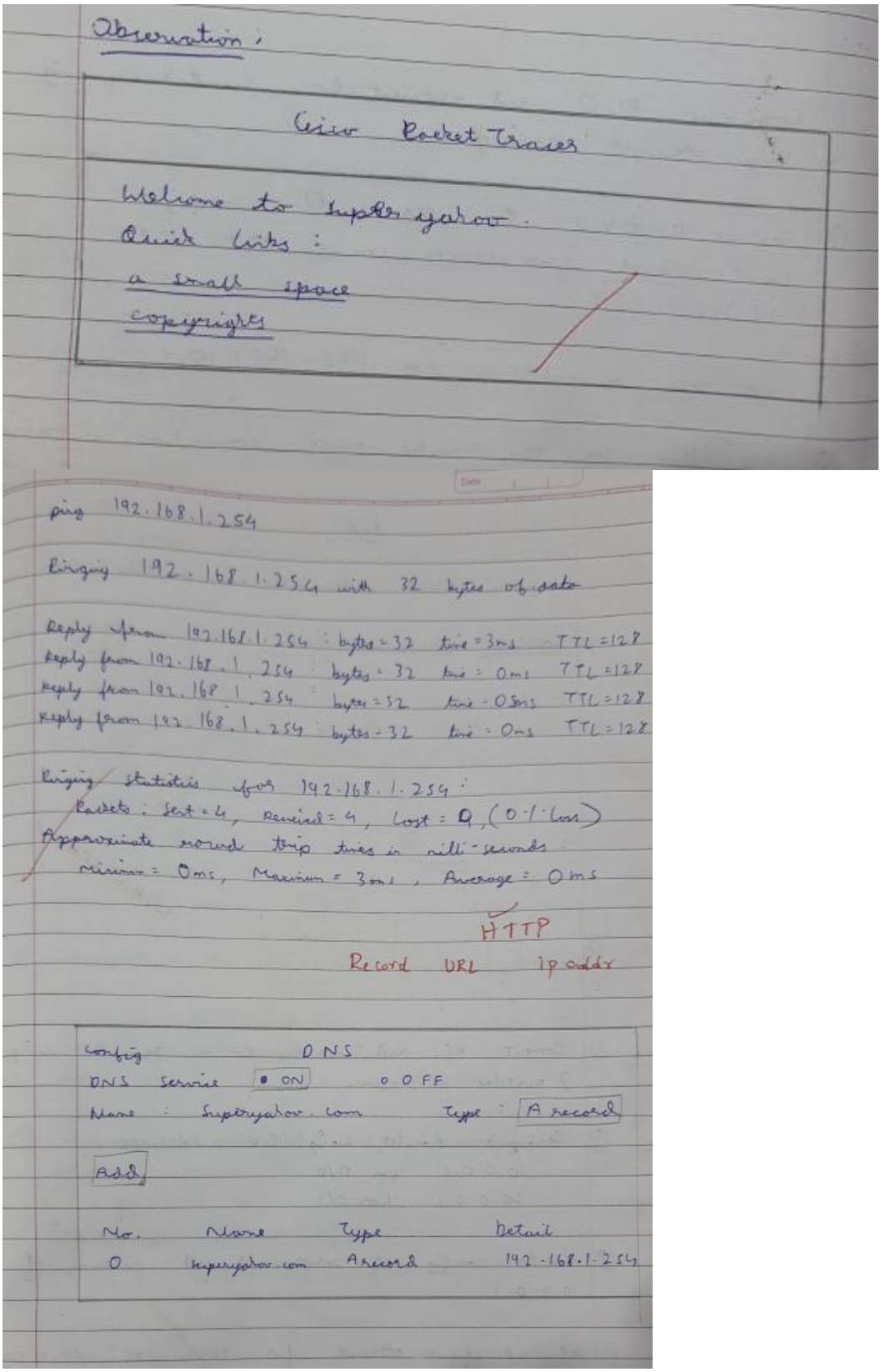

Router1
Physical
Config
CLI
IOS Command Line Interface
Router>enable
Router#interface serial 2/0
^
% Invalid input detected at '^' marker.
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface serial 2/0
Router(config-if)#encapsulation ppp
Router(config-if)#e
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up
xit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#interface serial 3/0
^
% Invalid input detected at '^' marker.
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface serial 3/0
Router(config-if)#ip address 30.0.0.1 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to down
Router(config-if)#clock rate 64000
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#
Copy
Paste

```
Router(config)#router ospf 1
Router(config-router)#router-id 1.1.1.1
Router(config-router)#network 10.0.0.0 0.255.255.255 area 3
Router(config-router)#network 20.0.0.0 0.255.255.255 area 1
Router(config-router)#exit
Router(config)#
```

Copy Paste



iv. Observation



Observation:

Cisco Packet Tracer

Welcome to Supteryator.

Quick links:

a small space

copyrights

ping 192.168.1.254

Pinging 192.168.1.254 with 32 bytes of data

Reply from 192.168.1.254: bytes=32 time=3ms TTL=128
Reply from 192.168.1.254: bytes=32 time=0ms TTL=128
Reply from 192.168.1.254: bytes=32 time=0ms TTL=128
Reply from 192.168.1.254: bytes=32 time=0ms TTL=128

Pinging statistics for 192.168.1.254:
Packets: Sent = 4, Received = 4, Lost = 0, (0% loss)
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 3ms, Average = 0ms

HTTP

Record URL ip addr

Config DNS

DNS service • ON ○ OFF

Name: Supteryator.com Type: A record

Add

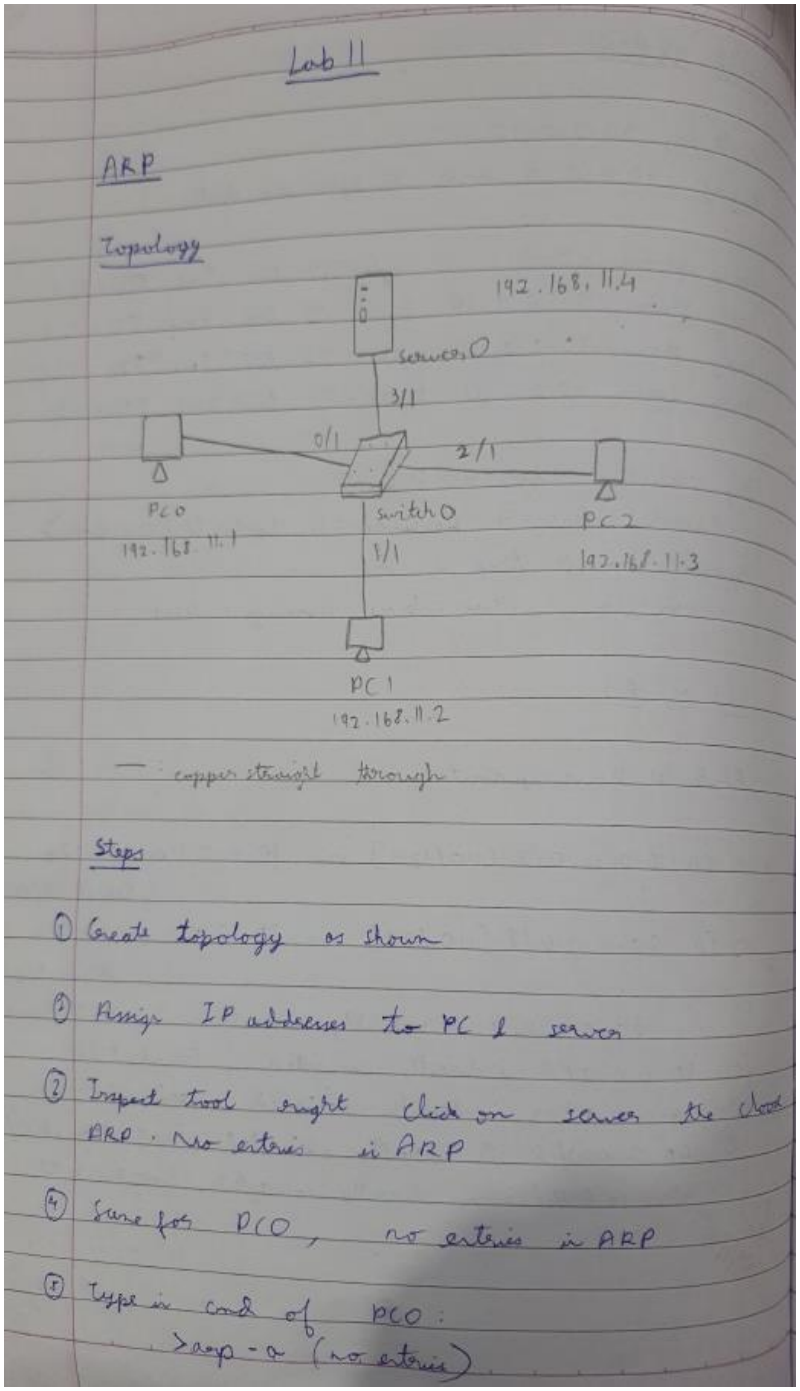
No.	Name	Type	Detail
0	supteryator.com	A record	192.168.1.254

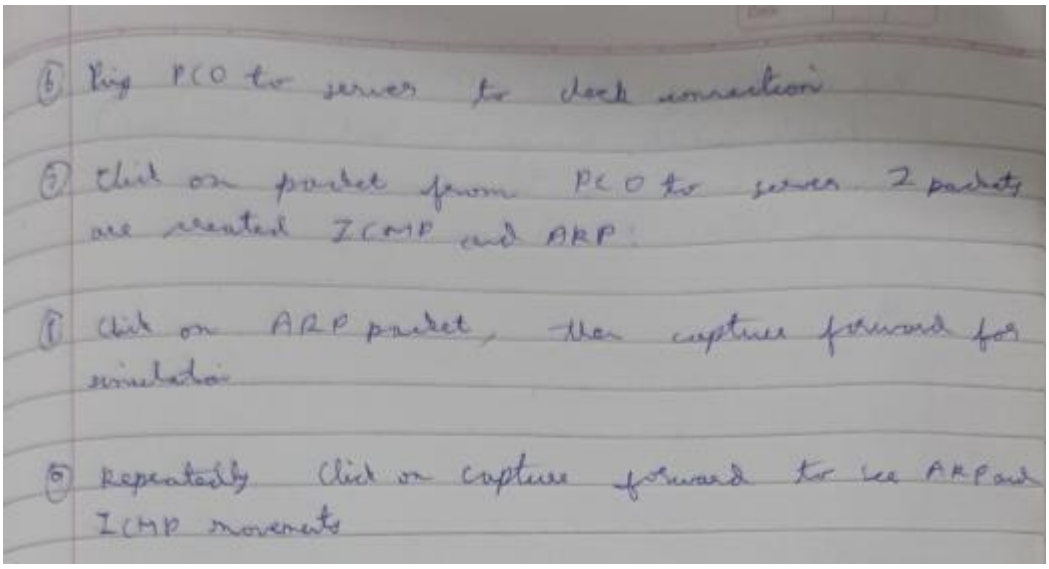
Program 9

i. Aim of the program

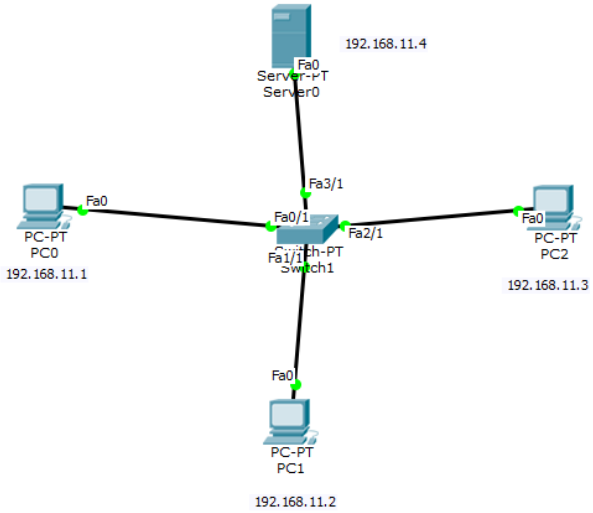
To construct simple LAN and understand the concept and operation of Address Resolution Protocol (ARP)

ii. Procedure along with the topology





iii. Screen shots/ output

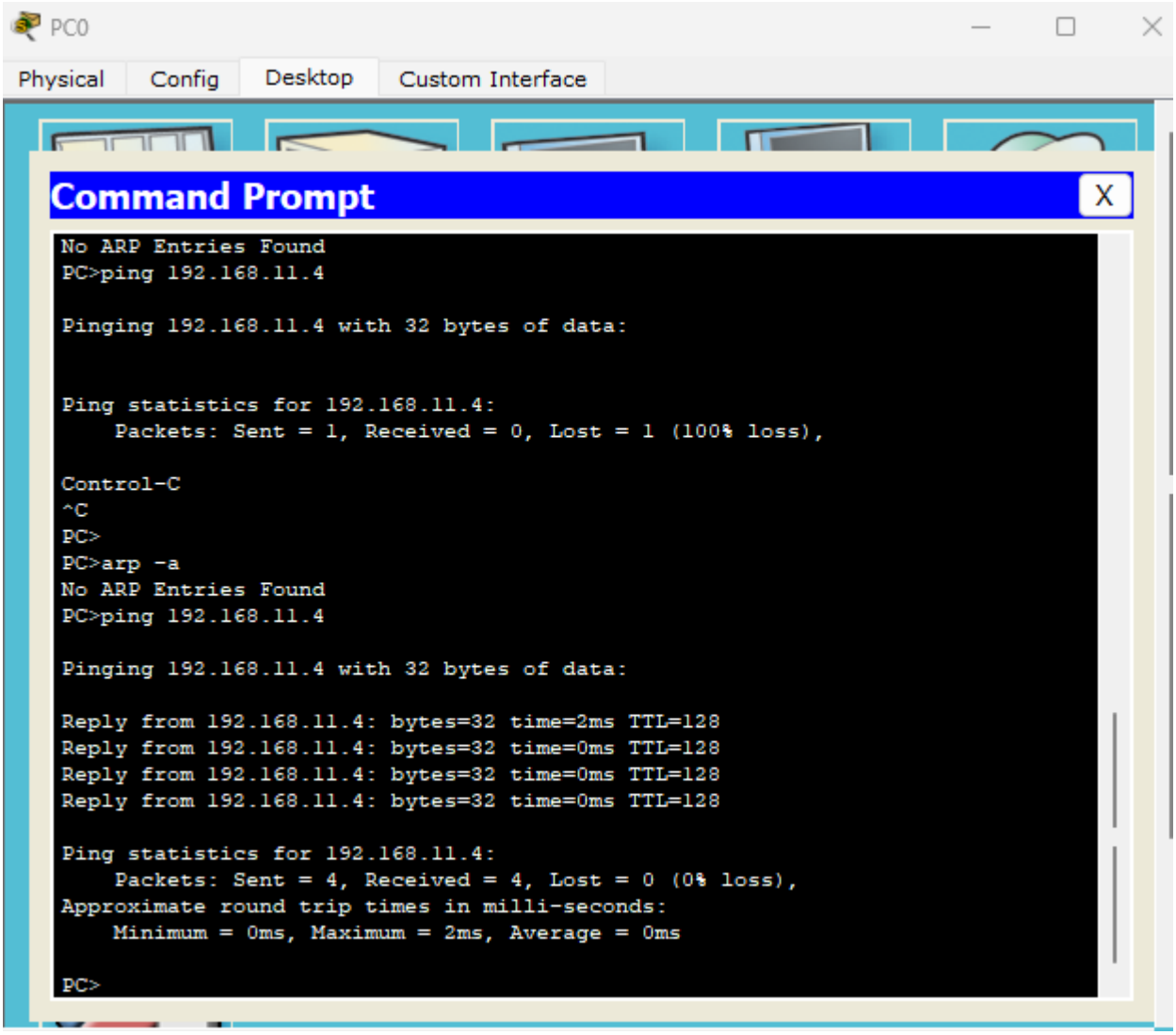


ARP Table for PC0

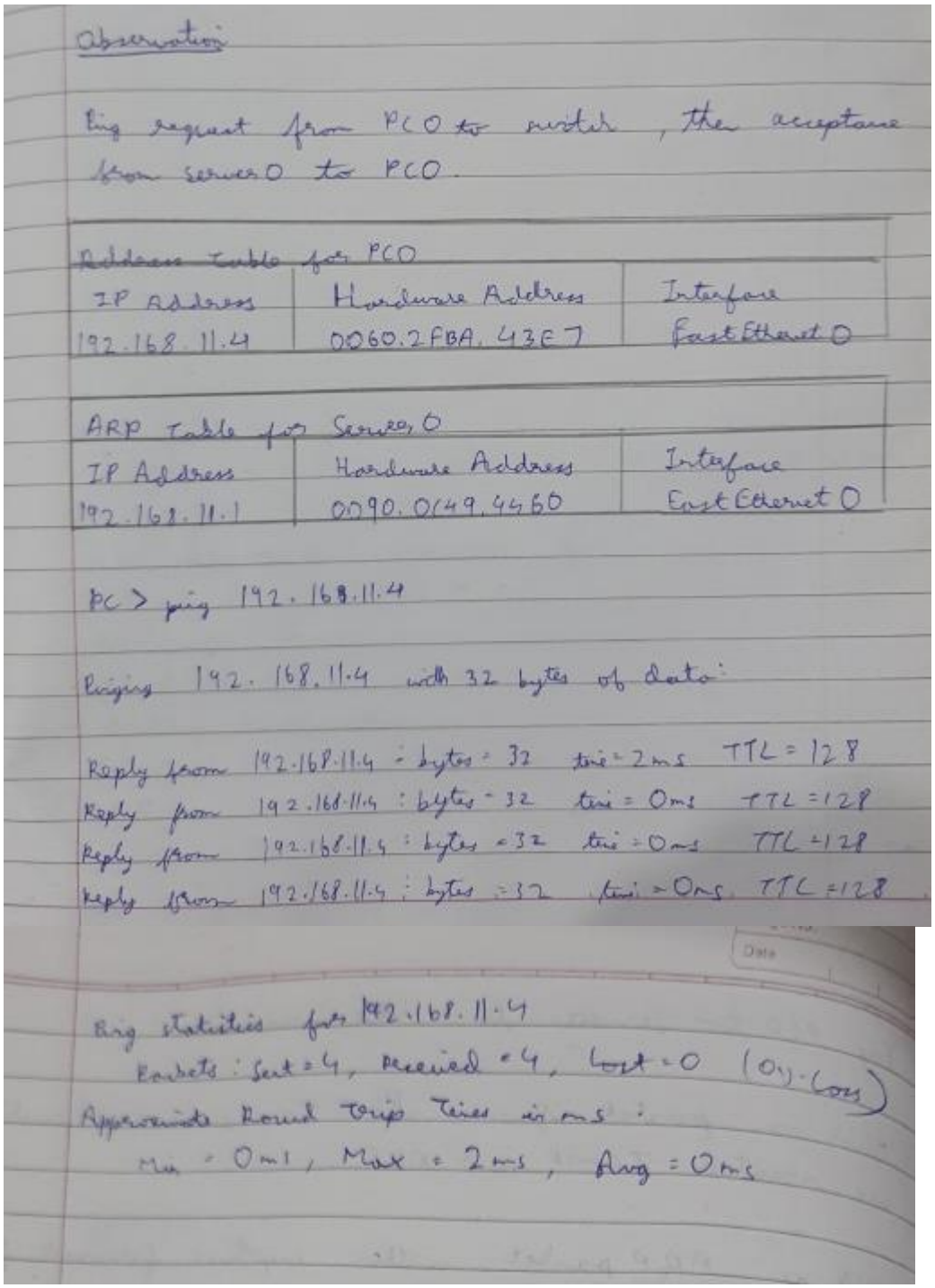
IP Address	Hardware Address	Interface
192.168.11.4	0060.2FBA.43E7	FastEthernet0

ARP Table for Server0

IP Address	Hardware Address	Interface
192.168.11.1	0090.0C49.4460	FastEthernet0



iv. Observation



Observation

Ping request from PC0 to router, then acceptance from server0 to PC0.

Address Table for PC0

IP Address	Hardware Address	Interface
192.168.11.4	0060.2FBA.43E7	FastEthernet0

ARP Table for Server0, 0

IP Address	Hardware Address	Interface
192.168.11.1	0090.0C49.4460	FastEthernet0

PC > ping 192.168.11.4

Pinging 192.168.11.4 with 32 bytes of data:

Reply from 192.168.11.4 : bytes = 32 time = 2ms TTL = 128
Reply from 192.168.11.4 : bytes = 32 time = 0ms TTL = 128
Reply from 192.168.11.4 : bytes = 32 time = 0ms TTL = 128
Reply from 192.168.11.4 : bytes = 32 time = 0ms TTL = 128

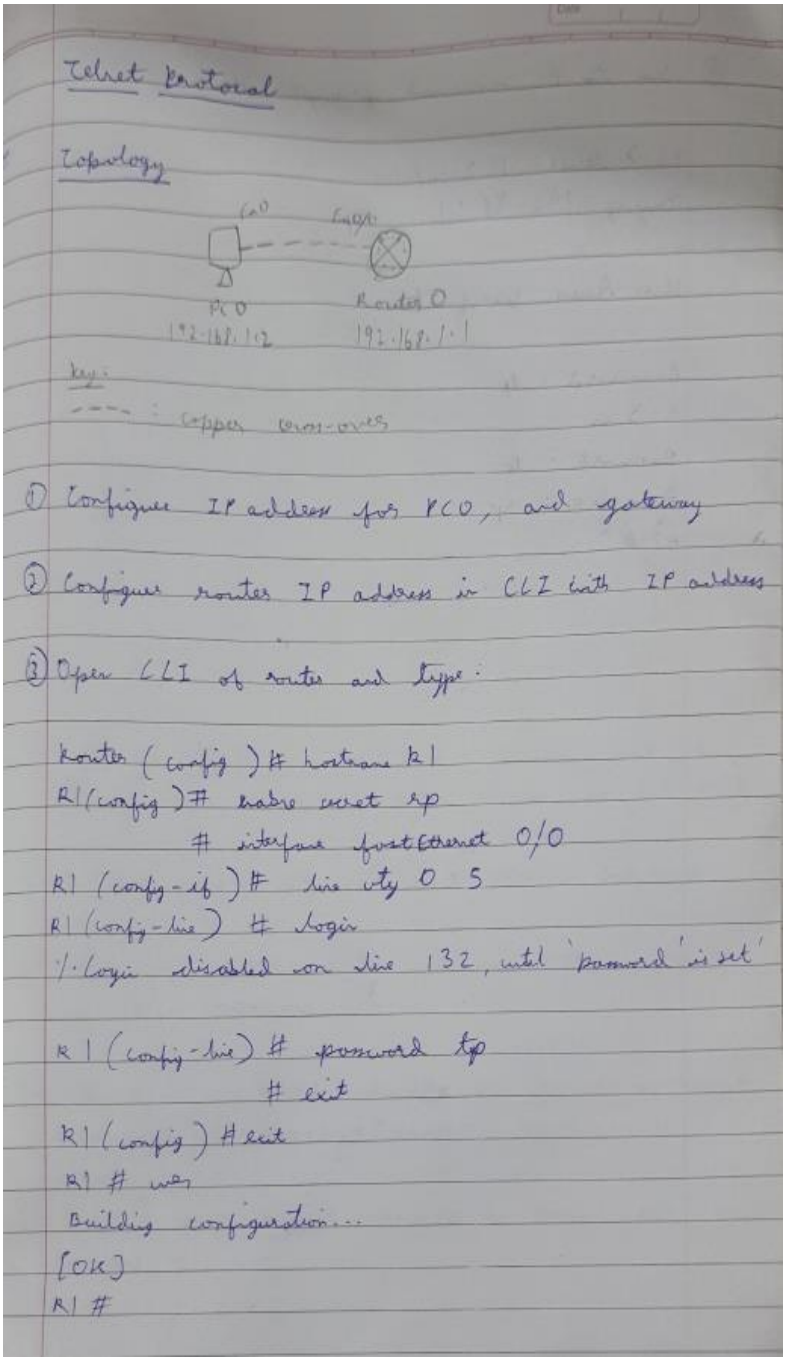
Ping statistics for 192.168.11.4
Packets: Sent = 4, Received = 4, Lost = 0 (0% Loss)
Approximate Round trip times in ms:
Min = 0ms, Max = 2ms, Avg = 0ms

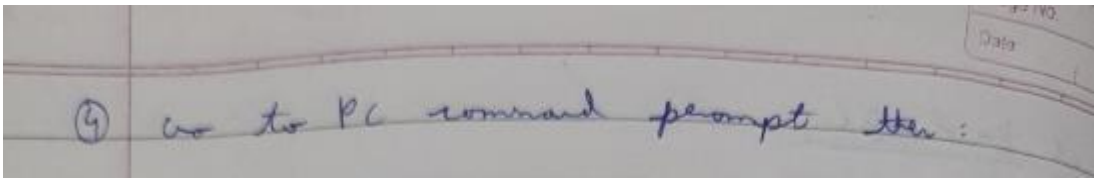
Program 10

i. Aim of the program

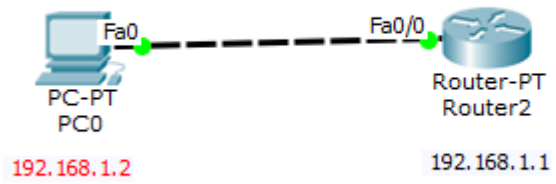
To understand the operation of TELNET by accessing the router in server room from a PC in IT office

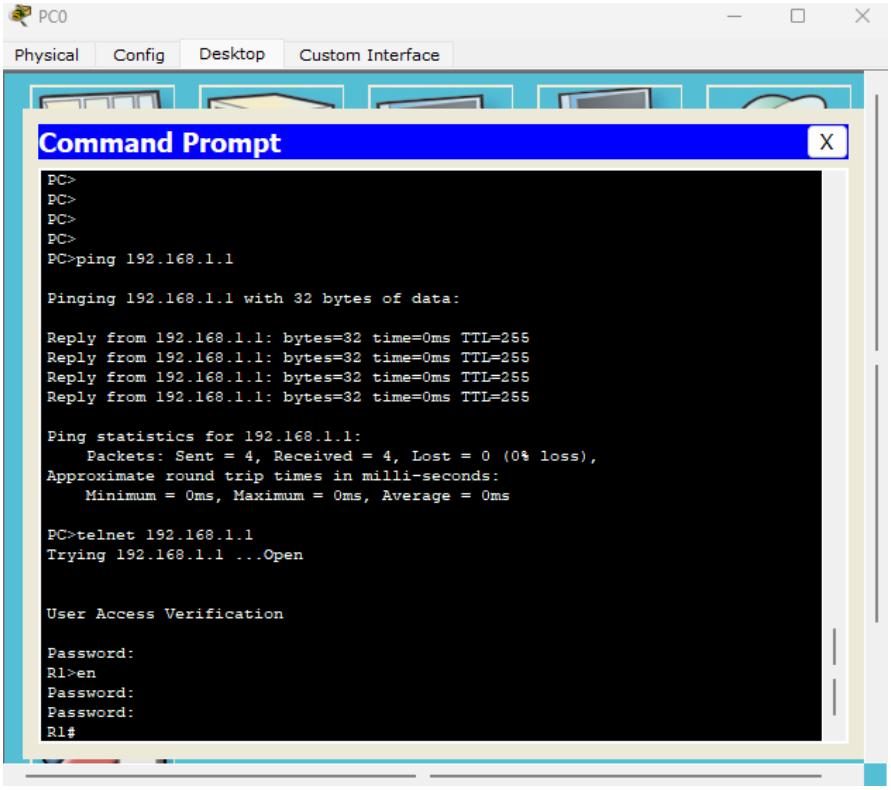
ii. Procedure along with the topology





iii. Screen shots/ output





Router2

Physical | Config | CLI

IOS Command Line Interface

```
Router(config-if)#
Router(config-if)#
Router(config-if)#
Router(config-if)#
Router(config-if)#
Router(config-if)#
Router(config-if)#
Router(config-if)#exit
Router(config)#hostname R1
R1(config)#enable secret rp
R1(config)#interface FastEthernet0/0
R1(config-if)#line vty 0 5
R1(config-line)#login
% Login disabled on line 132, until 'password' is set
% Login disabled on line 133, until 'password' is set
% Login disabled on line 134, until 'password' is set
% Login disabled on line 135, until 'password' is set
% Login disabled on line 136, until 'password' is set
% Login disabled on line 137, until 'password' is set
R1(config-line)#password tp
R1(config-line)#exit
R1(config)#exit
R1#
%SYS-5-CONFIG_I: Configured from console by console

R1#wr
Building configuration...
[OK]
R1#
```

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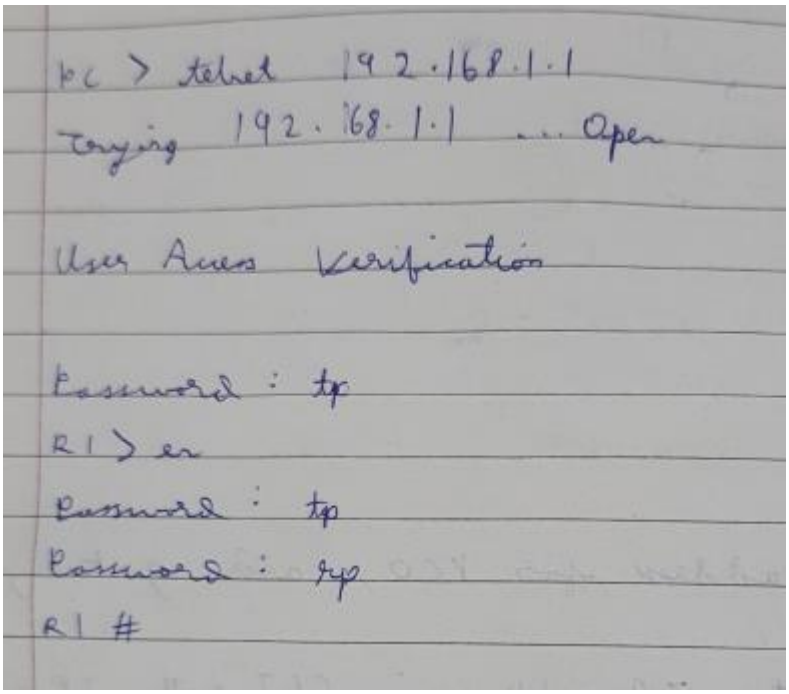
iv. Observation

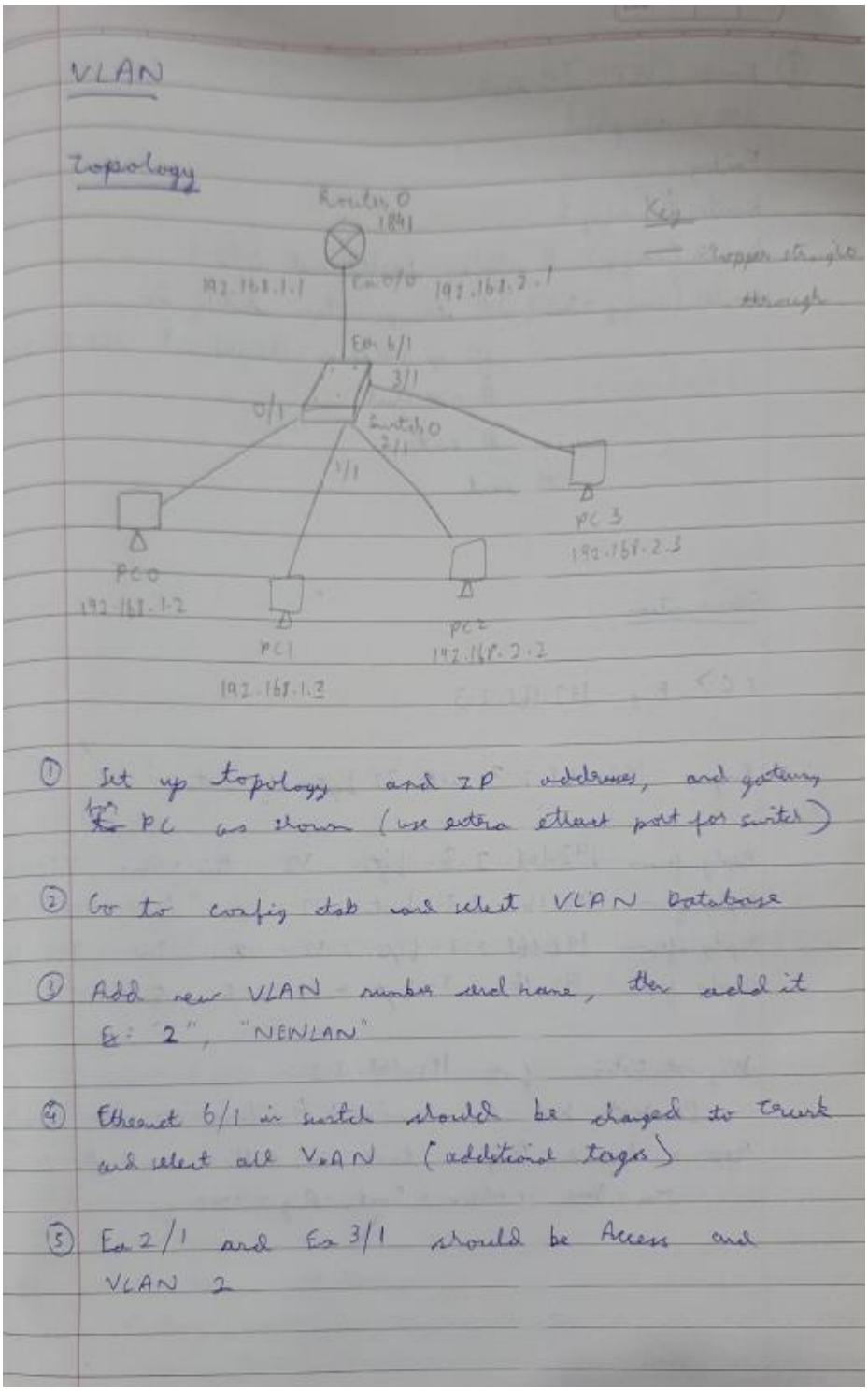


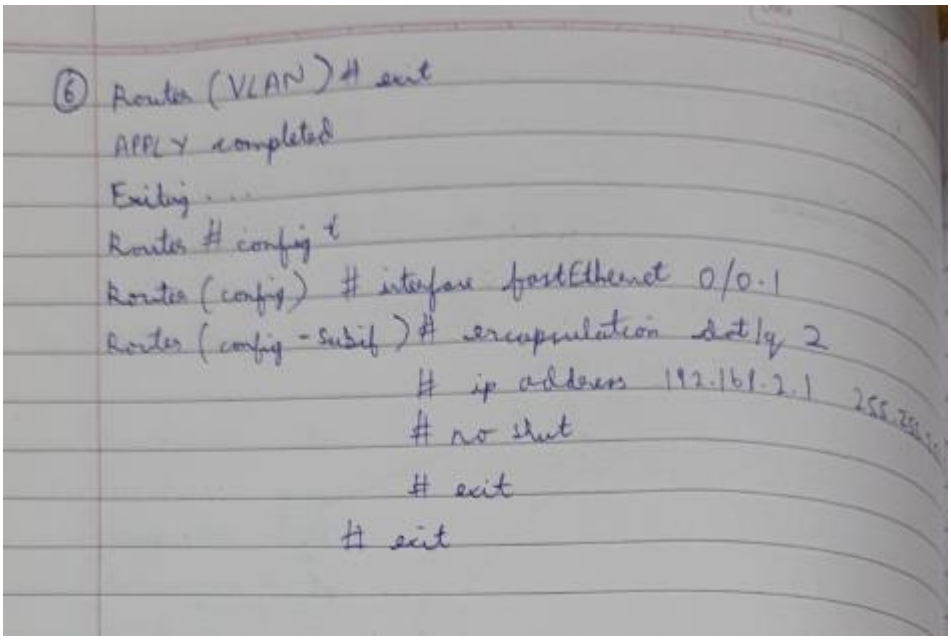
Program 11

i. Aim of the program

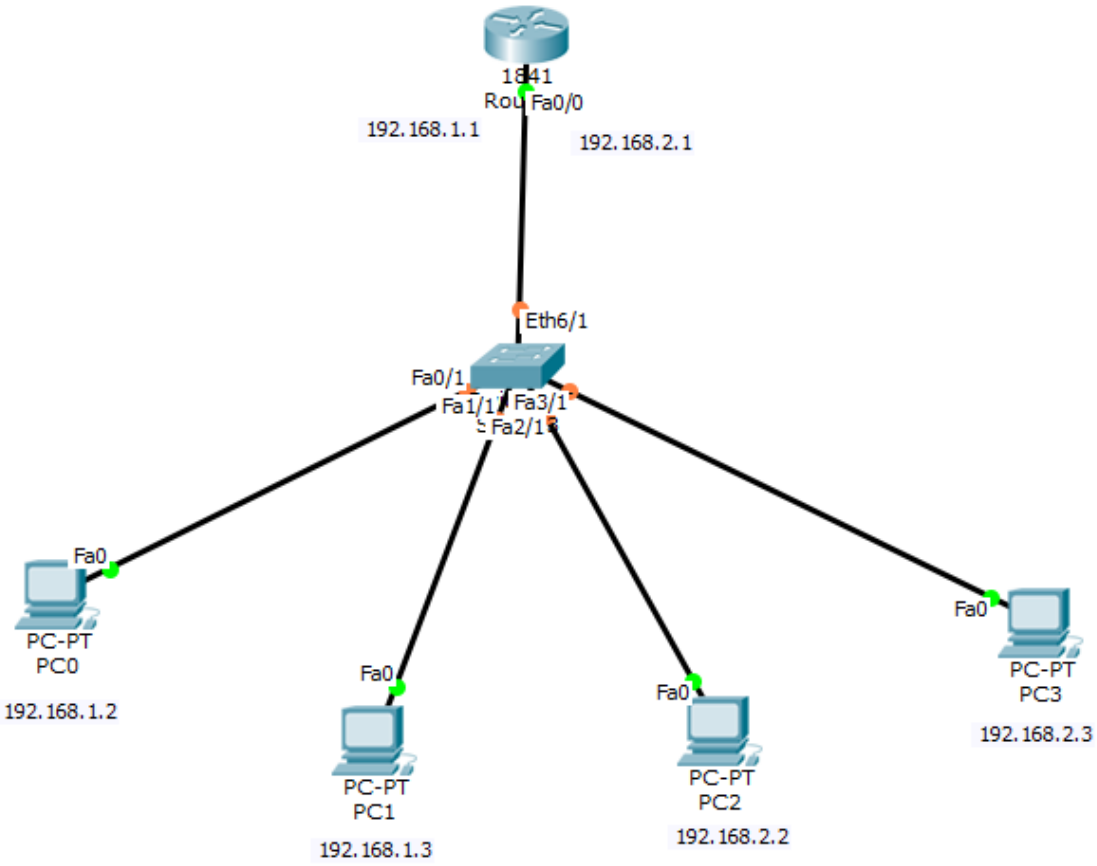
To construct a VLAN and make the PC's communicate among a VLAN

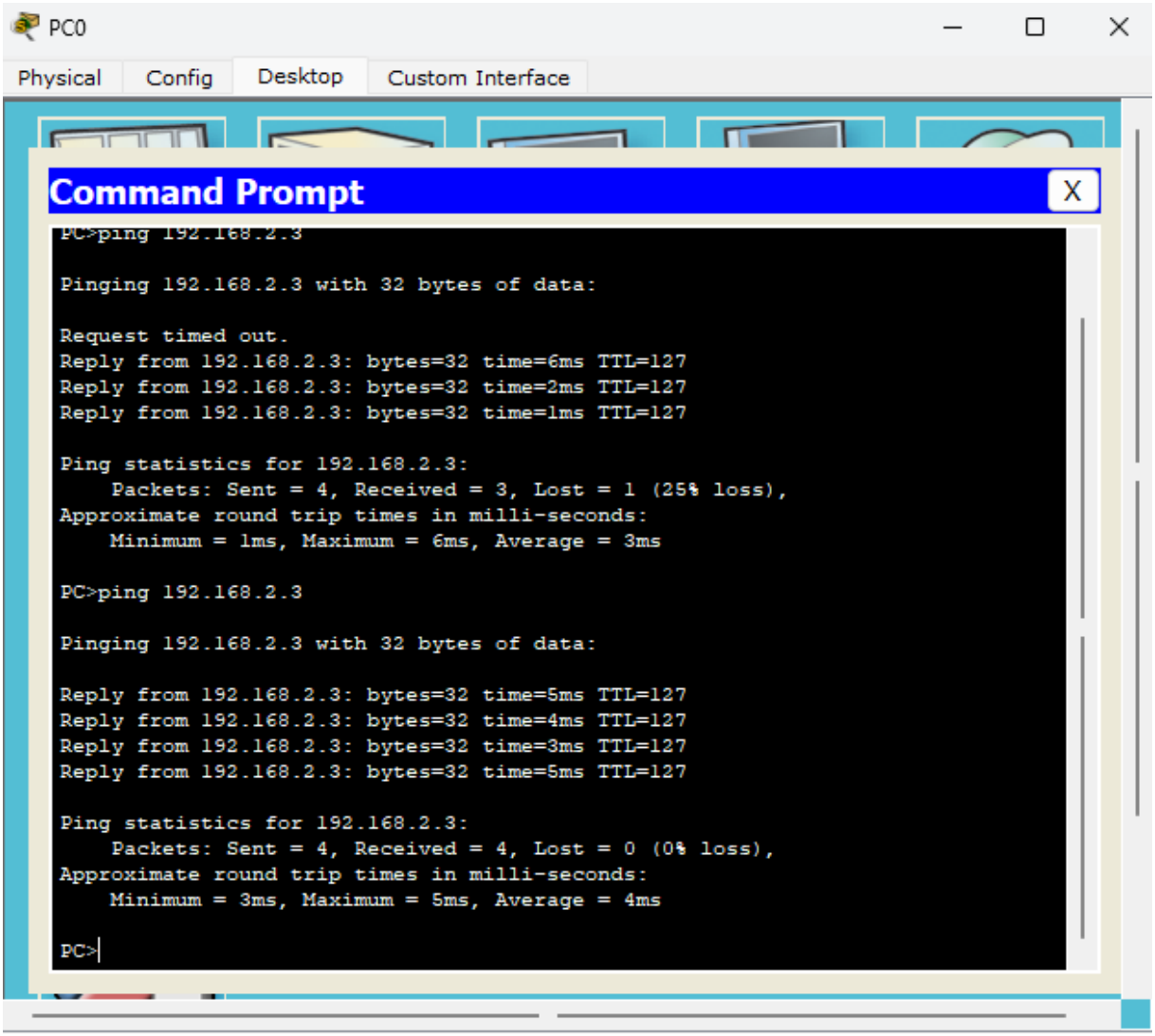
ii. Procedure along with the topology

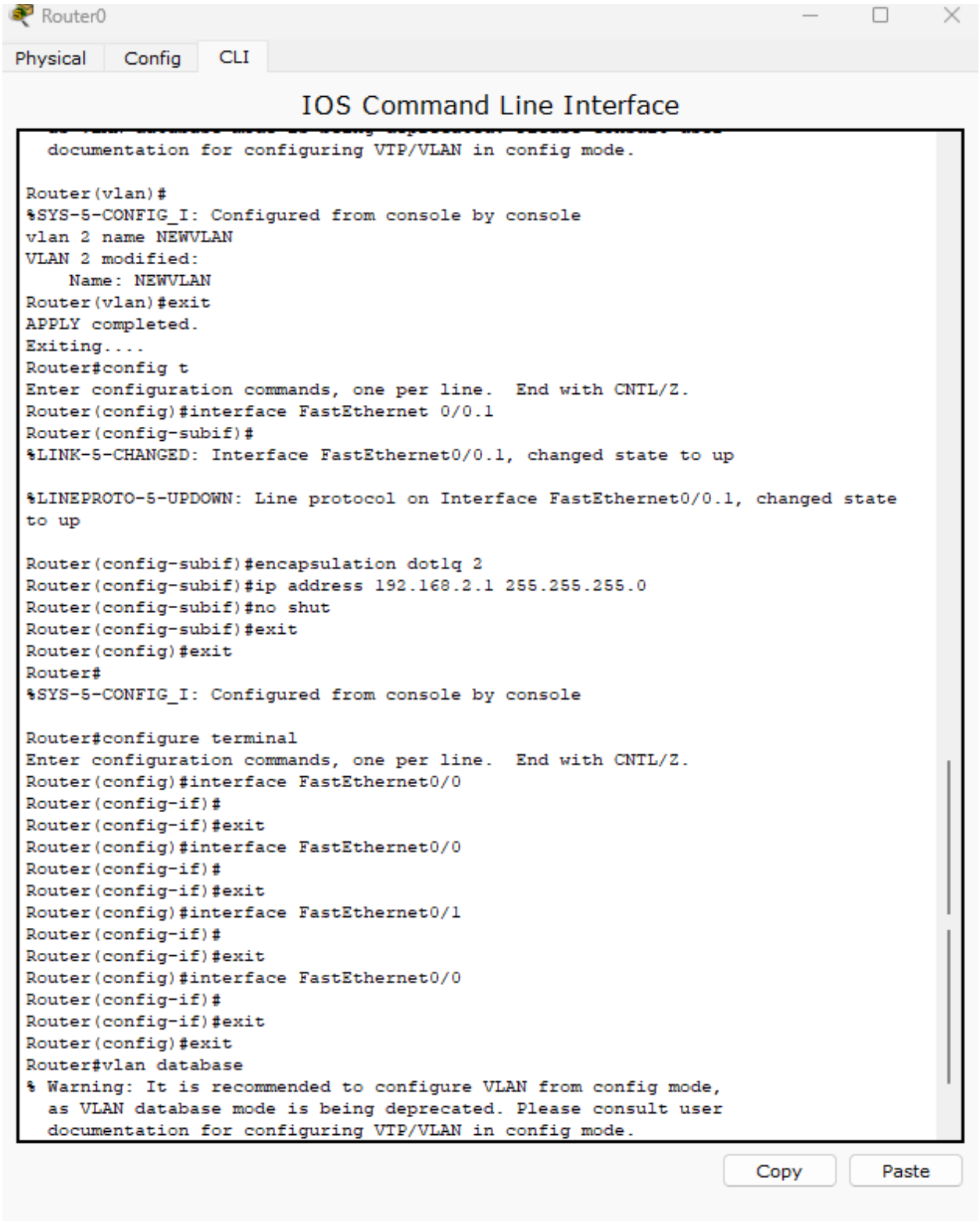




iii. Screen shots/ output




PC0
Physical
Config
Desktop
Custom Interface
Command Prompt
X
PC>ping 192.168.2.3
Pinging 192.168.2.3 with 32 bytes of data:
Request timed out.
Reply from 192.168.2.3: bytes=32 time=6ms TTL=127
Reply from 192.168.2.3: bytes=32 time=2ms TTL=127
Reply from 192.168.2.3: bytes=32 time=1ms TTL=127
Ping statistics for 192.168.2.3:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 1ms, Maximum = 6ms, Average = 3ms
PC>ping 192.168.2.3
Pinging 192.168.2.3 with 32 bytes of data:
Reply from 192.168.2.3: bytes=32 time=5ms TTL=127
Reply from 192.168.2.3: bytes=32 time=4ms TTL=127
Reply from 192.168.2.3: bytes=32 time=3ms TTL=127
Reply from 192.168.2.3: bytes=32 time=5ms TTL=127
Ping statistics for 192.168.2.3:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 3ms, Maximum = 5ms, Average = 4ms
PC>


Router0
Physical
Config
CLI
IOS Command Line Interface
documentation for configuring VTP/VLAN in config mode.
Router(vlan)#
%SYS-5-CONFIG_I: Configured from console by console
vlan 2 name NEWVLAN
VLAN 2 modified:
Name: NEWVLAN
Router(vlan)#exit
APPLY completed.
Exiting....
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet 0/0.1
Router(config-subif)#
%LINK-5-CHANGED: Interface FastEthernet0/0.1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.1, changed state to up
Router(config-subif)#encapsulation dot1q 2
Router(config-subif)#ip address 192.168.2.1 255.255.255.0
Router(config-subif)#no shut
Router(config-subif)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet0/1
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#exit
Router#vlan database
% Warning: It is recommended to configure VLAN from config mode,
as VLAN database mode is being deprecated. Please consult user
documentation for configuring VTP/VLAN in config mode.
Copy
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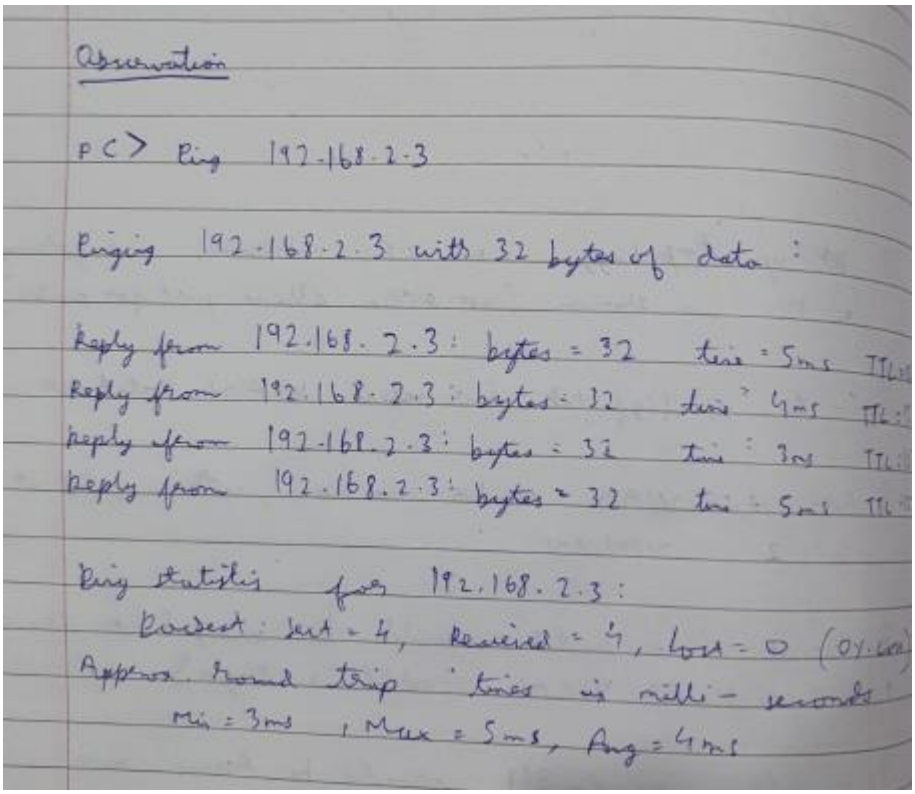
iv. Observation



Observation

PC> Ping 192.168.2.3

Pinging 192.168.2.3 with 32 bytes of data :

Reply from 192.168.2.3: bytes = 32 time = 5ms TTL=
Reply from 192.168.2.3: bytes = 32 time = 4ms TTL=
Reply from 192.168.2.3: bytes = 32 time = 3ms TTL=
Reply from 192.168.2.3: bytes = 32 time = 5ms TTL=

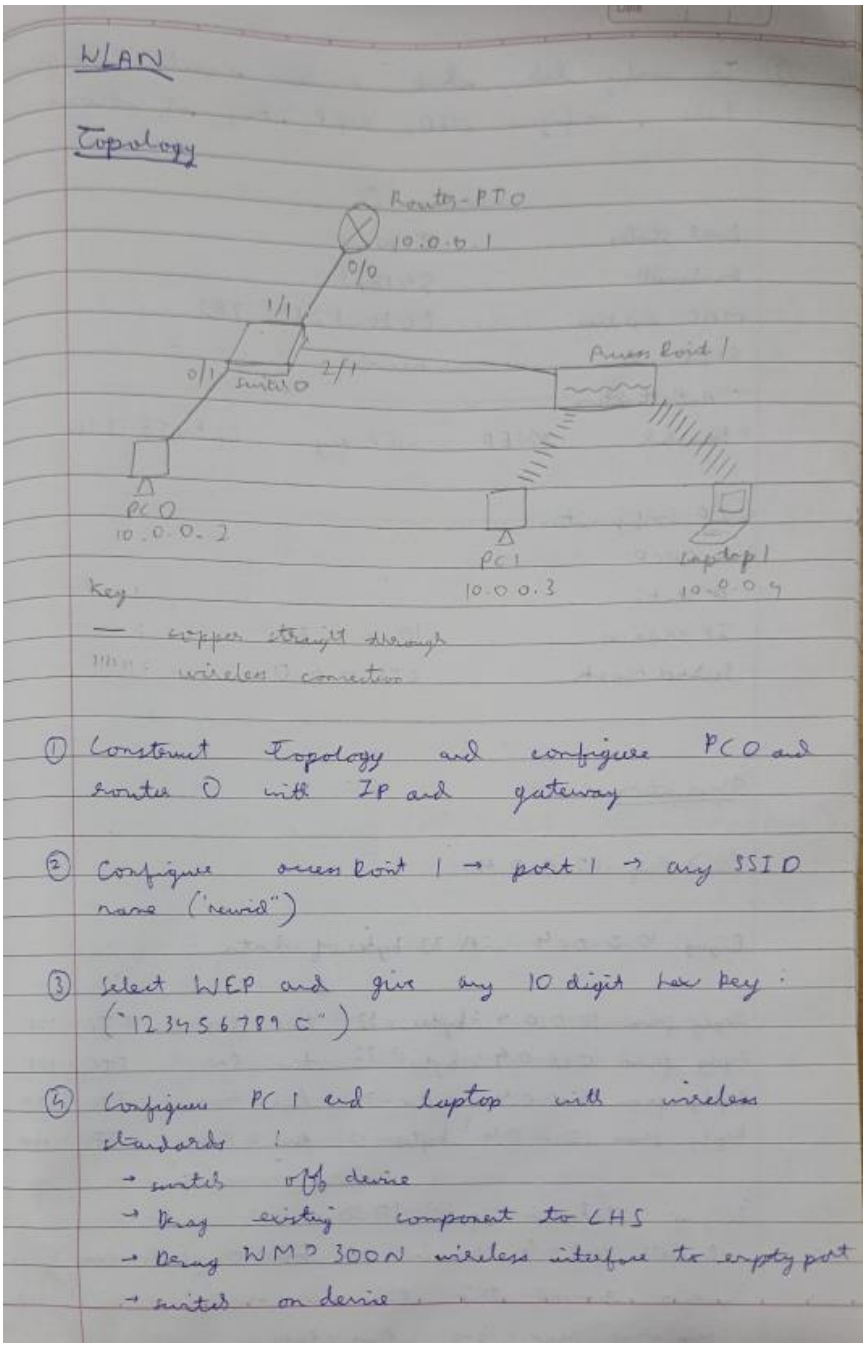
Ping statistics for 192.168.2.3:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss)
Approx. round trip times in milli-seconds:
Min = 3ms, Max = 5ms, Avg = 4ms

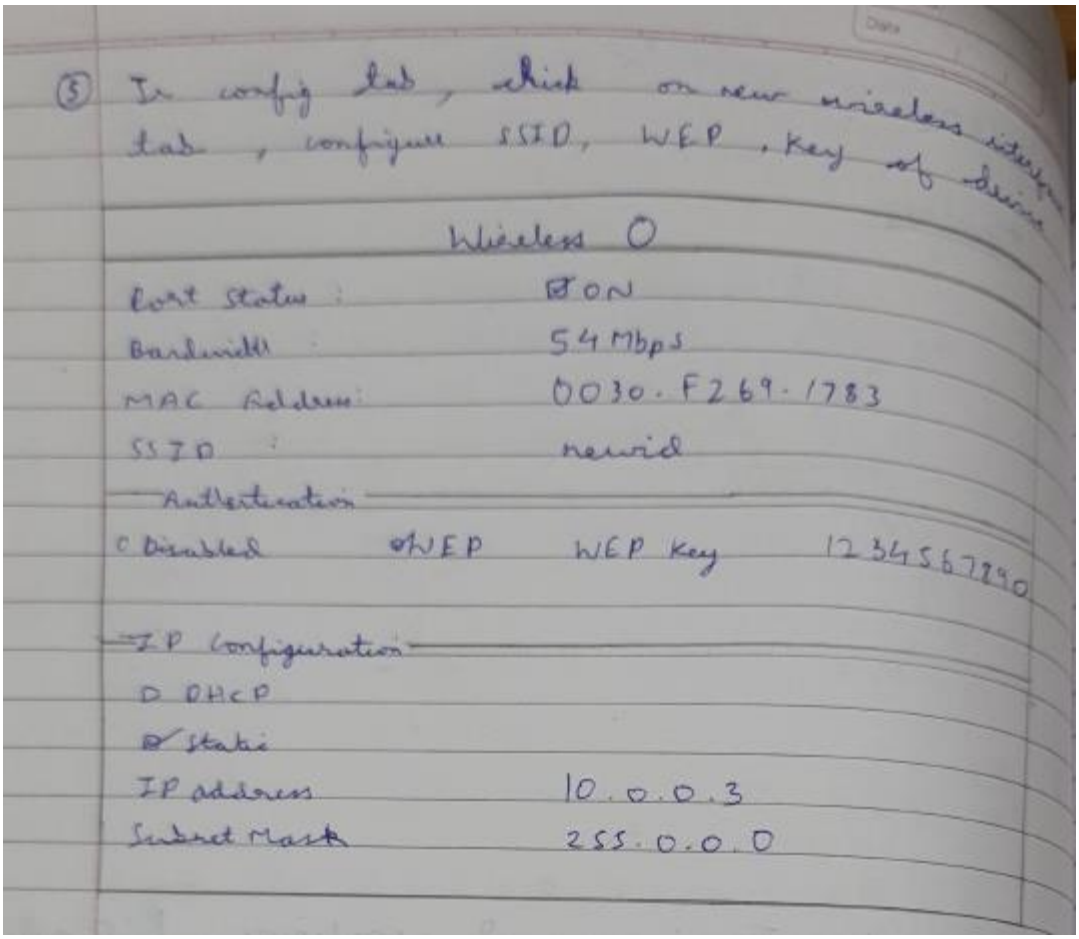
Program 12

i. Aim of the program

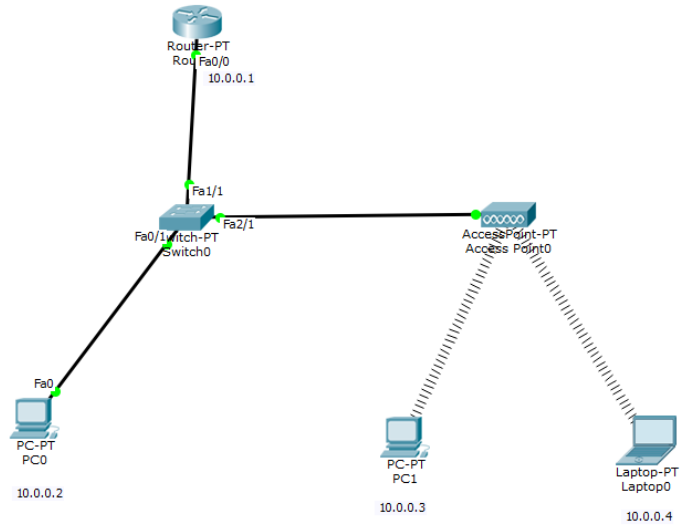
To construct a WLAN and make the nodes communicate wirelessly

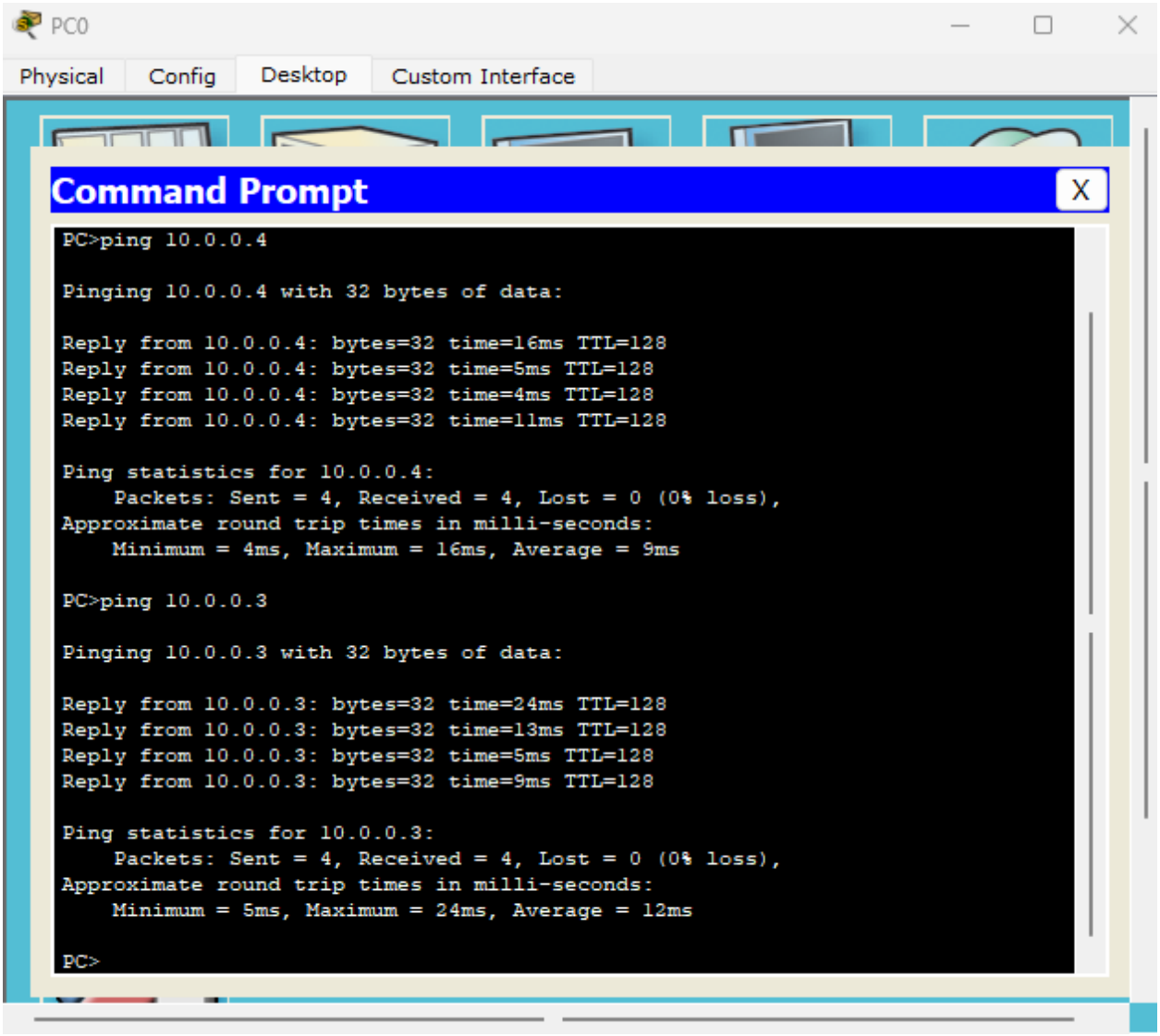
ii. Procedure along with the topology

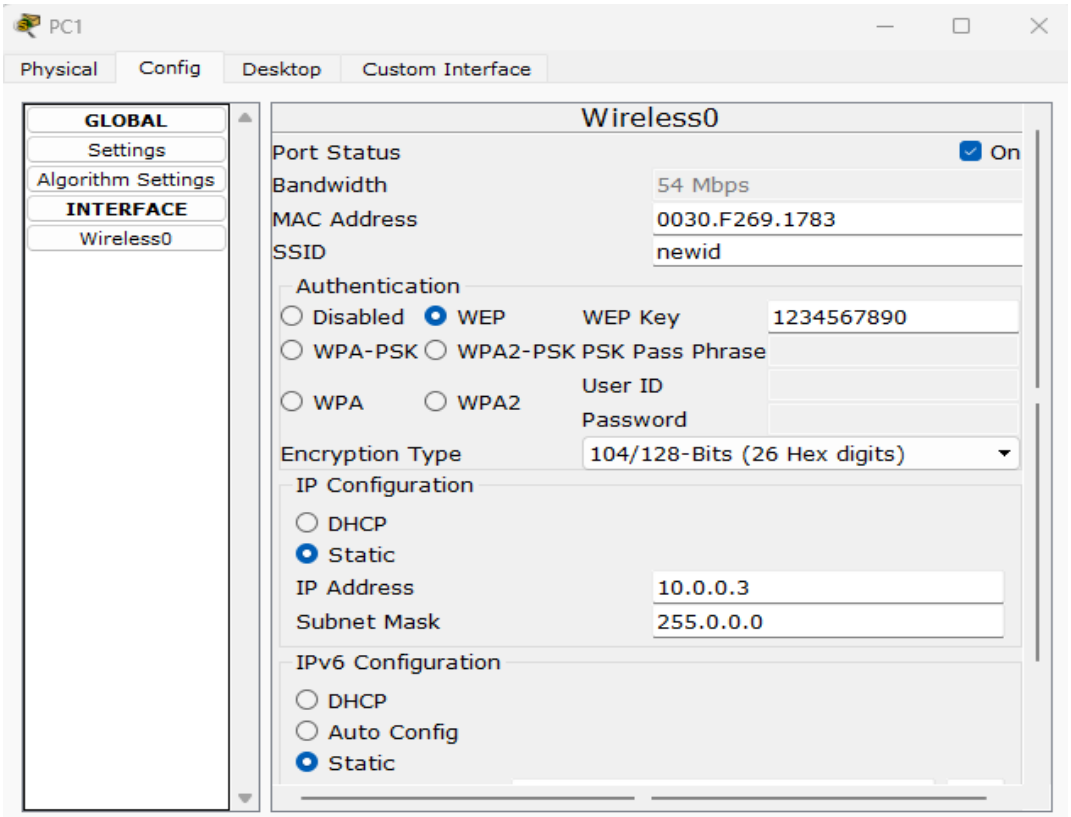


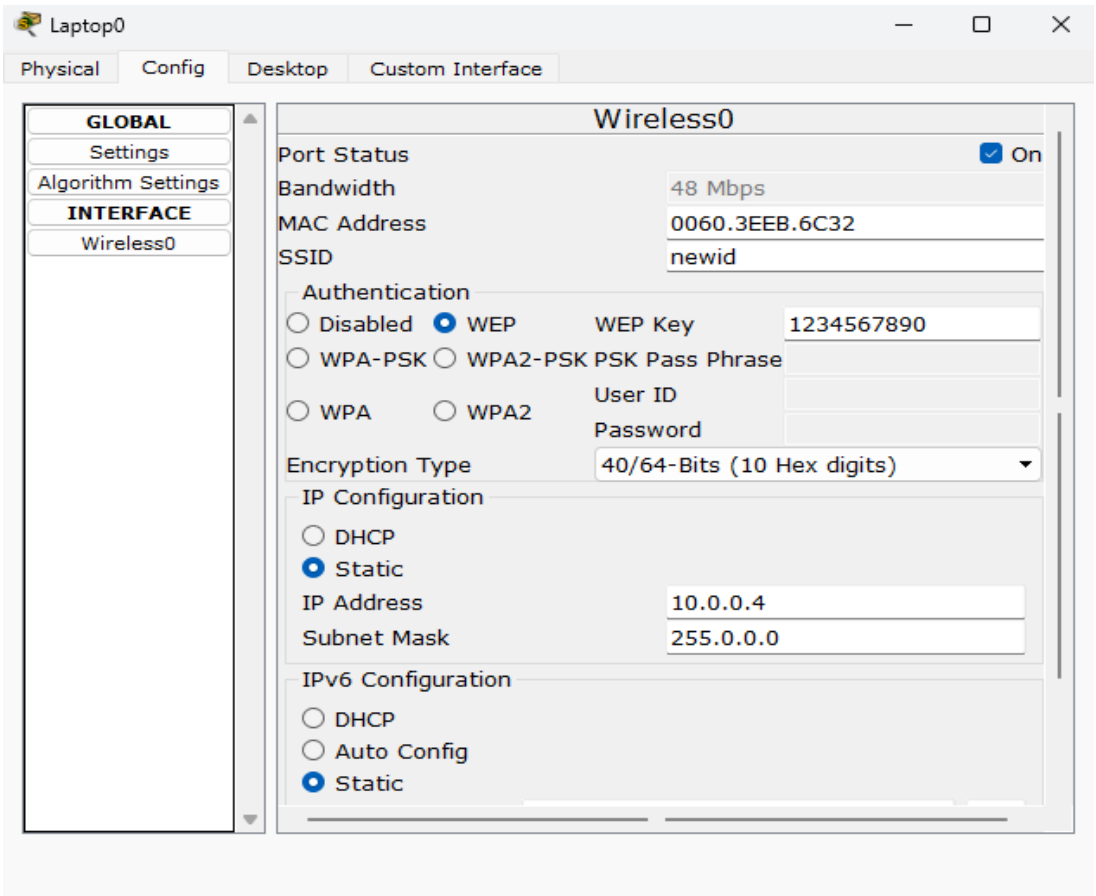


iii. Screen shots/ output

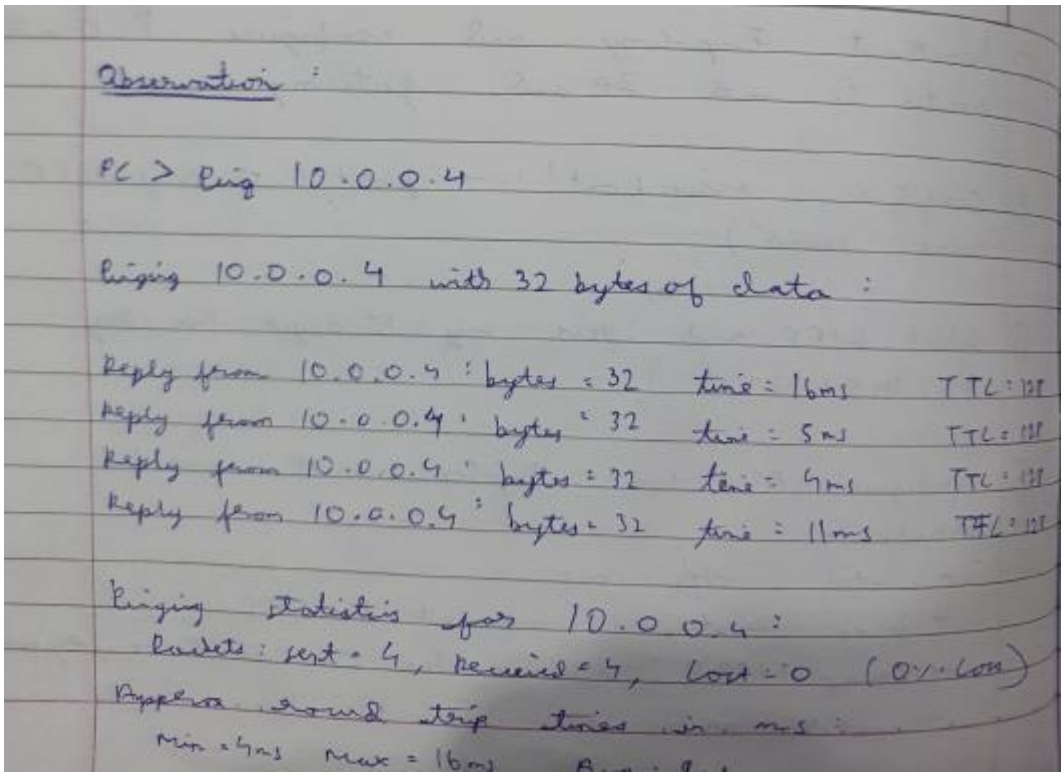



PC0
Physical
Config
Desktop
Custom Interface
Command Prompt
X
PC>ping 10.0.0.4
Pinging 10.0.0.4 with 32 bytes of data:
Reply from 10.0.0.4: bytes=32 time=16ms TTL=128
Reply from 10.0.0.4: bytes=32 time=5ms TTL=128
Reply from 10.0.0.4: bytes=32 time=4ms TTL=128
Reply from 10.0.0.4: bytes=32 time=11ms TTL=128
Ping statistics for 10.0.0.4:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 4ms, Maximum = 16ms, Average = 9ms
PC>ping 10.0.0.3
Pinging 10.0.0.3 with 32 bytes of data:
Reply from 10.0.0.3: bytes=32 time=24ms TTL=128
Reply from 10.0.0.3: bytes=32 time=13ms TTL=128
Reply from 10.0.0.3: bytes=32 time=5ms TTL=128
Reply from 10.0.0.3: bytes=32 time=9ms TTL=128
Ping statistics for 10.0.0.3:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 5ms, Maximum = 24ms, Average = 12ms
PC>


PC1
Physical
Config
Desktop
Custom Interface
GLOBAL
Settings
Algorithm Settings
INTERFACE
Wireless0
Wireless0
Port Status
On
Bandwidth
54 Mbps
MAC Address
0030.F269.1783
SSID
newid
Authentication
Disabled
WEP
WEP Key
1234567890
WPA-PSK
WPA2-PSK
PSK Pass Phrase
WPA
WPA2
User ID
Password
Encryption Type
104/128-Bits (26 Hex digits)
IP Configuration
DHCP
Static
IP Address
10.0.0.3
Subnet Mask
255.0.0.0
IPv6 Configuration
DHCP
Auto Config
Static


Laptop0
Physical
Config
Desktop
Custom Interface
GLOBAL
Settings
Algorithm Settings
INTERFACE
Wireless0
Wireless0
Port Status
On
Bandwidth
48 Mbps
MAC Address
0060.3EEB.6C32
SSID
newid
Authentication
Disabled
WEP
WEP Key
1234567890
WPA-PSK
WPA2-PSK
PSK Pass Phrase
WPA
WPA2
User ID
Password
Encryption Type
40/64-Bits (10 Hex digits)
IP Configuration
DHCP
Static
IP Address
10.0.0.4
Subnet Mask
255.0.0.0
IPv6 Configuration
DHCP
Auto Config
Static

iv. Observation



Observation :

PC > Ping 10.0.0.4

Pinging 10.0.0.4 with 32 bytes of data :

Reply from 10.0.0.4 : bytes = 32 time = 16ms TTL : 128
Reply from 10.0.0.4 : bytes = 32 time = 5ms TTL : 128
Reply from 10.0.0.4 : bytes = 32 time = 4ms TTL : 128
Reply from 10.0.0.4 : bytes = 32 time = 11ms TTL : 128

Pinging statistics for 10.0.0.4 :
Packets : sent = 4, Received = 4, Lost = 0 (0% loss)
Approx round trip times in ms :
Min = 4ms Max = 16ms

Program 13

i. Aim of the program

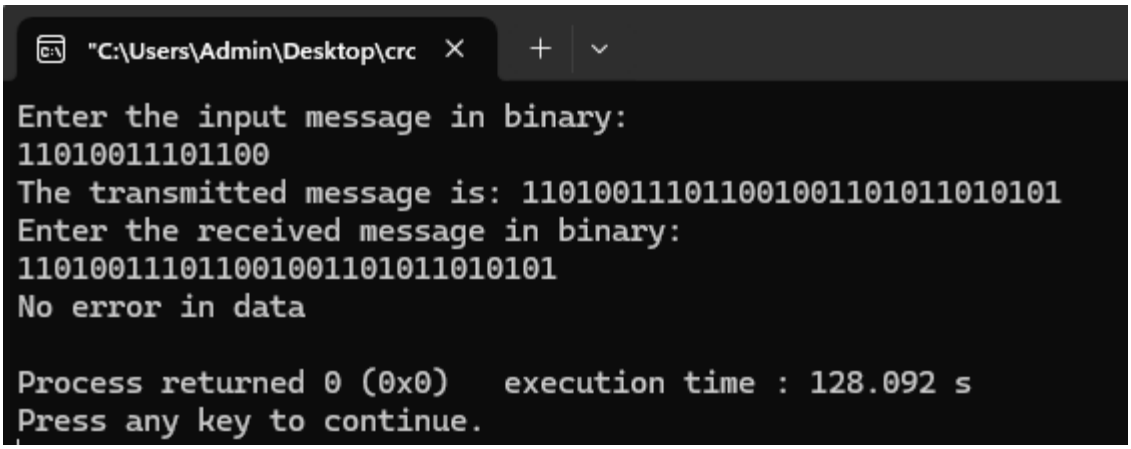
Write a program for error detecting code using CRC-CCITT (16-bits)

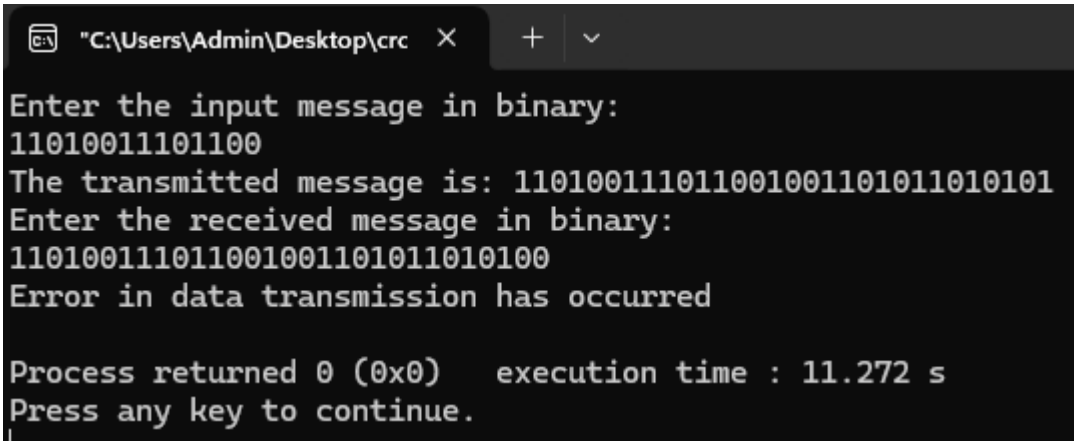
ii. Procedure along with the topology

```
#include <iostream>
#include <cstring>
using namespace std;

int crc(char *ip, char *op, char *poly, int mode) {
    strcpy(op, ip);

    // Append zeros if mode is 1 (transmitting)
    if (mode) {
        for (int i = 1; i < strlen(poly); i++) {
            strcat(op, "0");
        }
    }

    // Perform XOR on the message with the selected polynomial
    for (int i = 0; i < strlen(ip); i++) {
        if (op[i] == '1') {
            for (int j = 0; j < strlen(poly); j++) {
                if (op[i + j] == poly[j])
                    op[i + j] = '0';
                else
                    op[i + j] = '1';
            }
        }
    }

    // Check for errors. Return 0 if error detected
    for (int i = 0; i < strlen(op); i++) {
        if (op[i] == '1')
            return 0;
    }

    return 1;
}

int main() {
    char ip[50], op[50], recv[50];
    char poly[] = "10001000000100011";
```

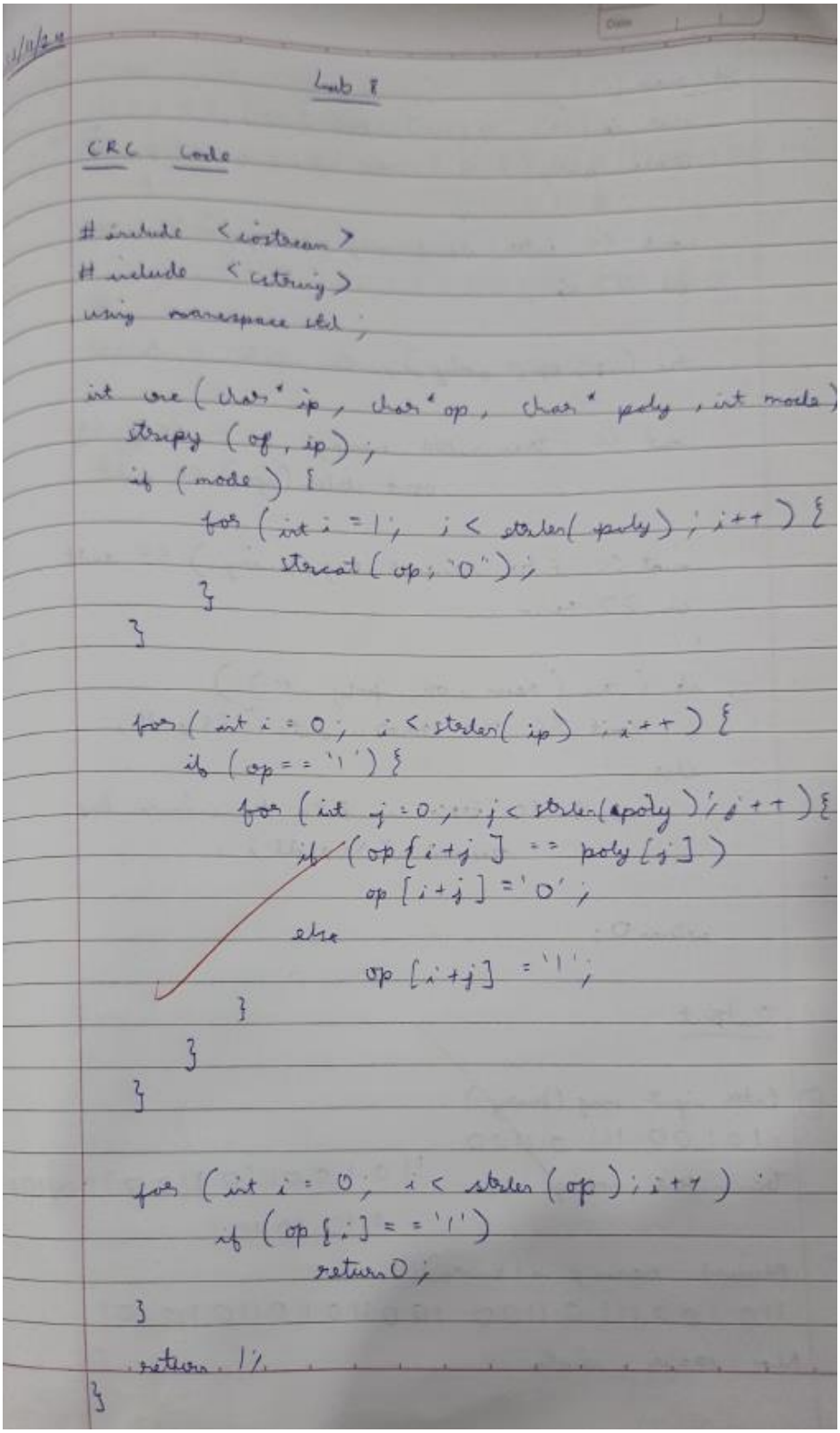
```
    cout << "Enter the input message in binary: " << endl;
    cin >> ip;

    crc(ip, op, poly, 1);

    cout << "The transmitted message is: " << ip << op + strlen(ip) << endl;

    cout << "Enter the received message in binary: " << endl;
    cin >> recv;

    if (crc(recv, op, poly, 0))
        cout << "No error in data" << endl;
    else
        cout << "Error in data transmission has occurred" << endl;

    return 0;
}
```

iii. Screen shots/ output





iv. Observation



Lab 8

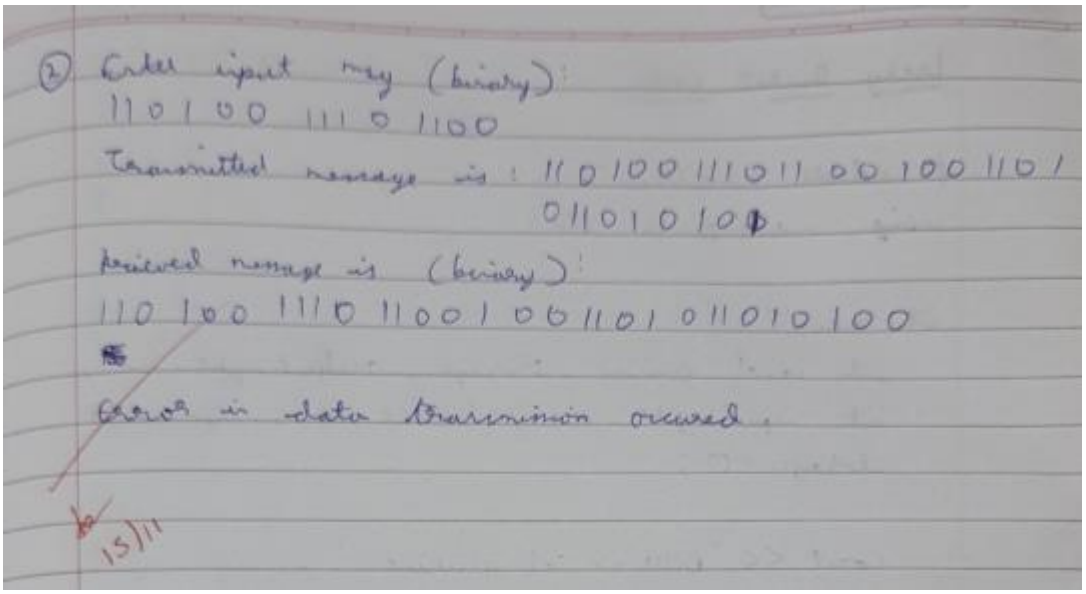
CRC Code

```
#include <iostream>
#include <string>
using namespace std;

int xor(char* ip, char* op, char* poly, int mode)
    strcpy(op, ip);
    if (mode) {
        for (int i = 1; i < strlen(poly); i++) {
            strcat(op, "0");
        }
    }

    for (int i = 0; i < strlen(ip); i++) {
        if (op == '1') {
            for (int j = 0; j < strlen(poly); j++) {
                if (op[i+j] == poly[j])
                    op[i+j] = '0';
                else
                    op[i+j] = '1';
            }
        }
    }

    for (int i = 0; i < strlen(op); i++)
        if (op[i] == '1')
            return 0;
    }
    return 1;
}
```

```
int main(){
    char ip[50], op[50], recv[50];
    char poly[] = "10001000 0001 0001"

    cout << "Enter input msg (binary)" << endl;
    cin >> ip;

    crc(ip, op, poly);

    cout << "Transmitted message is : " << ip <<
                op + strlen(ip) << endl;

    cout << "Enter recieved msg (binary) << endl;
    cin >> recv;

    if (crc(recv, op, poly, 0))
        cout << "No error in data" << endl;
    else
        cout << "Error in data transmission has
                occured" << endl;

    return 0;
```

Output :

① Enter input msg (binary) :
110100 111 0 1100
Transmitted message is : 110 1 00111 0 1100 1001101
0110 10101
Recieved message is (binary):
110100111 0 1100 1001101 0110 10101
No error in data



② Enter input msg (binary):

110100 1110 1100

Transmitted message is : 110100 111011 00100 1101 011010 100

Received message is (binary):

110 100 1110 1100 1 00 1101 011010 100

Error in data transmission occured.

15/11

Program 14

i. Aim of the program

Write a program for congestion control using Leaky bucket algorithm.

ii. Procedure along with the topology

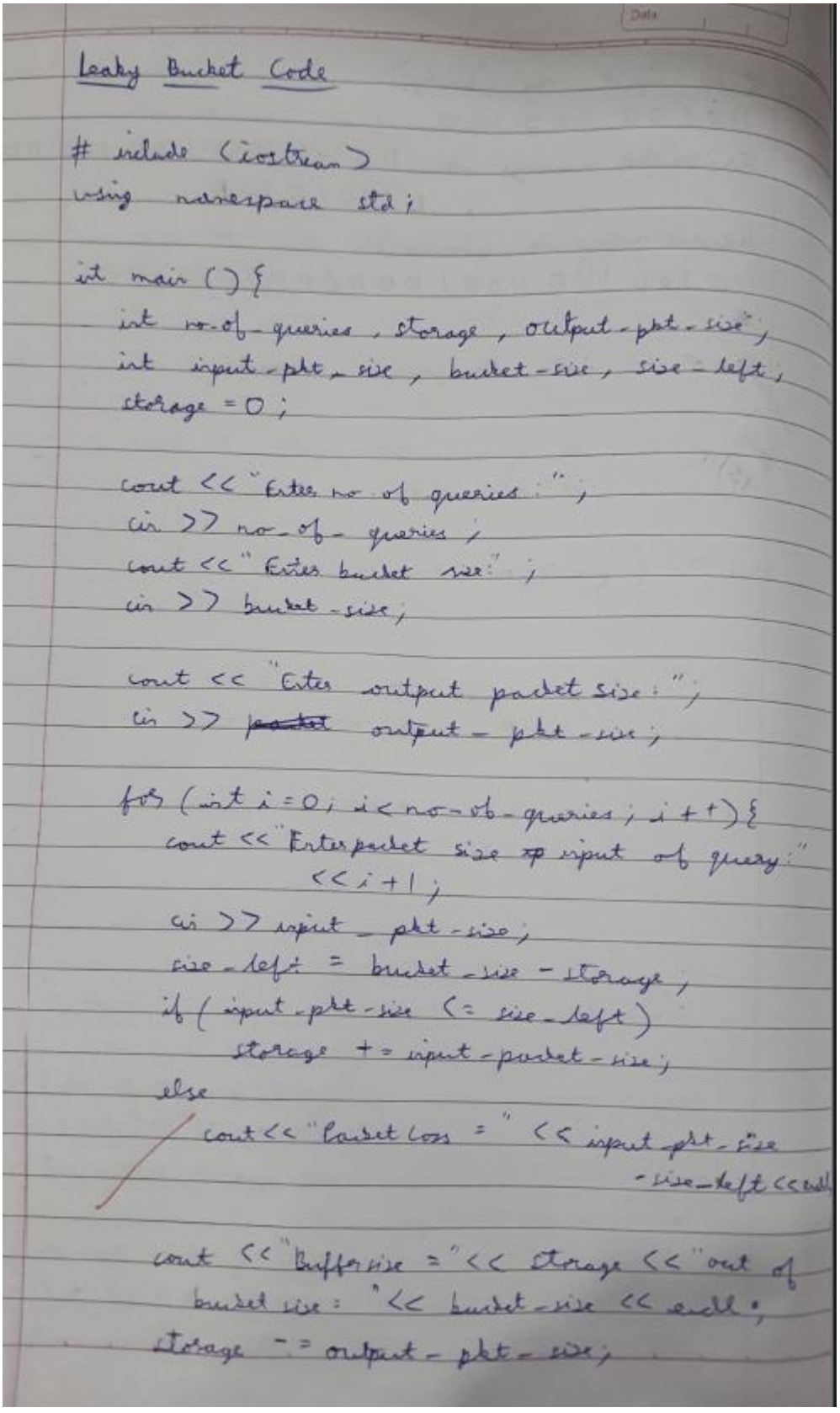
```
#include <bits/stdc++.h>
using namespace std;

int main() {
    int no_of_queries, storage, output_pkt_size;
    int input_pkt_size, bucket_size, size_left;

    // Initial packets in the bucket
    storage = 0;

    // Total number of times bucket content is checked
    cout << "Enter the number of queries: ";
    cin >> no_of_queries;

    // Total number of packets that can be accommodated in the bucket
    cout << "Enter the bucket size: ";
    cin >> bucket_size;

    // Number of packets that exit the bucket at a time
    cout << "Enter the output packet size: ";
    cin >> output_pkt_size;

    // Iterating for each query
    for (int i = 0; i < no_of_queries; i++) {
        // Get the input packet size for the current query
        cout << "Enter the input packet size for query " << i + 1 << ": ";
        cin >> input_pkt_size;

        // Calculate the space left in the bucket
        size_left = bucket_size - storage;

        if (input_pkt_size <= size_left) {
            // If there is enough space, add the input packets to the storage
            storage += input_pkt_size;
        } else {
            // If there is not enough space, packet loss occurs
            cout << "Packet loss = " << input_pkt_size - size_left << endl;
        }
```

```
        // Print current buffer size
        cout << "Buffer size = " << storage << " out of bucket size = " << bucket_size << endl;

        // Simulate output packet consumption
        storage -= output_pkt_size;

        // Ensure the storage does not become negative
        if (storage < 0) {
            storage = 0;
        }
    }

    return 0;
}
```

iii. Screen shots/ output

```
Enter the number of queries: 5
Enter the bucket size: 10
Enter the output packet size: 3
Enter the input packet size for query 1: 4
Buffer size = 4 out of bucket size = 10
Enter the input packet size for query 2: 3
Buffer size = 4 out of bucket size = 10
Enter the input packet size for query 3: 5
Buffer size = 6 out of bucket size = 10
Enter the input packet size for query 4: 6
Buffer size = 9 out of bucket size = 10
Enter the input packet size for query 5: 9
Packet loss = 5
Buffer size = 6 out of bucket size = 10
```

iv. Observation



Leaky Bucket Code

```
# include (iostream)
using namespace std;

int main () {
    int no_of_queries, storage, output_pkt_size;
    int input_pkt_size, bucket_size, size_left,
    storage = 0;

    cout << "Enter no of queries: ";
    cin >> no_of_queries;
    cout << "Enter bucket size: ";
    cin >> bucket_size;

    cout << "Enter output packet size: ";
    cin >> ~~packet~~ output_pkt_size;

    for (int i = 0; i < no_of_queries; i++) {
        cout << "Enter packet size ~~of~~ input of query:"
                << i+1;
        cin >> input_pkt_size;
        size_left = bucket_size - storage;
        if (input_pkt_size <= size_left)
            storage += input_packet_size;
        else
            cout << "Packet Loss = " << input_pkt_size
                - size_left << endl;

        cout << "Buffer size =" << storage << "out of
            bucket size: " << bucket_size << endl;
        storage -= output_pkt_size;
```

```
    if (storage < 0)
        storage = 0;
  }
}
return 0;
}
```

Output :

```
Enter no. of queries : 5
Enter bucket size : 10
Enter output packet size : 3
Enter input packet size for query 1 : 4
Buffer size = 4 out of bucket size = 10
Enter input packet size for query 2 : 3
Buffer size = 4 out of bucket size = 10
Enter input packet size for query 3 : 5
Buffer size = 6 out of bucket size = 10
Enter input packet size for query 4 : 6
Buffer size = 9 out of bucket size = 10
Enter input packet size for query 5 : 9
Packet loss = 5
Buffer size = 6 out of bucket size = 10
```

Program 15

i. Aim of the program

Using TCP/IP sockets, write a client-server program to make the client send the file name and the server to send back the contents of the requested file if present.

ii. Procedure along with the topology

Client.py

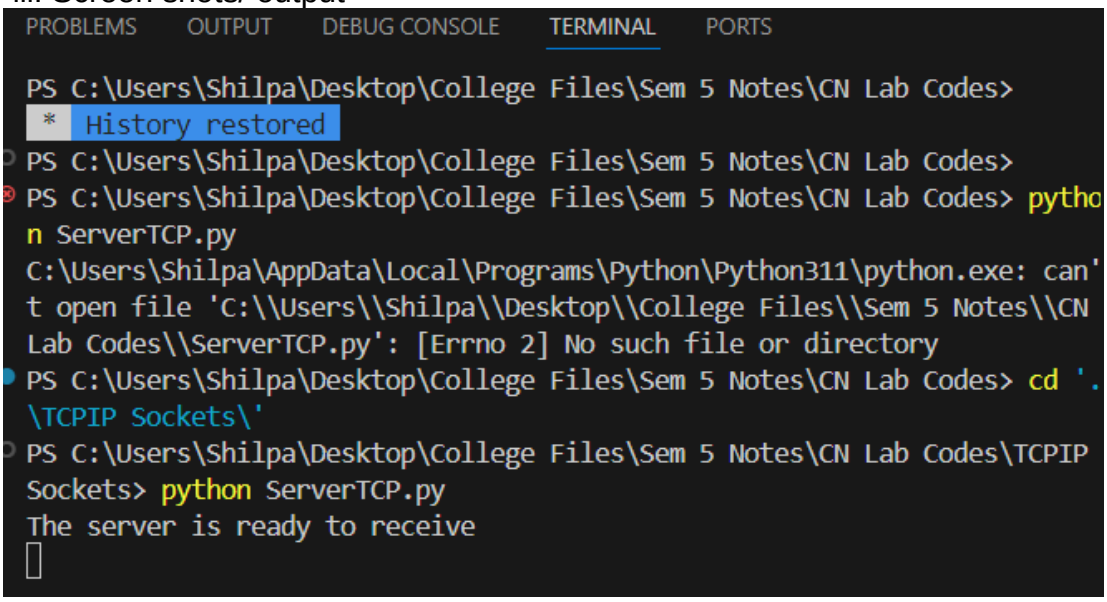
```
from socket import *

serverName = "127.0.0.1"
serverPort = 12000

clientSocket = socket(AF_INET, SOCK_STREAM)
clientSocket.connect((serverName, serverPort))

sentence = input("Enter file name: ")
clientSocket.send(sentence.encode())

filecontents = clientSocket.recv(1024).decode()
print('From Server:', filecontents)

clientSocket.close()
```

Server.py

```
from socket import *

serverName = "127.0.0.1"
serverPort = 12000

serverSocket = socket(AF_INET, SOCK_STREAM)
serverSocket.bind((serverName, serverPort))
serverSocket.listen(1)

print("The server is ready to receive")

while 1:
    connectionSocket, addr = serverSocket.accept()
    sentence = connectionSocket.recv(1024).decode()

    try:
        with open(sentence, "r") as file:
            content = file.read(1024)
            connectionSocket.send(content.encode())
    except FileNotFoundError:
```

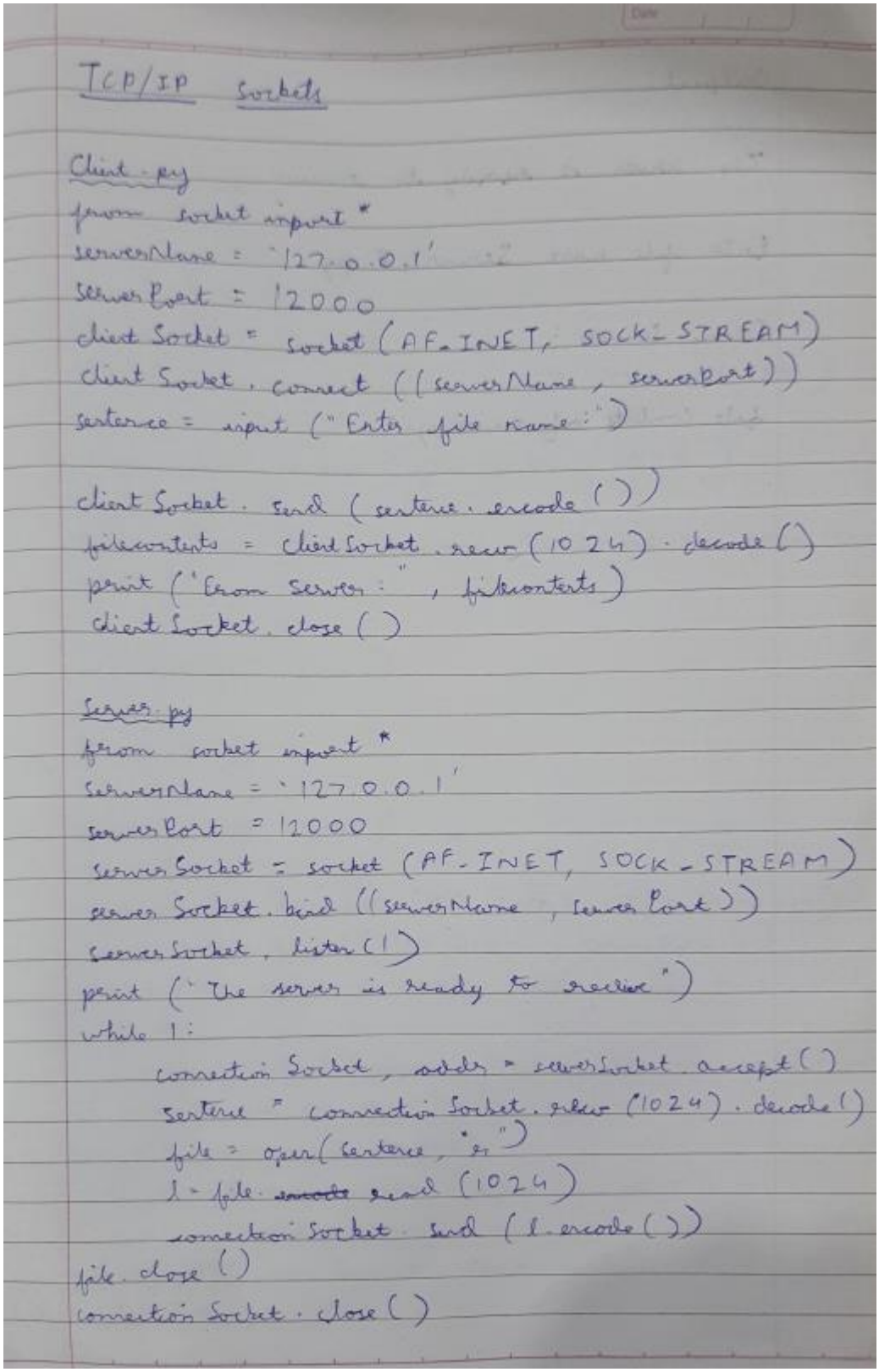
```
    connectionSocket.send("File not found".encode())

connectionSocket.close()
```

iii. Screen shots/ output



```
PS C:\Users\Shilpa\Desktop\College Files\Sem 5 Notes\CN Lab Codes> cd '.
\TCPIP Sockets\'
PS C:\Users\Shilpa\Desktop\College Files\Sem 5 Notes\CN Lab Codes\TCPIP
Sockets> python ClientTCP.py
Enter file name: ServerTCP.py
From Server: from socket import *

serverName = "127.0.0.1"
serverPort = 12000

serverSocket = socket(AF_INET, SOCK_STREAM)
serverSocket.bind((serverName, serverPort))
serverSocket.listen(1)

print("The server is ready to receive")

while 1:
    connectionSocket, addr = serverSocket.accept()
    sentence = connectionSocket.recv(1024).decode()

    try:
        with open(sentence, "r") as file:
            content = file.read(1024)
            connectionSocket.send(content.encode())
    except FileNotFoundError:
        connectionSocket.send("File not found".encode())

    connectionSocket.close()

PS C:\Users\Shilpa\Desktop\College Files\Sem 5 Notes\CN Lab Codes\TCPIP
Sockets>
```

iv. Observation



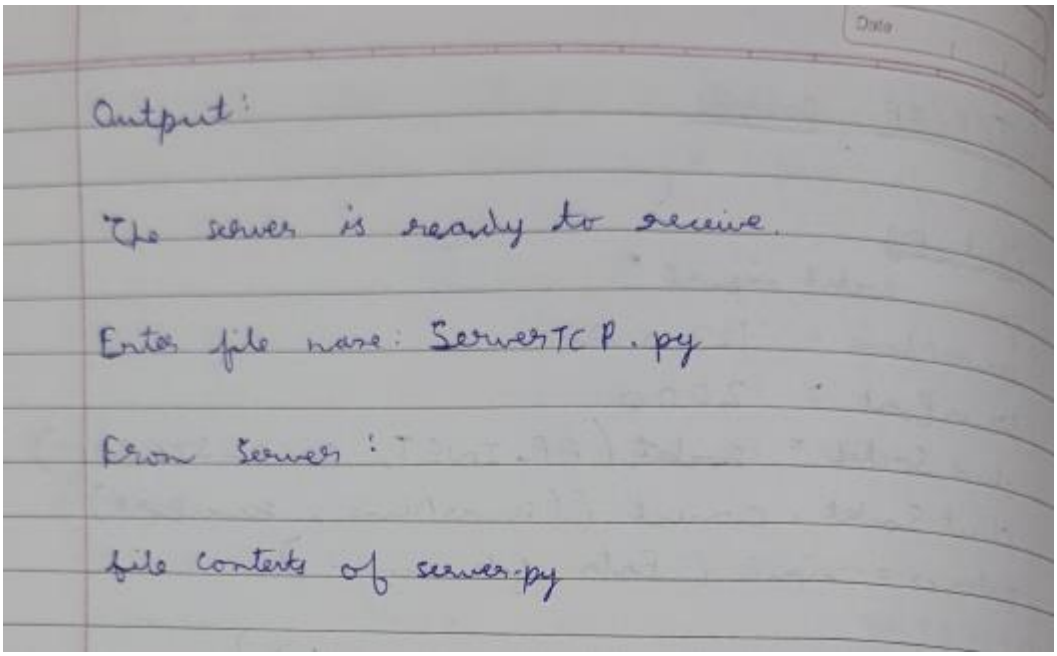
TCP/IP Sockets

Client.py

```
from socket import *
serverName = '127.0.0.1'
serverPort = 12000
clientSocket = socket(AF_INET, SOCK_STREAM)
clientSocket.connect((serverName, serverPort))
sentence = input("Enter file name:")

clientSocket.send(sentence.encode())
filecontents = clientSocket.recv(1024).decode()
print('From Server:', filecontents)
clientSocket.close()
```

Server.py

```
from socket import *
serverName = '127.0.0.1'
serverPort = 12000
serverSocket = socket(AF_INET, SOCK_STREAM)
serverSocket.bind((serverName, serverPort))
serverSocket.listen(1)
print('The server is ready to receive')
while 1:
    connectionSocket, addr = serverSocket.accept()
    sentence = connectionSocket.recv(1024).decode()
    file = open(sentence, "r")
    l = file.read(1024)
    connectionSocket.send(l.encode())
file.close()
connectionSocket.close()
```


Output:
The server is ready to receive
Enter file name: ServerTCP.py
From Server:
file contents of server.py

Program 16

i. Aim of the program

Using UDP sockets, write a client-server program to make the client send the file name and the server to send back the contents of the requested file if present.

ii. Procedure along with the topology

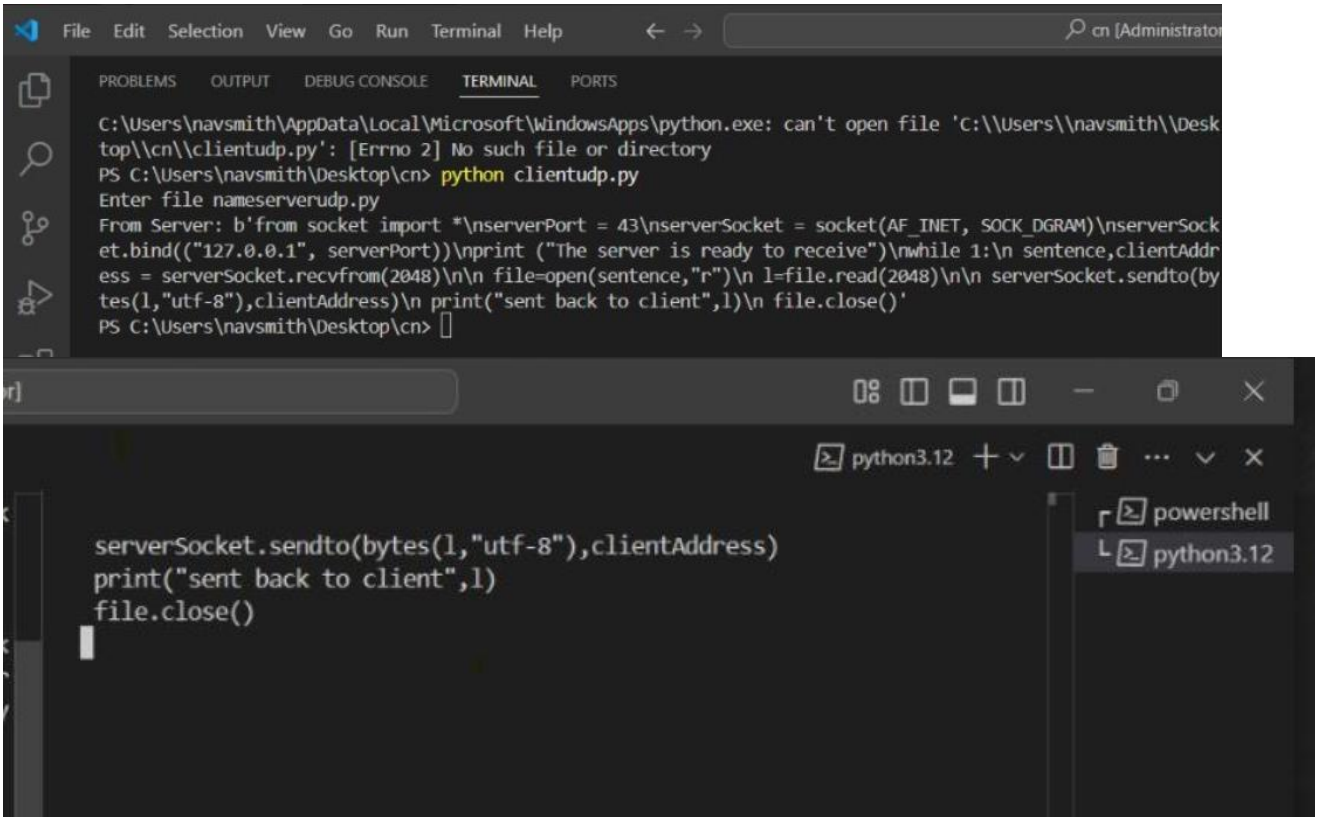
Client.py

```
from socket import *

serverName = "127.0.0.1"
serverPort = 12000

clientSocket = socket(AF_INET, SOCK_DGRAM)

sentence = input("Enter file name: ")
clientSocket.sendto(bytes(sentence, "utf-8"), (serverName, serverPort))

filecontents, serverAddress = clientSocket.recvfrom(2048)
print('From Server:', filecontents.decode())

clientSocket.close()
```

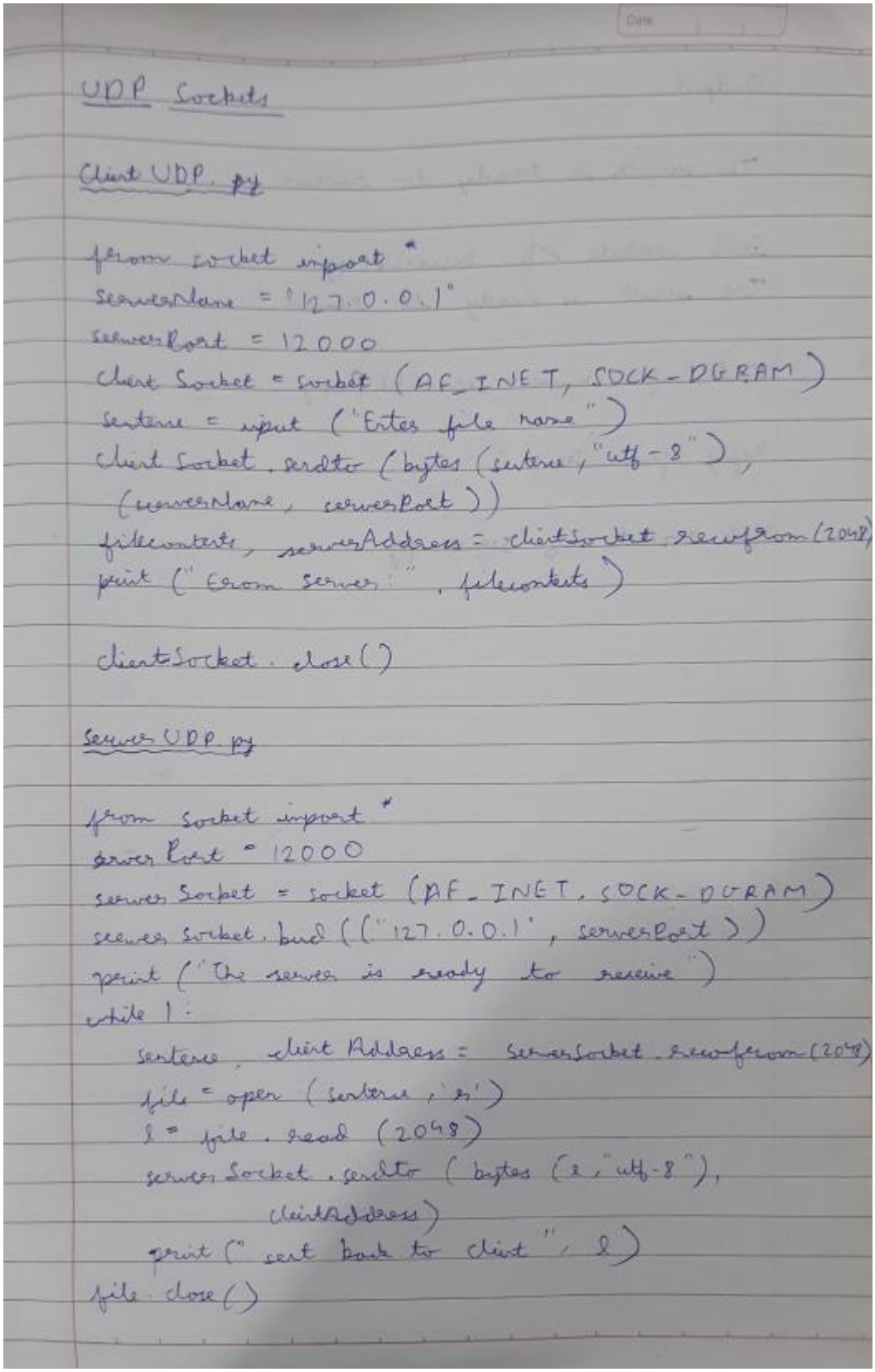
Server.py

```
from socket import *

serverPort = 12000
serverSocket = socket(AF_INET, SOCK_DGRAM)

serverSocket.bind(("127.0.0.1", serverPort))
print("The server is ready to receive")

while 1:
    sentence, clientAddress = serverSocket.recvfrom(2048)

    try:
        with open(sentence.decode(), "r") as file:
            l = file.read(2048)
            serverSocket.sendto(bytes(l, "utf-8"), clientAddress)
            print("Sent back to client:", l)
    except FileNotFoundError:
        serverSocket.sendto(bytes("File not found", "utf-8"), clientAddress)
        print("File not found:", sentence.decode())
```

iii. Screen shots/ output



iv. Observation



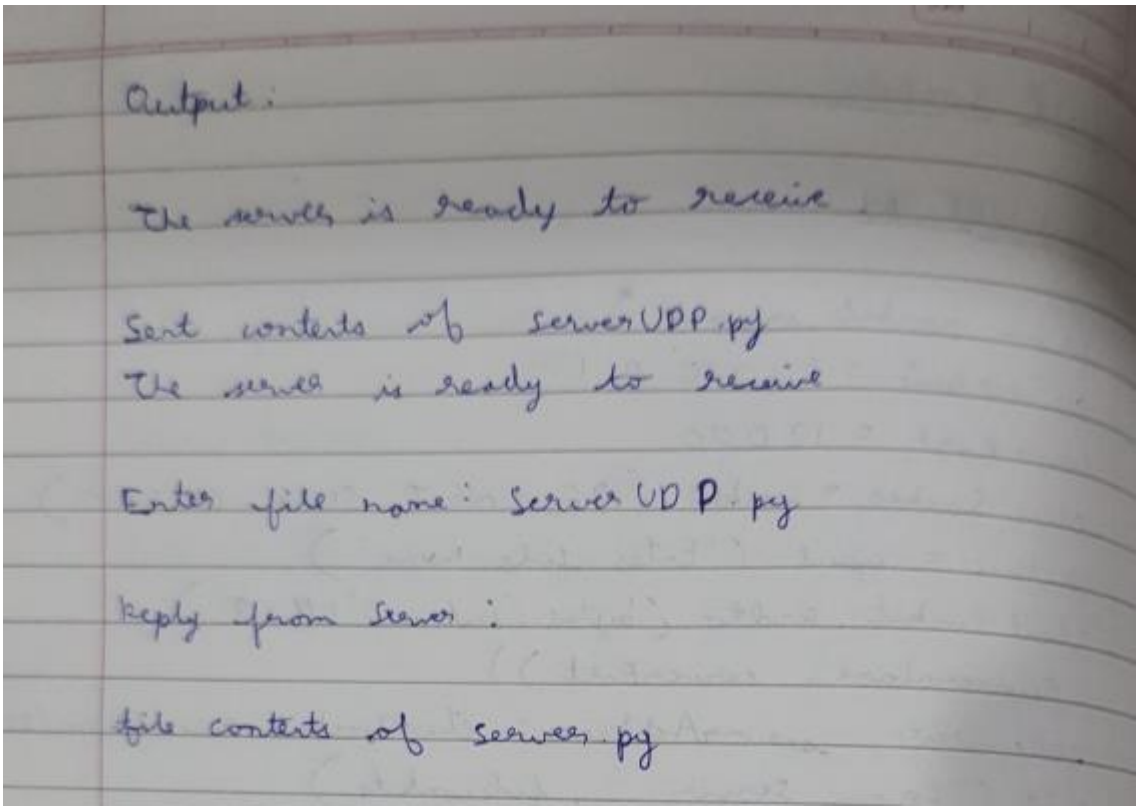
UDP Sockets

Client UDP.py

```
from socket import *
serverName = '127.0.0.1'
serverPort = 12000
clientSocket = socket (AF_INET, SOCK_DGRAM)
sentence = input ('Enter file name')
clientSocket.sendto (bytes (sentence, "utf-8"),
(serverName, serverPort))
fileContents, serverAddress = clientSocket.recvfrom(2048)
print ("From server", fileContents)

clientSocket.close()
```

Server UDP.py

```
from socket import *
serverPort = 12000
serverSocket = socket (AF_INET, SOCK_DGRAM)
serverSocket.bind (('127.0.0.1', serverPort))
print ('The server is ready to receive')
while 1:
    sentence, clientAddress = serverSocket.recvfrom(2048)
    file = open (sentence, 'r')
    l = file.read (2048)
    serverSocket.sendto (bytes (l, "utf-8"),
                clientAddress)
    print ("sent back to client", l)
file.close()
```


Output:

The server is ready to receive

Sent contents of serverUDP.py
The server is ready to receive

Enter file name: serverUDP.py

Reply from Server:

file contents of server.py