Institute of Computer Technology

B. Tech Computer Science and Engineering

Sub: CN

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SEM: CSE 5-B (BATCH53)

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Practical-6

Aim:

Design a Network of an organization using fundamentals of subnetting.

Scenario:

Organization named Zenith enterprise has setup a branch office at Noida and hired you as a Network Engineer. The branch office will be having 5 different departments and each department has its own network. Each department has actually 14 devices (including network devices). The IP address range given to you is 192.XX.10.0/24. Design the network such that wastage of IP address is less. So, for designing purpose you can take 2 devices in each department (as first device and last device in network) for ease of the implementation.

Calculation:

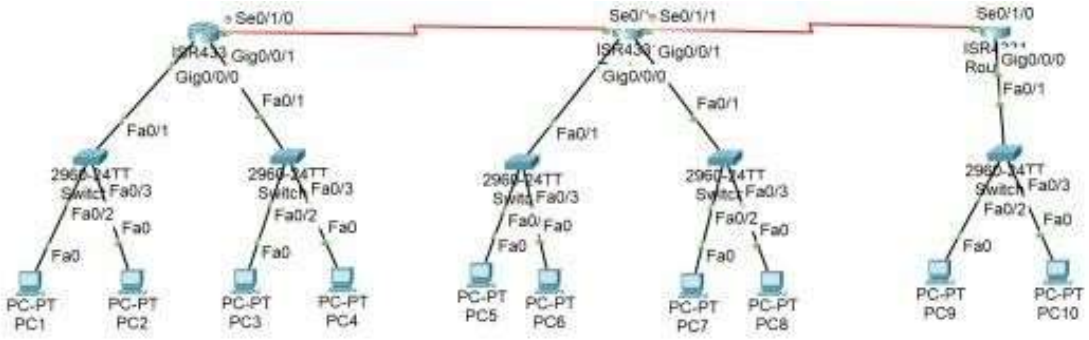
Reserved address:

- Network Address
- Broadcast Address

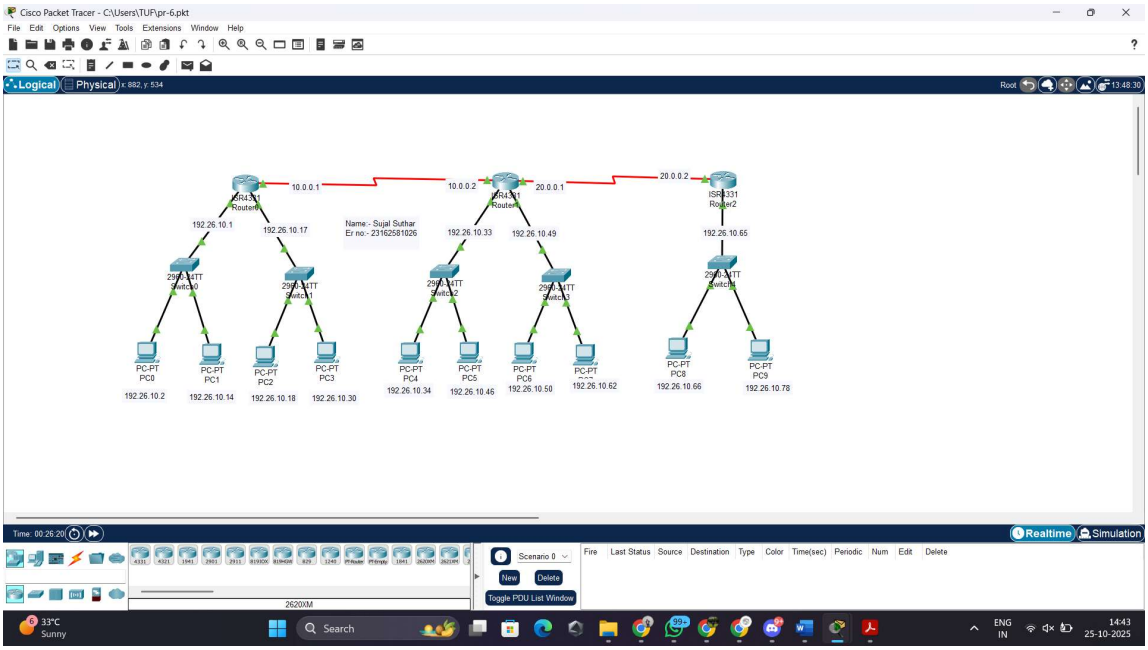
Min host bit requirement:

Procedure: No of devices $\leq 2 - 2$

1) Create network as given below



Network



2) Calculate the number of bits required for host as per the given problem.

- IPv4 address length = 32 bits
- Remaining bits = 32 – 28 = 4 bits

Number of Host Bits = 4

Verification:

- Possible host addresses = 2^4 – 2 = 14
- This satisfies the requirement of 14 hosts per department.

3) Get subnet mask for subnetting

Old Subnet mask (Decimal form)	255.255.255.0
Old Subnet mask (Binary form)	11111111. 11111111. 11111111. 00000000
New Subnet mask (Binary form)	11111111.11111111.11111111.11110000
New Subnet mask (Decimal form)	255.255.255.240 (/28)

4) Calculate IP address and design a network

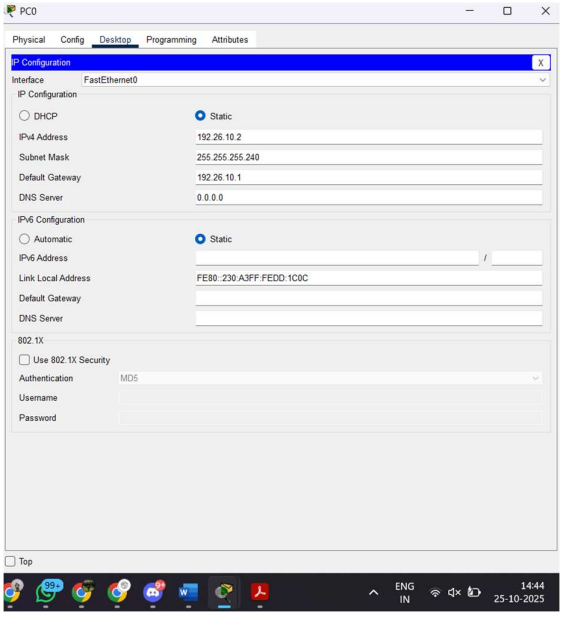
Dept.	**Device**	**IP Address**	**Subnet Mask**
Dept. 1	Network	192.26.10.0	255.255.255.240
	Default Gateway	192.26.10.1	255.255.255.240
	Host (First)	192.26.10.2	255.255.255.240
	Host (Last)	192.26.10.14	255.255.255.240
	Broadcast	192.26.10.15	255.255.255.240

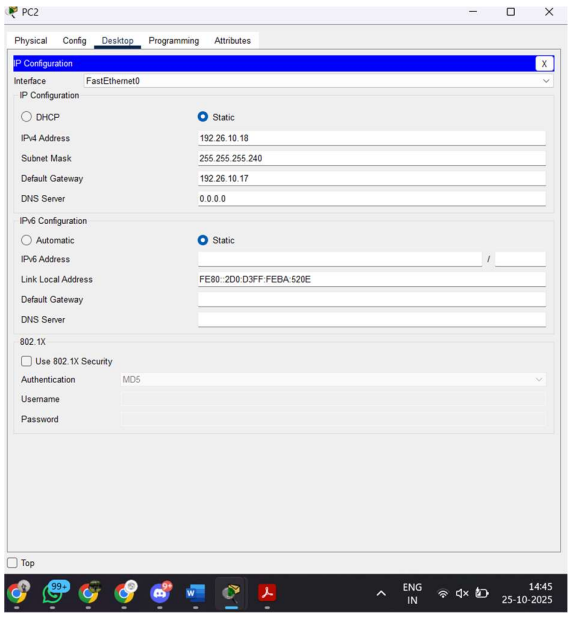
Dept. 2	Network	192.26.10.16	255.255.255.240
	Default Gateway	192.26.10.17	255.255.255.240
	Host (First)	192.26.10.18	255.255.255.240
	Host (Last)	192.26.10.30	255.255.255.240
	Broadcast	192.26.10.31	255.255.255.240
Dept. 3	Network	192.26.10.32	255.255.255.240
	Default Gateway	192.26.10.33	255.255.255.240
	Host (First)	192.26.10.34	255.255.255.240
	Host (Last)	192.26.10.46	255.255.255.240
	Broadcast	192.26.10.47	255.255.255.240
Dept. 4	Network	192.26.10.48	255.255.255.240
	Default Gateway	192.26.10.49	255.255.255.240
	Host (First)	192.26.10.50	255.255.255.240

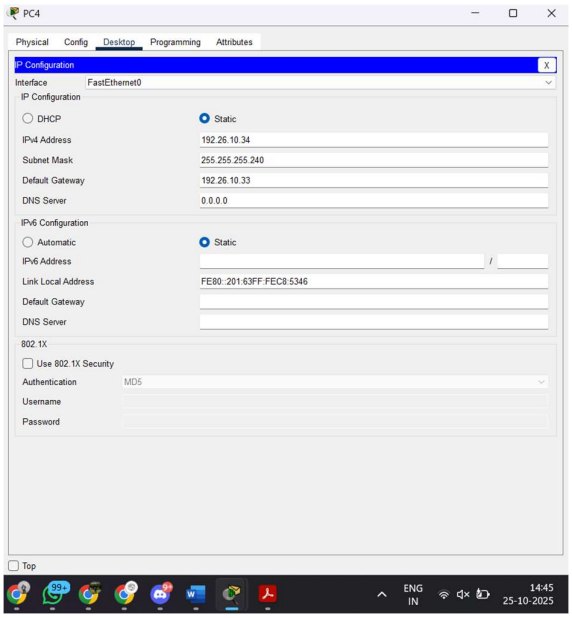
	Host (Last)	192.26.10.62	255.255.255.240
	Broadcast	192.26.10.63	255.255.255.240
Dept. 5	Network	192.26.10.64	255.255.255.240
	Default Gateway	192.26.10.65	255.255.255.240
	Host (First)	192.26.10.66	255.255.255.240
	Host (Last)	192.26.10.78	255.255.255.240
	Broadcast	192.26.10.79	255.255.255.240

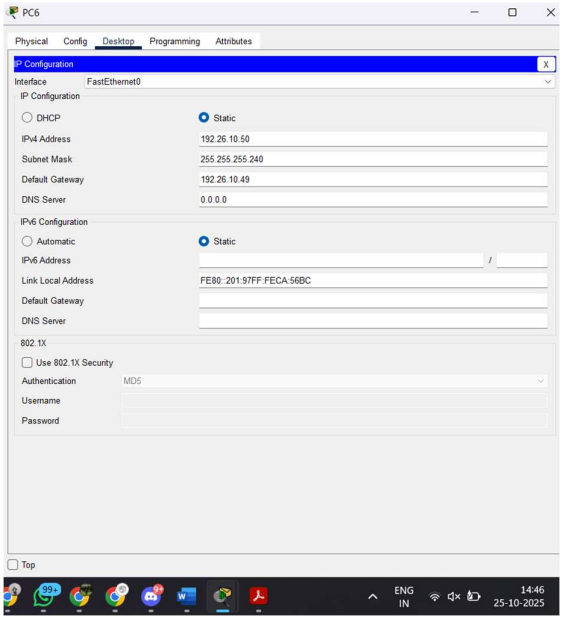
5) Configure IP address (All Devices, Routers)

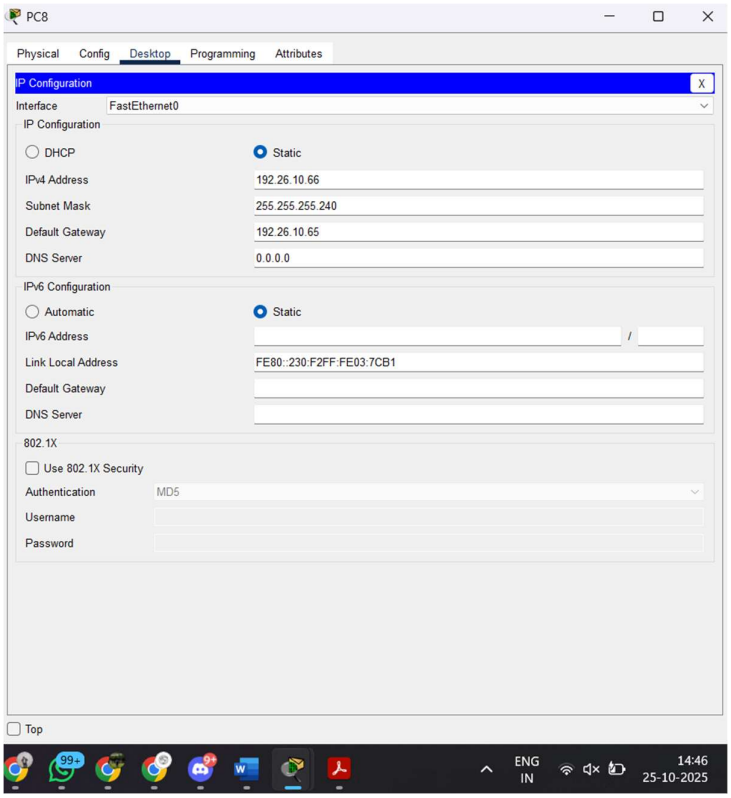
Configuration:-



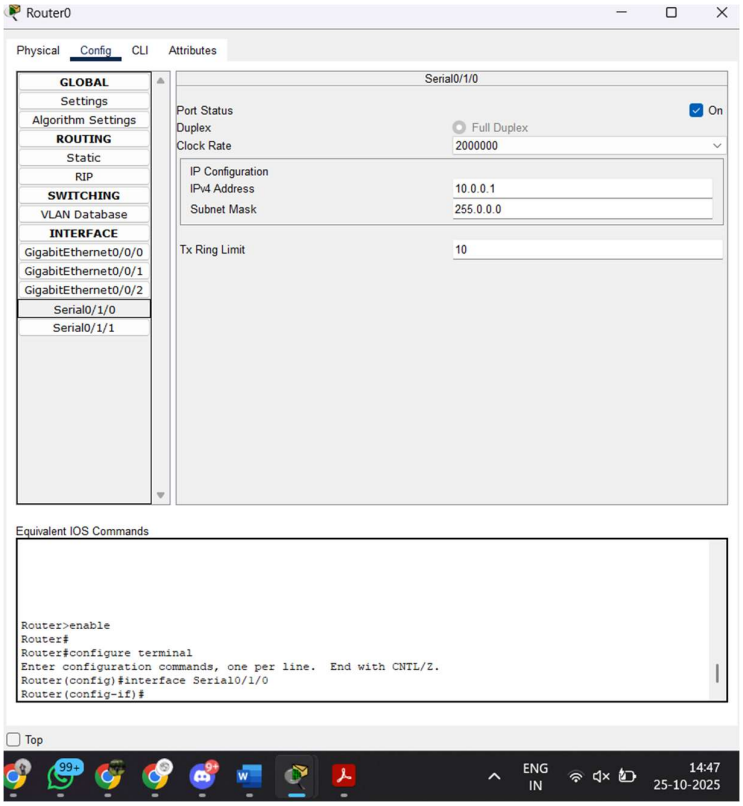


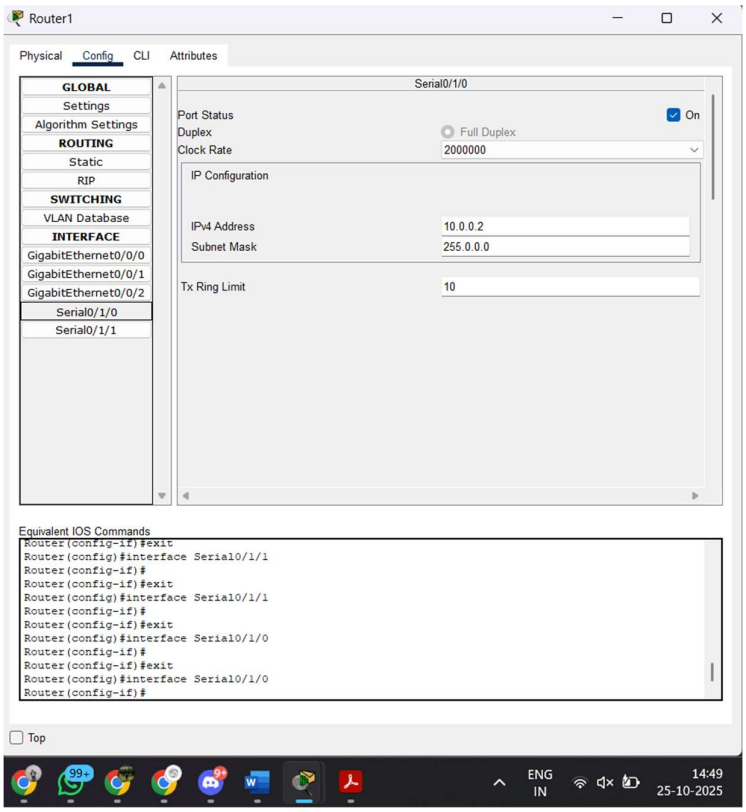

PC4
Physical
Config
Desktop
Programming
Attributes
IP Configuration
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
192.26.10.34
Subnet Mask
255.255.255.240
Default Gateway
192.26.10.33
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address
FE80::201:63FF:FEC8:5346
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Username
Password
Top
ENG
IN
14:45
25-10-2025

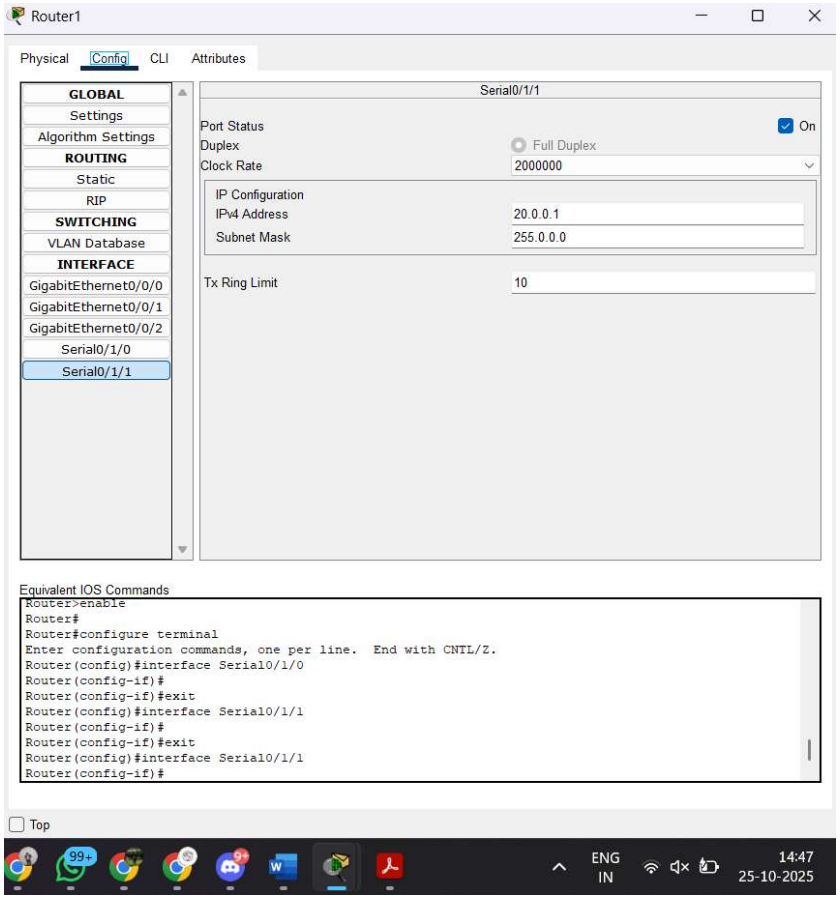

PC6
Physical
Config
Desktop
Programming
Attributes
IP Configuration
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
192.26.10.50
Subnet Mask
255.255.255.240
Default Gateway
192.26.10.49
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address
FE80::201:97FF:FECA:56BC
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Username
Password
Top
ENG
IN
14:46
25-10-2025

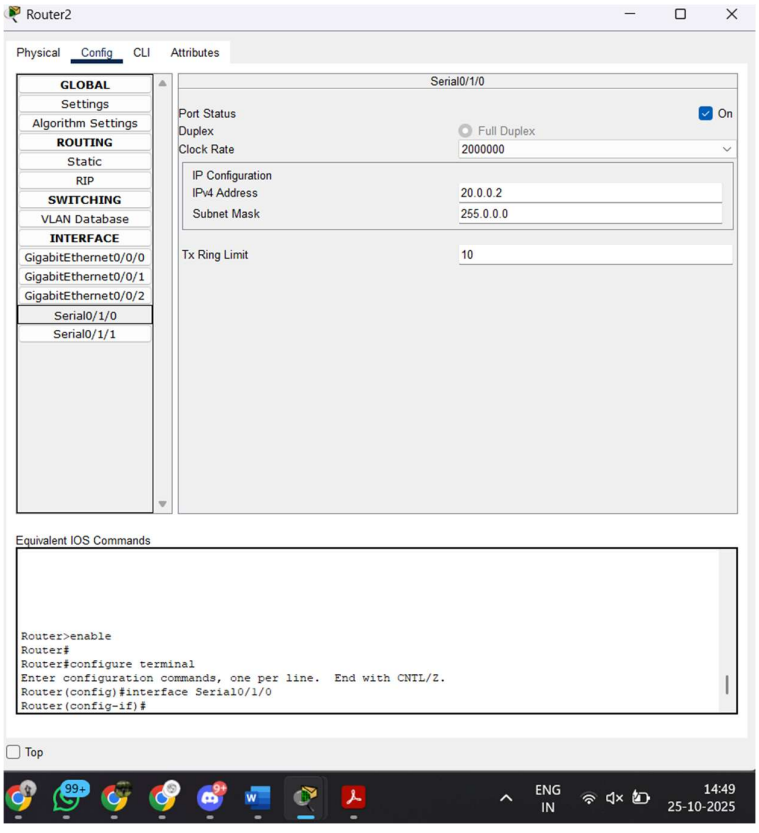

PC8
Physical
Config
Desktop
Programming
Attributes
IP Configuration
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
192.26.10.66
Subnet Mask
255.255.255.240
Default Gateway
192.26.10.65
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address
FE80::230:F2FF:FE03:7CB1
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Username
Password
Top
ENG
IN
14:46
25-10-2025

Router Configuration:-





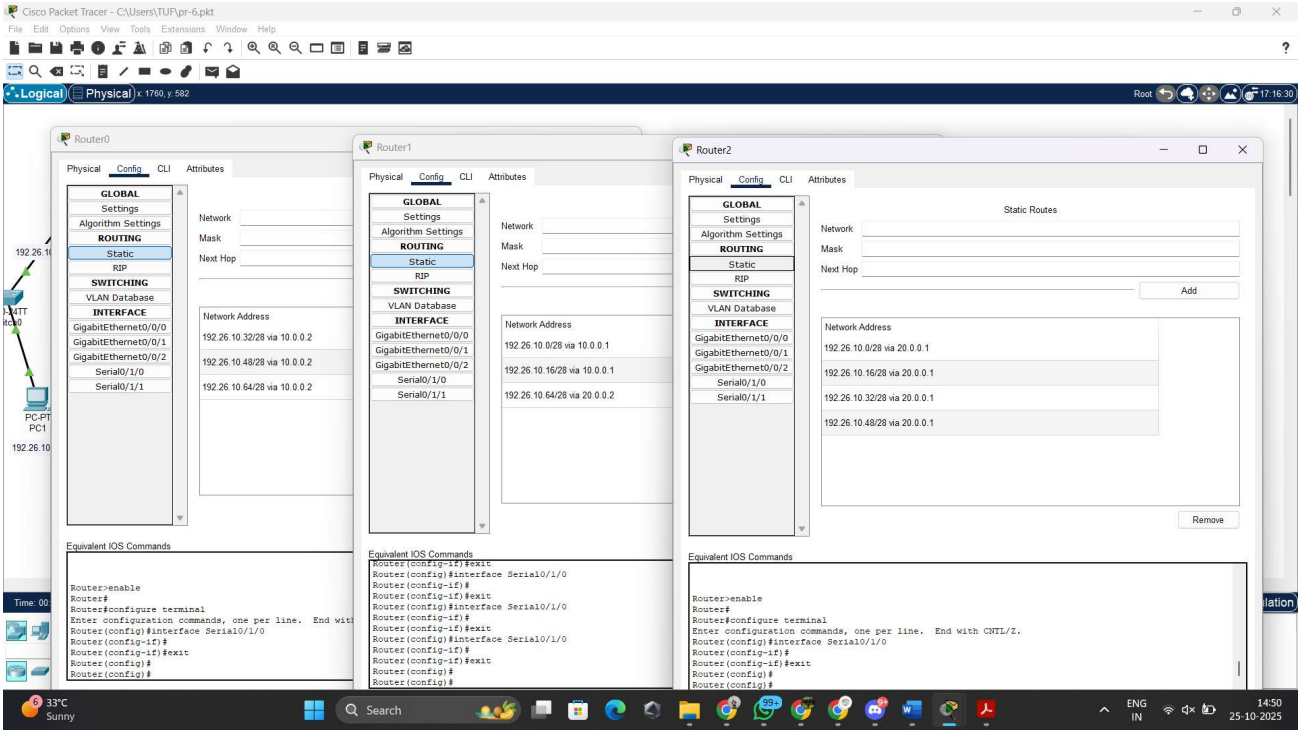

Router1
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
GigabitEthernet0/0/0
GigabitEthernet0/0/1
GigabitEthernet0/0/2
Serial0/1/0
Serial0/1/1
Serial0/1/1
Port Status
On
Duplex
Full Duplex
Clock Rate
2000000
IP Configuration
IPv4 Address
20.0.0.1
Subnet Mask
255.0.0.0
Tx Ring Limit
10
Equivalent IOS Commands
Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface Serial0/1/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial0/1/1
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial0/1/1
Router(config-if)#
Top
ENG
IN
14:47
25-10-2025


Router2
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
GigabitEthernet0/0/0
GigabitEthernet0/0/1
GigabitEthernet0/0/2
Serial0/1/0
Serial0/1/1
Serial0/1/0
Port Status
On
Duplex
Full Duplex
Clock Rate
2000000
IP Configuration
IPv4 Address
20.0.0.2
Subnet Mask
255.0.0.0
Tx Ring Limit
10
Equivalent IOS Commands
Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface Serial0/1/0
Router(config-if)#
Top
ENG
IN
14:49
25-10-2025

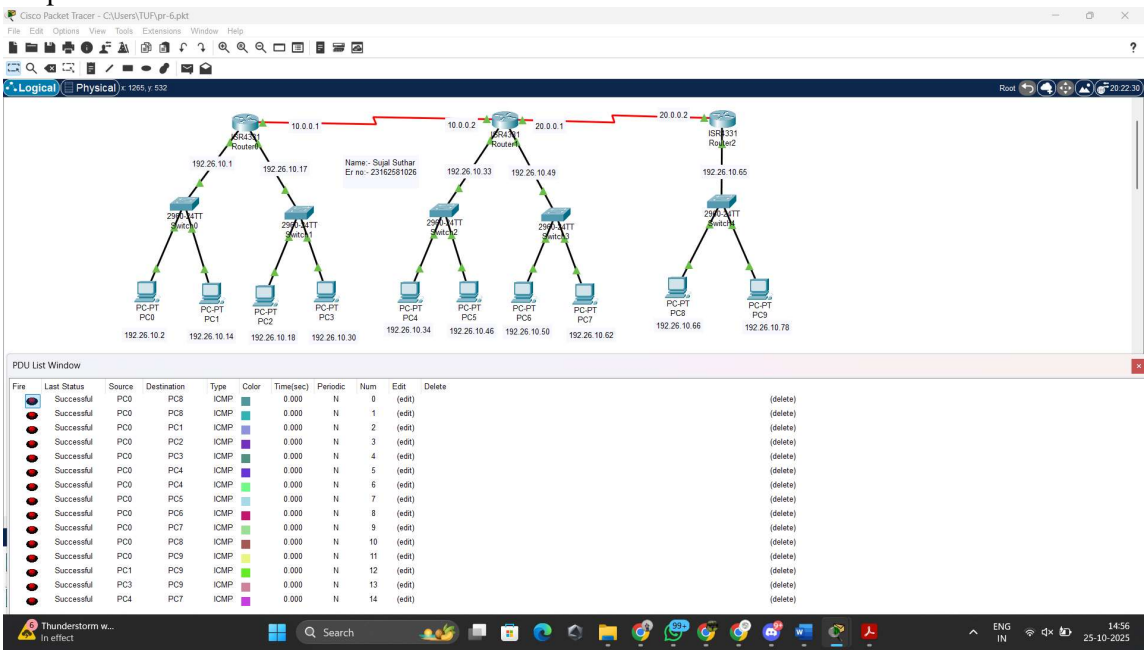
6) Configure static routing table (STATIC in routers)

Router	Dept.	Network	Subnet Mask	Next Hop
Router0	Dept.3	192.26.10.32	255.255.255.240	10.0.0.2
	Dept.4	192.26.10.48	255.255.255.240	10.0.0.2
	Dept.5	192.26.10.64	255.255.255.240	10.0.0.2
Router1	Dept.1	192.26.10.0	255.255.255.240	10.0.0.1
	Dept.2	192.26.10.16	255.255.255.240	10.0.0.1
	Dept.5	192.26.10.64	255.255.255.240	20.0.0.2
Router2	Dept.1	192.26.10.0	255.255.255.240	20.0.0.1
	Dept.2	192.26.10.16	255.255.255.240	20.0.0.1
	Dept.3	192.26.10.32	255.255.255.240	20.0.0.1
	Dept.4	192.26.10.48	255.255.255.240	20.0.0.1

Static (Routers)



Output:-



Conclusion:

We subnetted **192.26.10.0/24** by borrowing **4 bits**, obtaining a mask of **255.255.255.240**. Each subnet offers **14 usable hosts**, which satisfies departmental requirements. A subnet table was prepared, IPs were assigned, and **static routes** were configured for full inter-department connectivity.

Note: Make sure the last two digits of your enrollment numbers appear in the network IP address that must be visible in the snapshot of the Cisco packet tracer. i.e. 192.XX.10.1 (XX indicates last two digits of your enrollment no.)