

Institute of Computer Technology

B. Tech Computer Science and Engineering

Sub: Computer Networks

Course Code:-2CSE502

Sem-V(CS)

Class:-A

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.

Reserved address:

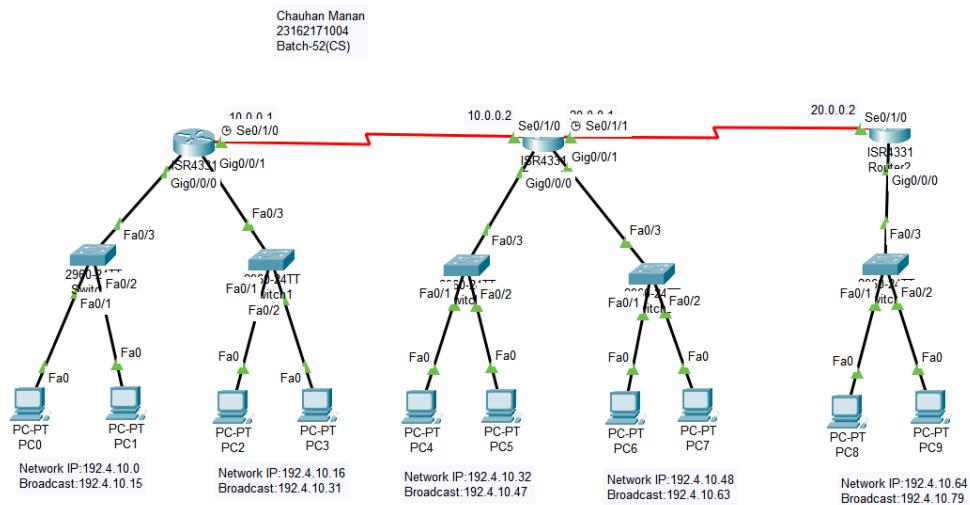
- Network Address
- Broadcast Address

Min host bit requirement:

No. of devices $\leq 2^n - 2$

Procedure:

1) Create network as given below



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

Formula:

$$2^n - 2 \geq 14$$

Where n = host bits

- $2^4 - 2 = 14$
- n = 4
- So, 4 host bits are required.

Subnet Mask Calculation

- Original subnet: /24 → 255.255.255.0 (8 host bits = 254 usable)
- New requirement: 4 host bits → 16 addresses (14 usable)

So, new mask = /28 → 255.255.255.240

3) Get subnet mask for subnetting

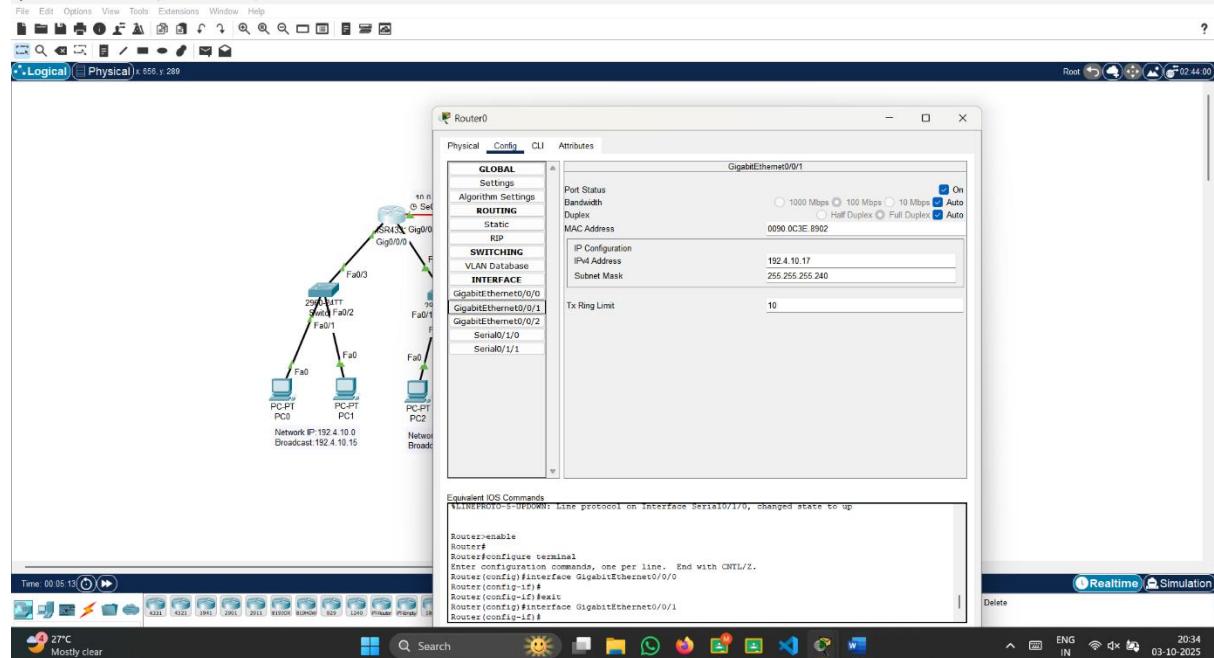
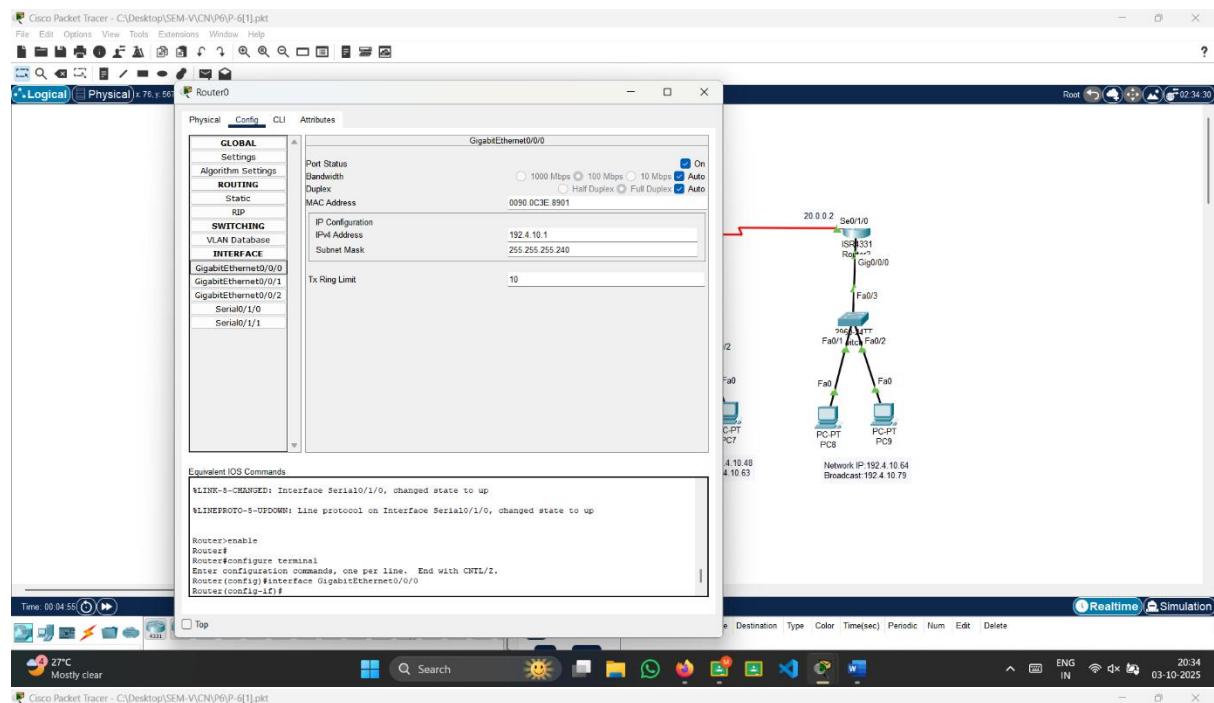
Old Subnet mask (Decimal form)	255.255.255.0
Old Subnet mask (Binary form)	11111111. 11111111. 11111111. 00000000
New Subnet mask (Binary form)	11111111.11111111.11111111.11110000
New Subnet mask (Decimal form)	255.255.255.240

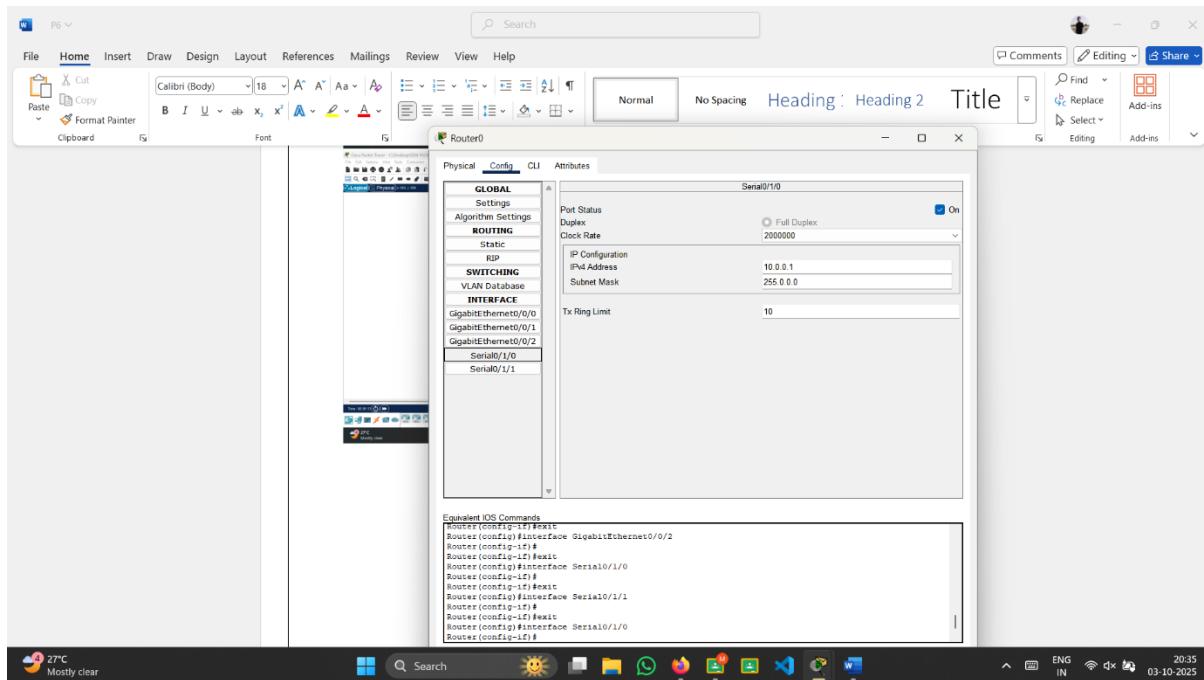
4) Calculate IP address and design a network

Dept.	Device	IP Address	Subnet Mask
Dept. 1	Network	192.04.10.0	255.255.255.240 (/28)
	Default Gateway	192.04.10.1	255.255.255.240 (/28)
	Host (First)	192.04.10.2	255.255.255.240 (/28)
	Host (Last)	192.04.10.14	255.255.255.240 (/28)
	Broadcast	192.04.10.15	255.255.255.240 (/28)
Dept. 2	Network	192.04.10.16	255.255.255.240 (/28)
	Default Gateway	192.04.10.17	255.255.255.240 (/28)
	Host (First)	192.04.10.18	255.255.255.240 (/28)
	Host (Last)	192.04.10.30	255.255.255.240 (/28)
	Broadcast	192.04.10.31	255.255.255.240 (/28)
Dept. 3	Network	192.04.10.32	255.255.255.240 (/28)
	Default Gateway	192.04.10.33	255.255.255.240 (/28)
	Host (First)	192.04.10.34	255.255.255.240 (/28)
	Host (Last)	192.04.10.46	255.255.255.240 (/28)
	Broadcast	192.04.10.47	255.255.255.240 (/28)
Dept. 4	Network	192.04.10.48	255.255.255.240 (/28)
	Default Gateway	192.04.10.49	255.255.255.240 (/28)
	Host (First)	192.04.10.50	255.255.255.240 (/28)
	Host (Last)	192.04.10.62	255.255.255.240 (/28)
	Broadcast	192.04.10.63	255.255.255.240 (/28)
Dept. 5	Network	192.04.10.64	255.255.255.240 (/28)
	Default Gateway	192.04.10.65	255.255.255.240 (/28)
	Host (First)	192.04.10.66	255.255.255.240 (/28)
	Host (Last)	192.04.10.78	255.255.255.240 (/28)
	Broadcast	192.04.10.79	255.255.255.240 (/28)

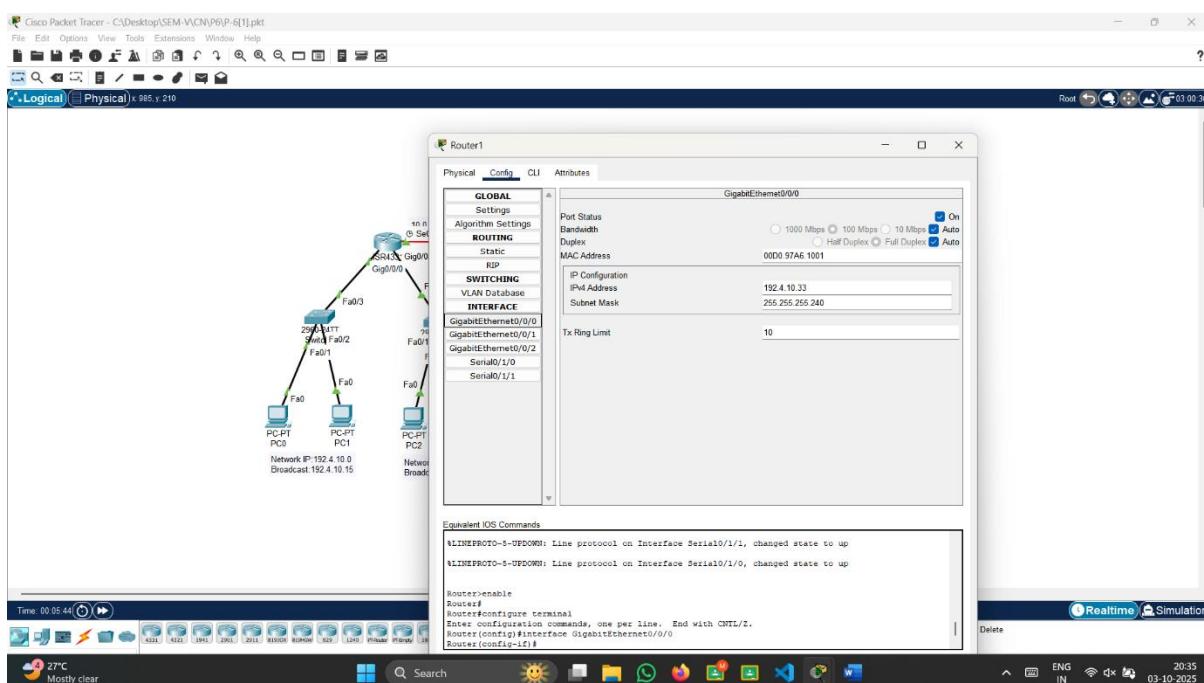
5) Configure IP address (All Devices, Routers)

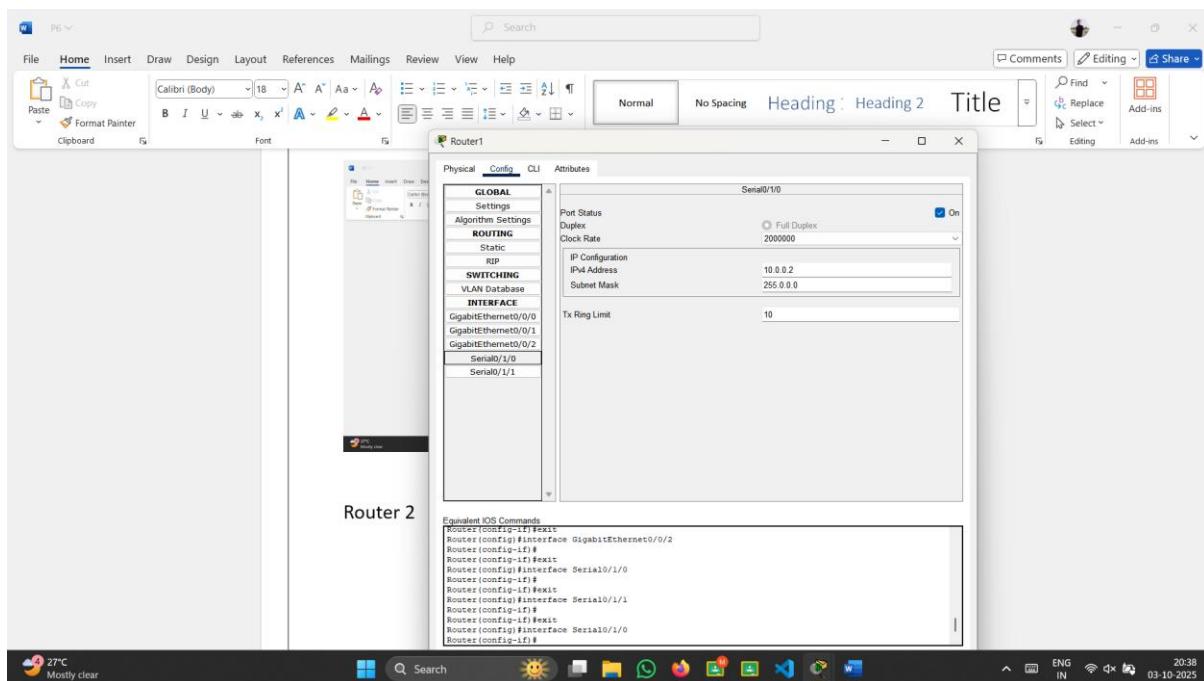
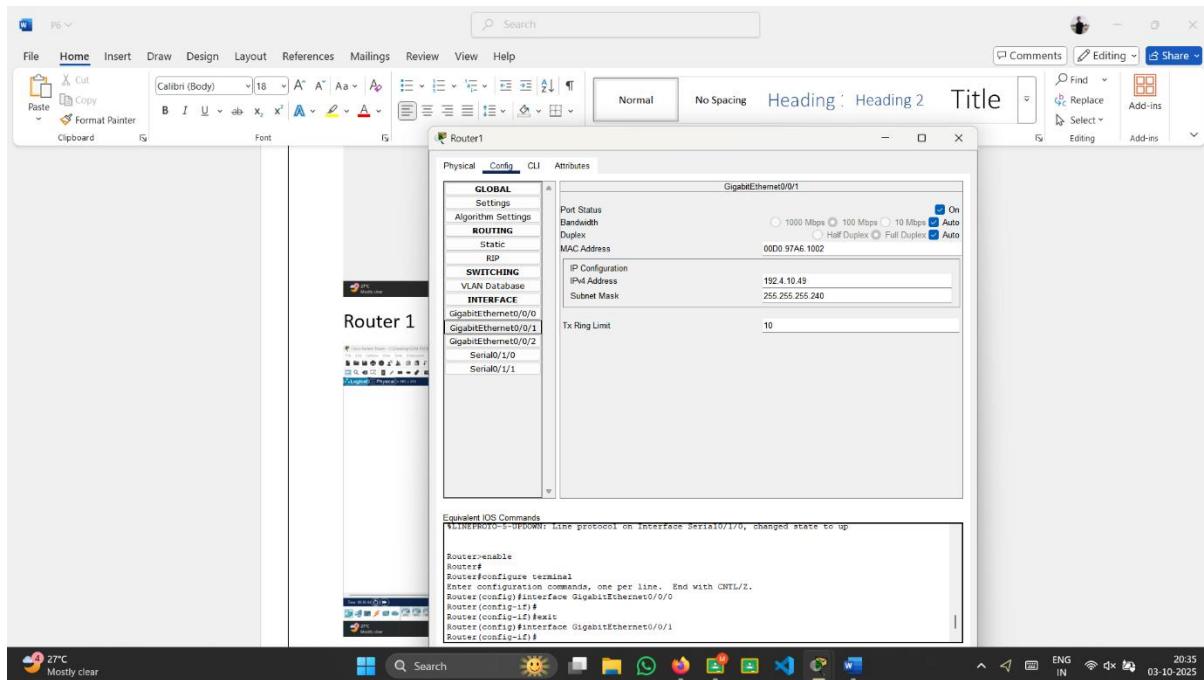
Router 0

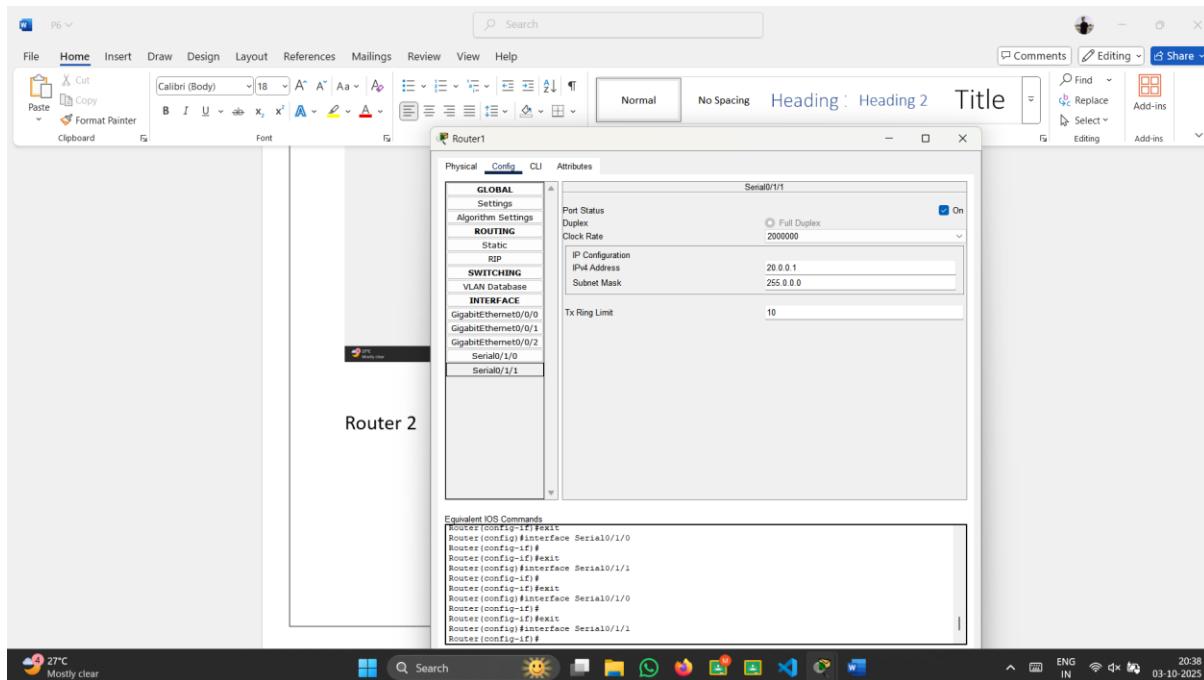




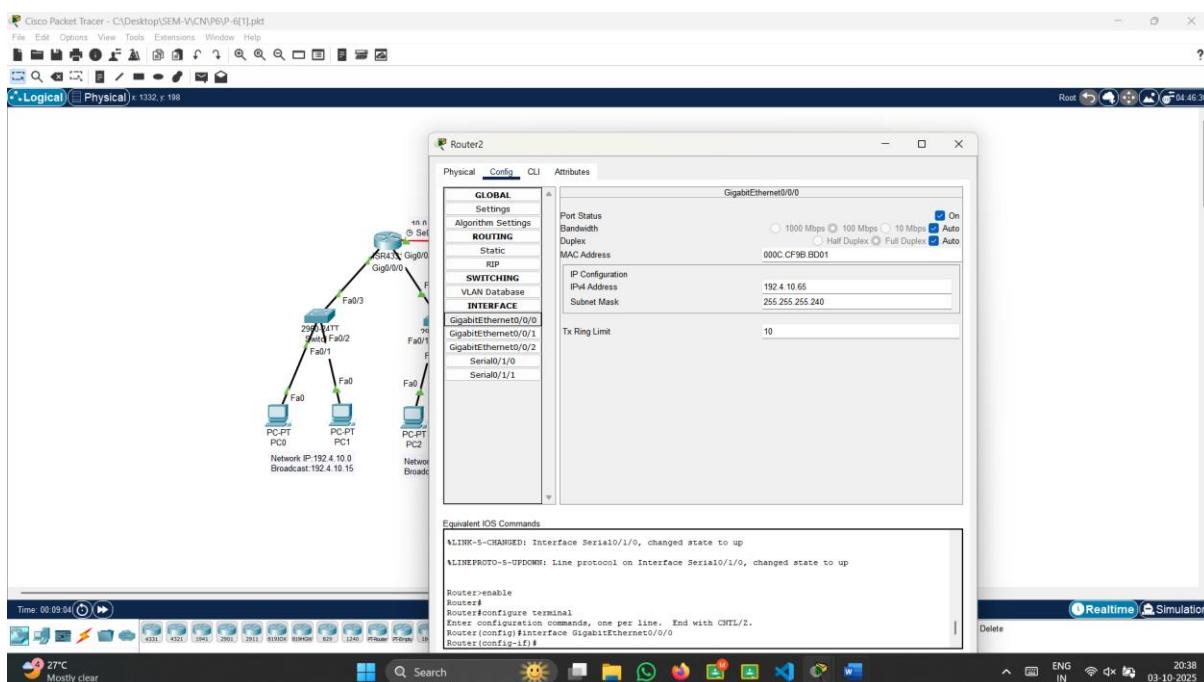
Router 1

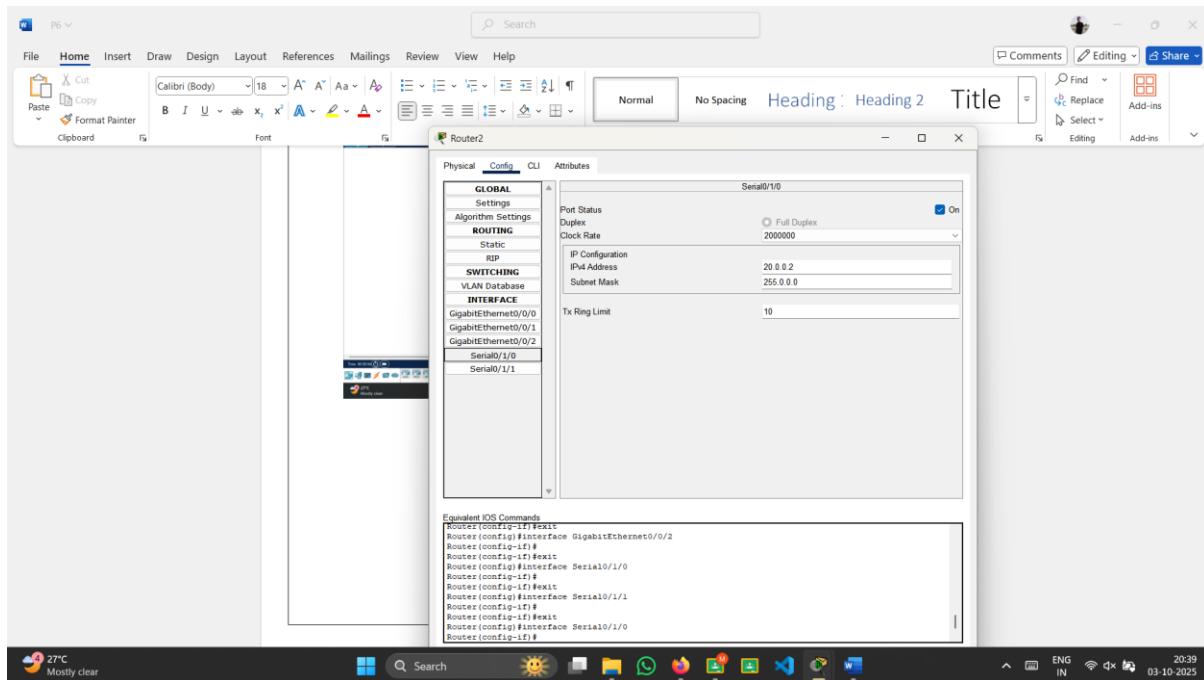




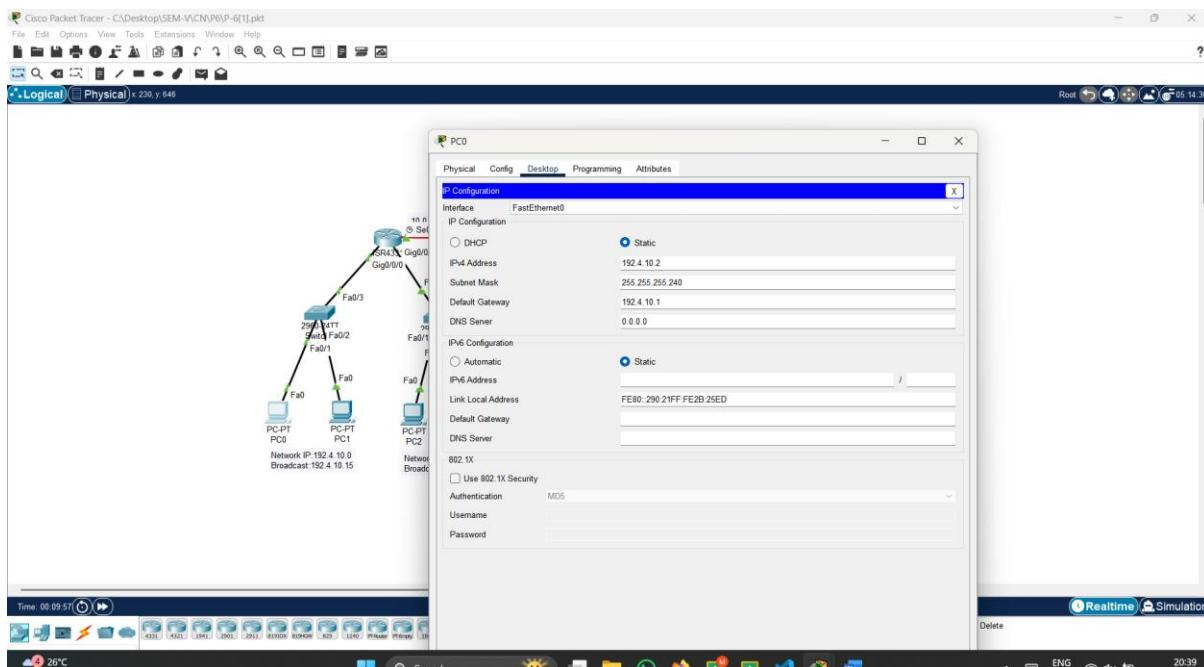


Router 2

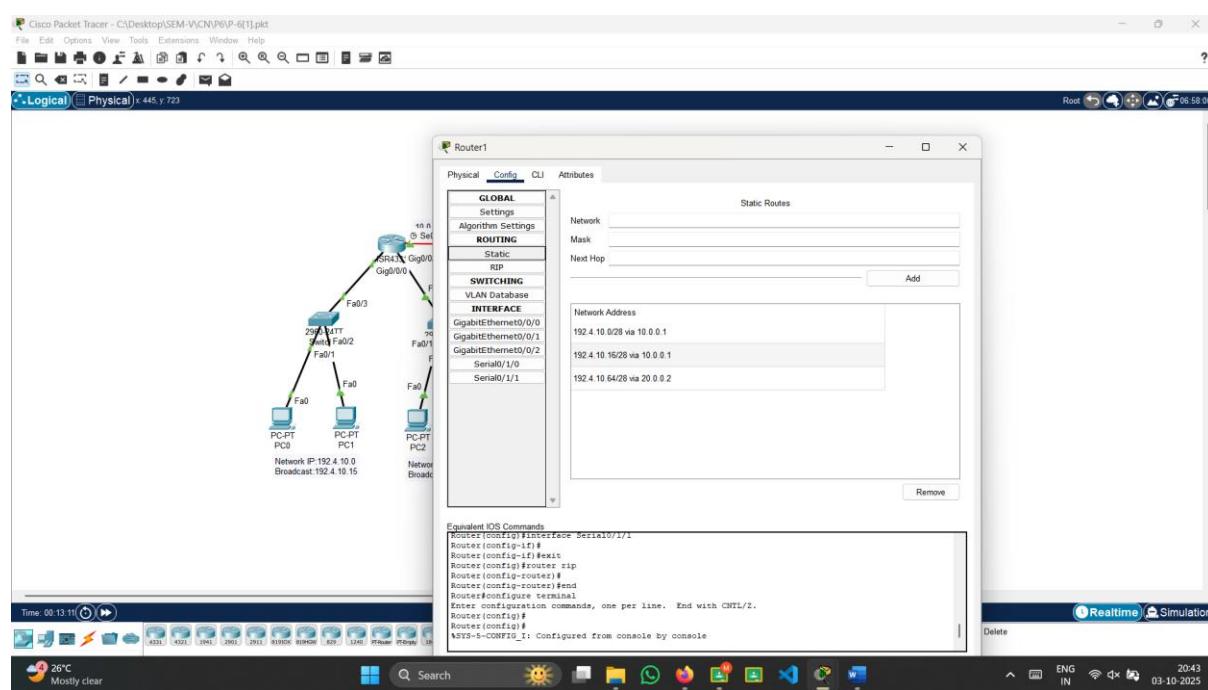
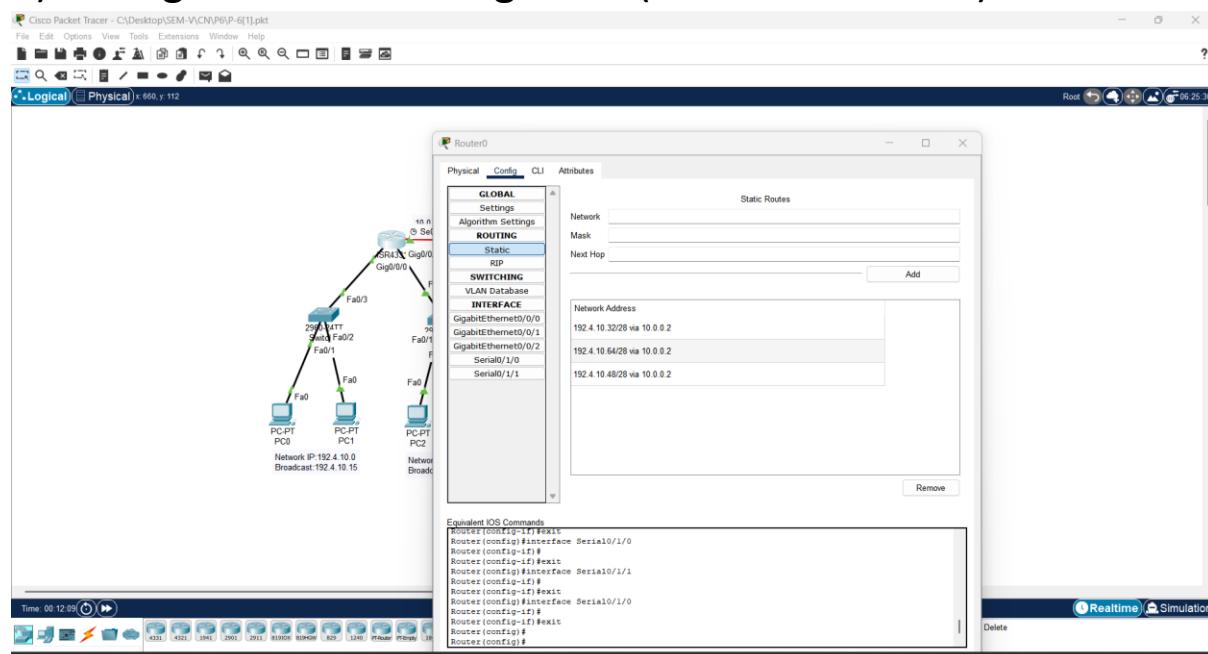


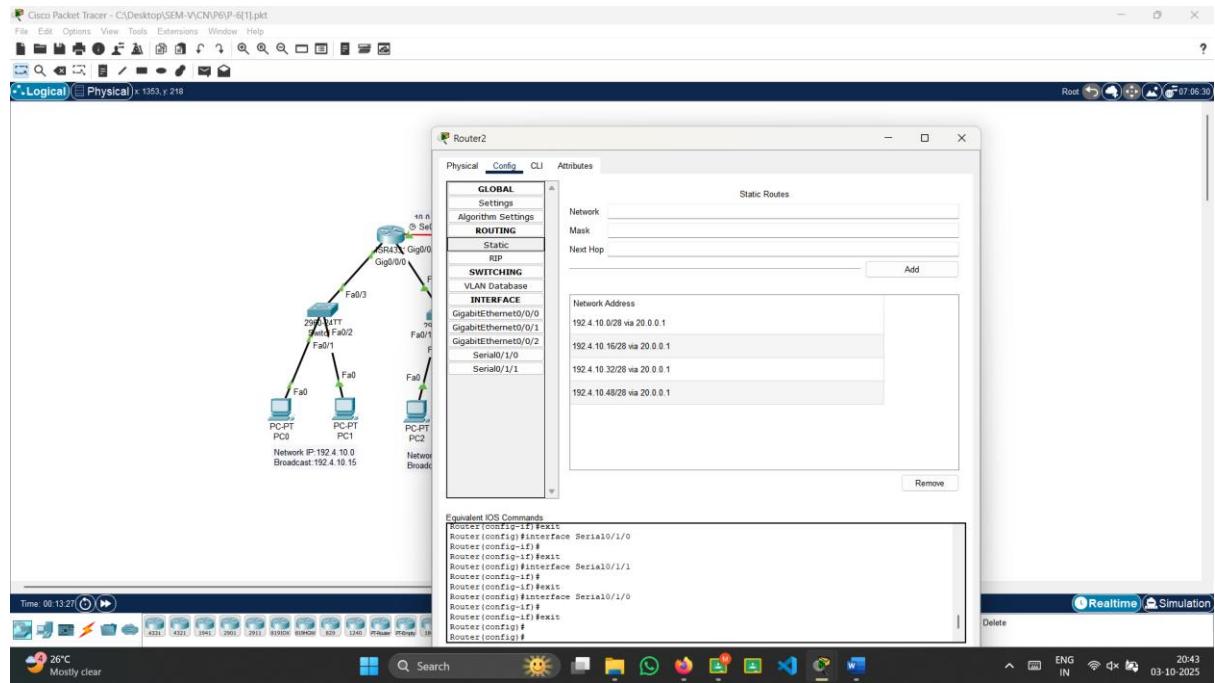


PC0 IP Config:- (For Ex.)



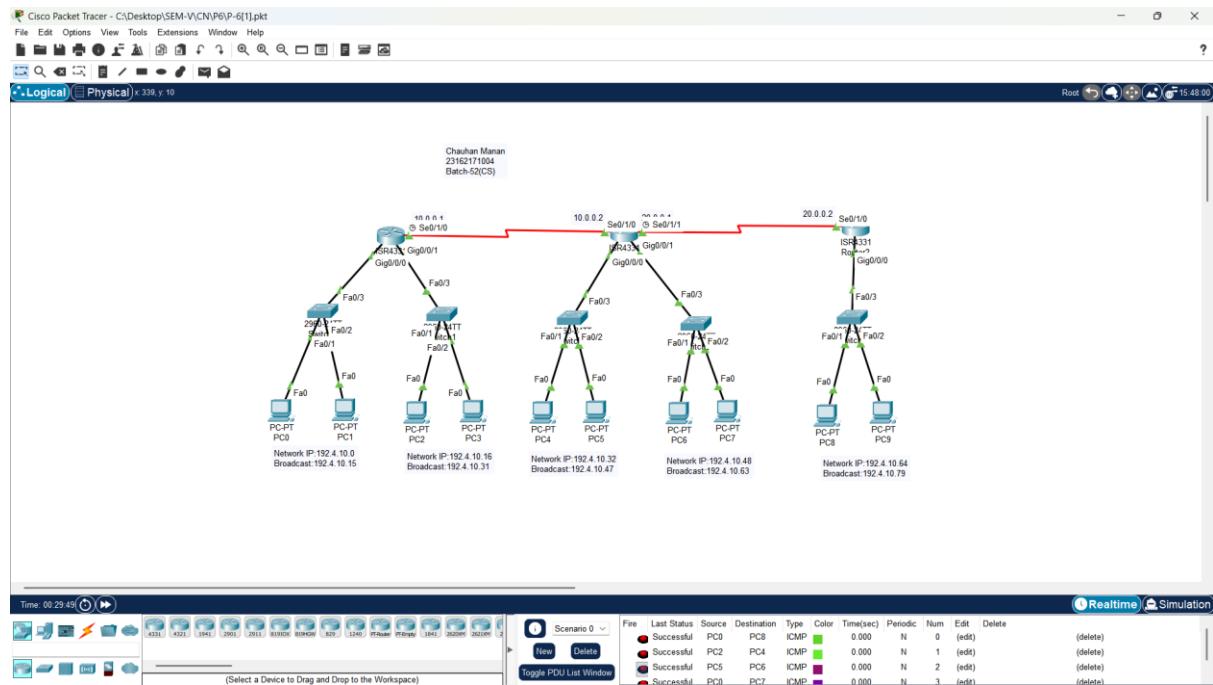
6) Configure static routing table (STATIC in routers)





Router	Dept.	Network	Subnet Mask	Next Hop
Router0	Dept.3	192.4.10.32	255.255.255.240	10.0.0.2
	Dept.4	192.4.10.48	255.255.255.240	10.0.0.2
	Dept.5	192.4.10.64	255.255.255.240	10.0.0.2
Router1	Dept.1	192.4.10.0	255.255.255.240	10.0.0.1
	Dept.2	192.4.10.16	255.255.255.240	10.0.0.1
	Dept.5	192.4.10.64	255.255.255.240	20.0.0.2
Router2	Dept.1	192.4.10.0	255.255.255.240	20.0.0.1
	Dept.2	192.4.10.16	255.255.255.240	20.0.0.1
	Dept.3	192.4.10.32	255.255.255.240	20.0.0.1
	Dept.4	192.4.10.48	255.255.255.240	20.0.0.1

After Static Routing Checks Packet Transferring :-



Conclusion:-

Subnetting divided 192.04.10.0/24 into efficient networks for 5 departments, reducing IP wastage and improving organization, security, and communication.