CCNA

Assignment :-

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Module - 2

Saathi

1) Describe IPv4 address range and explain example of subnetting.

→ The groups are separated by periods starting from zero. the highest number in a grouping is 255.

class A IP addresses 1st bit is 0 encompass the Range of 0.0.0.0 to 127.255.255.255. This class is for large networks and has 8 bits for Network and 24 bits for hosts.

class B IP addresses. where the 1st two bits are 10, are in the range of 128.0.0.0 to 191.255.255.255. This class is for medium networks and has 16 bits for network and 16 bits for hosts.

class C IP addresses, where the 1st three bits are 110, are in the range of 192.0.0.0 to 223.255.255.255. This class is for Smaller network and has 24 bits for network and 8 bits for hosts.

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class D are multicast IP addresses, Where 1st four bits are 1110. are in the range of 224.0.0.0 to 239.255.255.255.

Class E are experimental IP address, Where the 1st four bits are. 1111, are in the Range of 240.0.0.0 to 255.255.255.255.

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Example 03

we have a big single network having IP Address 200.1.2.0.

we want to do Subnetting and divid this network into 2 subnets

given network belongs to class C.

If borrowed bit = 0 then it respresents the first subnet

If borrowed bit = 1 then it represents the second subnet.

IP address of the two subnets are

200.1.2.00000000 = 200.1.2.0.
200.1.2.10000000 = 200.1.2.128.

For 1st Subnet

- IP address of the subnet = 200.1.2.0
- Total Number of IP address = $2^7 = 128$

Total hosts = 128 - 2 = 126

IP range = 200.1.2.00000000, 200.1.2.01111111
= (200.1.2.0, 200.1.2.127)

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broadcast address = 200.1.2.01111111
= 200.1.2.127.

four 2nd Subnet

IP Address of the Subnet = 200.1.2.128

Total IP Addresses = 2^7 = 128

Total host = 128 - 2 = 126

Range IP addresses = (200.1.2.10000000, 200.1.2.11111111)
= 200.1.2.128, 200.1.2.255

broadcast address = 200.1.2.11111111
= 200.1.2.255

2) List of Private address.

Address Ranges to be use by Private networks are:

- class A : 10.0.0.0 to 10.255.255.255
class B : 172.16.0.0 to 172.31.255.255.
class C : 192.168.0.0 to 192.168.255.255.

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An IP address within these ranges is therefore considered non-routable, as it is not unique.

3) What is routing? Explain Work of Router and Protocol.

→ A Routing is a process of selecting path along which the data can be transferred from source to the destination.

→ Routing is performed by special device known as a router.

Router work

→ A Router is a networking device that forwards data packets between Computer networks.

→ one or more Packet-switched networks or subnetwork can be connected using a router.

→ Router as an air traffic Controller and consider data packets as Planes flying to various airports

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→ The Routing protocols use the metric to determine the best path for the packet delivery.

→ The metric is the standard of measurement such as hop count, bandwidth, delay, current load on the path. etc.

4) Type of Routing - example of static Routing:

* Type of Routing.

→ Static Routing

→ - Static Routing is a process in which we have to manually add routes to the routing table.

→ Default Routing :-
- This is the method where the routers is configured to send all packets towards a single Router.

→ Dynamic Routing :-
- Dynamic Routing makes automatic adjustments of the routes according to the current state of the route in the routing table.

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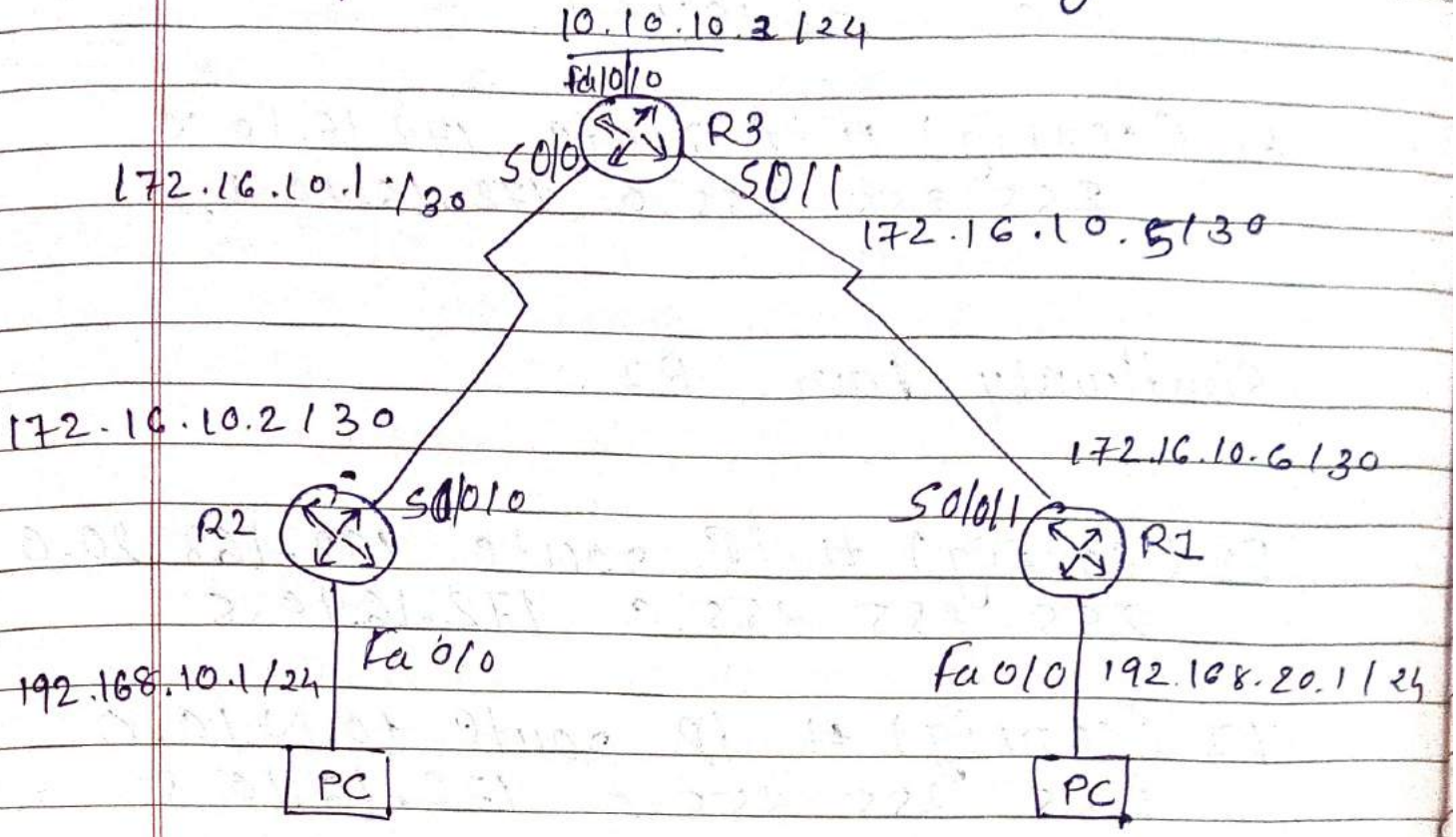
Example of Static Routing :-



Now Configuring Static Routes for R3.

R3 (config) # ip route 192.168.10.0 255.255.255.0 172.168.10.2

R3 (config) # ip route 192.168.20.0 255.255.255.0 172.16.10.6

Now R2

R2 (config) # ip route 192.168.10.0 255.255.255.0 172.16.10.1

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R2(config) # ip route 10.10.10.0 255.255.255.0 172.16.10.1.

R2(config) # ip route 172.16.10.0 255.255.255.0 172.16.10.1.

Similarly for R1.

R1(config) # ip route 192.168.20.0 255.255.255.0 172.16.10.5.

R1(config) # ip route 10.10.10.0 255.255.255.0 172.16.10.5.

R1(config) # ip route 172.16.10.0 255.255.255.0 172.16.10.5.

5) Explain Dynamic Routing.

→ Dynamic Routing makes automatic adjustments of the routes according to the current state of the route in the routing table.

→ Dynamic routing uses protocols to discovers network destinations and the routes to reach them.

→ RIP and OSPF are the best examples of dynamic Routing Protocols.

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→ Automatic adjustments will be made to reach the network destination if one route goes down.

Features:

1. The routers should have the same dynamic protocol running in order to exchanges routes.

2. When a routers finds a change in the topology then the routers advertises it to all other routers.

6) Deference between RIP, EIGRP ~~and OSPF with different area concept~~.

→ RIP stands for Routing Information Protocol	→ OSPF stand open Shortest Path First.
→ RIP is a distance Vector protocol.	→ OSPF is a link state Protocol.
→ The metrics used is hop.	→ The metrics used are bandwidth and delay.

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RIP	OSPF
RIP uses Distance vector algorithm to Calculate the best Path	OSPF uses the SPF algorithm to Calculate the best Path.
→ In RIP, networks are not divided into area our tables.	→ Routing with OSPF is done in Autonomous System, area, stub areas and backbone area.
→ Maximum hop count is 15.	→ No Hop Count.

EIGRP

→ EIGRP stands for Enhanced Interior Gateway Routing Protocol.

→ EIGRP is derived from integrated Gateway Routing protocol.

→ The metrics used are: bandwidth, delay, load and reliability.

→ EIGRP uses Diffusing update algorithm to Calculate the best path.

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→ Routing with EIGRP is done in neighbour Tables, TOPOlogy tubles, and Routing tubles.

→ Maximum hop count is 255.

7) Explain Autonomous System number?

→ An Autonomous system number is a Unique identifier that is globally available and allows its autonomous system to exchange routing information with other system.

→ Autonomous system is a group of IP Prefixes with a clearly defined external routing policy.

→ In order for multiple autonomous systems to interact, each needs to have a unique identifier.

→ If your Autonomous system system requires an internet connection or a connection to a separate network, it needs to use Border Gateway protocol, which required manual configuration.

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6) What is Switching explain VLAN?

→ When a user accesses the internet or another computer network outside their immediate location, messages are sent through the network of transmission media.

→ This Technique of transferring the information from one computer network to another network is know as switching.

→ Switching in Computer network is achieved by using switches.

* VLAN :-

→ Virtual LAN is a concept in which we can divide the devices logically on layer 2 (data link layer).

→ Generally, layer 3 devices divide the broadcast domain but the broadcast domain can be divided by switches using the concept of VLAN.

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VLAN Ranges :-

VLAN 0, 4095 :

These are reserved VLAN which cannot be seen or used.

VLAN 1 :

It is the default VLAN of Switches. By default, all switch ports are in VLAN. This VLAN can't be deleted or edit but can be used.

VLAN 2 - 1001 :

This is normal VLAN range. We can create, edit and delete these VLAN.

VLAN 1002 - 1005

These are CISCO defaults for fddi and token orings. These VLAN can't be deleted.

VLAN 1006 - 4094 :

This is the extended orange of Vlan.

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9) What is Access Port and trunk Port ?

* Access Port :-

→ These switch ports belong to carry the traffic of only one VLAN.

→ By default, it will carry the traffic of native VLAN. (VLAN 1).

→ If the switch port are assigned as access ports then they can be considered as the switch ports belongs to a single broadcast domain.

→ Any traffic arriving on these switch ports is considered as it belongs to the VLAN assigned to the port.

Trunk Ports :-

→ These switch ports belong to and carry the traffic of more then one VLAN.

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→ This is a great advantage as to carry the traffic of a group of VLAN, a single switch port can be used.

→ These are of great use if the user wants to exchange traffic between more then one switch having more then one VLAN configured.

10) List of basic SHOW Command.

→ Show interfaces
→ Show ip route.
→ Show interfaces trunk
→ Show flash
→ Show protocols
→ Show startup-config
→ Show running-config
→ Show vlan
→ Show version
→ Show arp
→ Show clock.
→ Show ip traffic
→ Show interfaces switchport.
→ Show hardware.
→ Show hosts
→ Show users
→ Show disk!
→ Show mac-address table.
→ Show file system

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11) Explain of Layer 2 and Layer 3 Switch.

→

* Layer 2

- Layer 2 Switches are traditional network Switch port that operate in the network data link layer or the "layer 2" of the OSI model of network connection.

→ Purely operating within the network's hardware layer. These Switches forward data packets based on the MAC addresses Specified.

→ Also known as multi-port bridges. layer 2 Switches leverage hardware Switching to handle a large amount of data within a Single network Segment or LAN.

* Layer 3

Layer 3 Switches, also known as multi-layer Switches, operate in the network layer or the "layer 3" of the OSI Model.

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→ These Switches process and transmit data packets based on the IP address of the source and destination device.

→ A layer 3 Switch can perform all the functionalities of a layer 2 Switch along with Static and dynamic routing in layer 3.

→ This means the layer 3 switch can operate on both layer 2 and layer 3.

→ Forwards packets based on its IP table along with ARP tables, between multiple network segments or Subnets and different Virtual LANs (VLANs).

12) Explain Switching method and VTP.

→ Circuit Switching.
→ Packet Switching.
→ Message Switching.

(1) Circuit Switching.

→ In Circuit Switching a path will be set-up before the transmission of the data. Now the data follow path

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Packet Switching

→ The data packets will contain the source and destination addresses.

→ Every Router in between will check the destination address, select the next router to which the packet should be forwarded and send it via an appropriate path.

→ As there is no path specified, different packets may follow different paths.

Message Switching

→ There is no dedicated path established between the sender and receiver in message.

→ For sending the message, there are many intermediary messages switching nodes that are responsible for transferring the message, and the message is transmitted as a whole from the source node to destination node.

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→ In Message Switching, when the Source node sends a message, the destination address is appended to the message.

→ So in message Switching, there is no need to establish a dedicated path between two communication nodes.

→ When a Sender Sends a message, the message sends as a whole to the next message switching node.

→ Store it in its entirety on the disk, and the transmits the whole message to the next switching node and so on. Until the message reaches the destination

VTP (VLAN Trunking protocol)

→ VTP is cisco proprietary protocol used to maintain consistency throughout the network or User can say that synchronizing the VLAN information in the same VTP domain.

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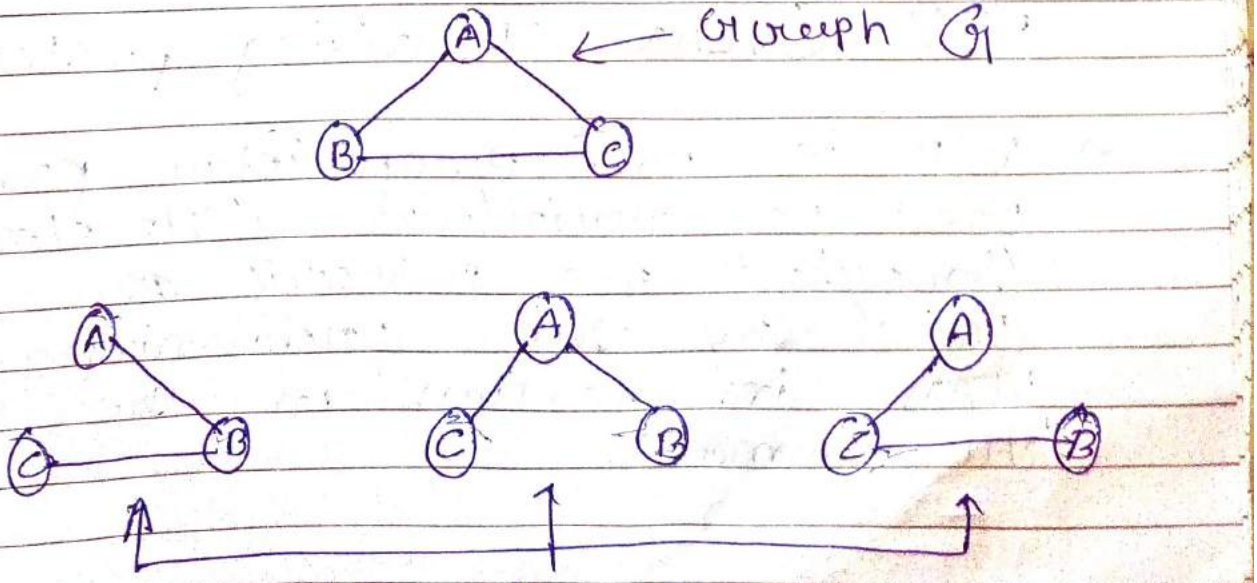
VTP allows you to add, delete and rename VLAN which is then propagated to other switches in the VTP domain.

VTP advertisements can be sent over 802.1Q, and ISL trunks.

13) What is Spanning tree. - mention Spanning tree protocol and algorithm.

→ A Spanning tree is a subset of Graph G. which has all the vertices covered with minimum possible number of edges.

Hence, a spanning tree does not have cycle and cannot be disconnected.



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→ every Connected and undirected Graph G has at least one Spanning tree.

→ disconnected graph does not have any spanning tree, as it cannot be spanned to all its vertices.

* Spanning tree protocol.

→ Spanning tree protocol is used to make a loop free network by monitoring the network to track all the links and shut down the least redundant ones.

→ STP monitors overall performance of the network.

→ This protocol uses the Spanning tree algorithm (STA), which is used to detect the redundant links

→ STP is a layer 2 protocol that tends to solve the problems when the computers use the shared telecommunications paths on a local area network.

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* Spanning tree- Algorithm.

two most important Spanning tree algorithms

* Kruskul's Algorithm
* Prim's Algorithm

* Kruskul's Algorithm

→ Kruskul's Algorithm to find the minimum cost spanning tree uses the greedy approach.

→ This algorithm treats the graph as a forest and every node it has as an individual tree.

→ A tree connects to another only and only if, it has the least cost among all available options and does not violate MST properties.

* Prim's Algorithm.

→ Prim's algorithm to find minimum cost spanning tree uses the greedy approach.

→ Prim's algorithm shares a similarity with the shortest path first algorithms.

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→ Prim's algorithm: in contrast with Kruskal's algorithm, treats the nodes as a single tree and keeps on adding new nodes to the spanning tree from the given graph.

14) What is IPv6 ? Explain types and ip address range.

→ IPv6 or Internet Protocol Version 6 is a network layer protocol that allows communication to take place over the network.

→ IPv6 is the newest version of internet protocol formulated by the Internet Engineering Task force. IPv4 address depletion due to prolonged internet use worldwide.

Types of IPV6

→ Unicast Addresses
- It identifies a unique node on a network and usually refers to a single sender or a single receiver.

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→ Multicast addresses

- It represents a group of IP devices and can only be used as the destination of a datagram.

→ Anycast addresses

- It is assigned to a set of interfaces that typically belong to different nodes.

IP addresses range :-

Address size is 128 bits.

IPV6 address representation is.

X:X:X:X:X:X:X:X

- each x is the hexadecimal value of eight 16 bit pieces of the address.

IPV6 addresses range from.

0000:0000:0000:0000:0000:0000:0000:0000

to.

ffff:ffff:ffff:ffff:ffff:ffff:ffff:ffff

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Double colon (::) in place of a series of zeros.

15) Which Software we are use for routing and Switching.

→ Cisco Packet Tracer
→ Boson Netsim
→ GNS3
→ VIRL
→ EVE-NG

this all Software are use for routing and Switching.

16) Explain Basic Command.

→ IP Config
→ nslookup
→ hostname
→ Ping IP address, name.
→ arp
→ Tracert
→ enable
→ configure terminal
→ Copy running-config startup config
→ Shutdown
→ no shutdown
→ show running-config
→ interface
→ ip address.

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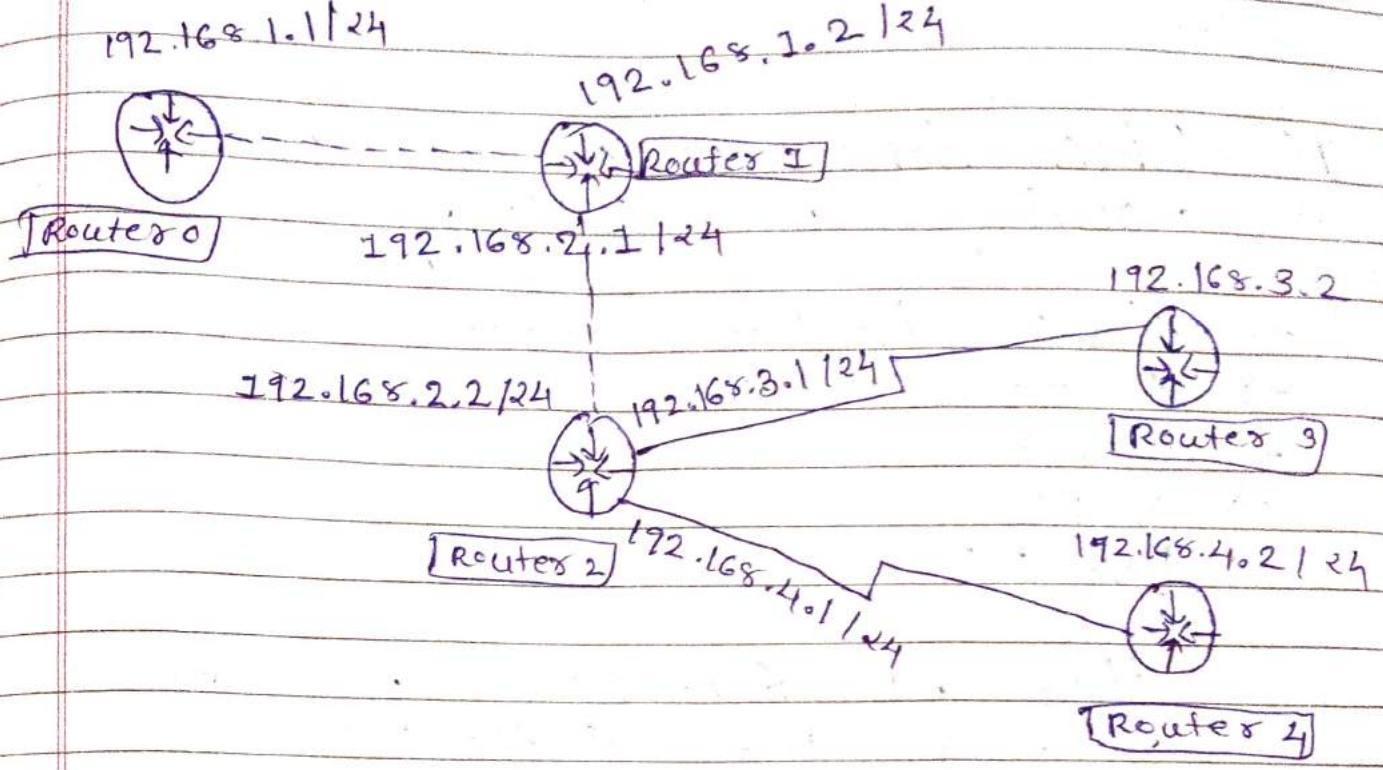
17) Example of Default routing?



1. Create default Route on router 0 and 1 to reach network 192.168.3.0 /24 and 192.168.4.0 /24.

2. Create a default route on router 2 to reach network 192.168.1.0/24.

3. Create a default route on router 3 and 4 to reach network. 192.168.1.0/24 and 192.168.2.0/24

4. Test Routing by Pinging router 4 From router 0.

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Task. 1.

Router 0

Router (config) # ip route 0.0.0.0
0.0.0.0 192.168.1.2

Router 1

Router(config) # ip route 0.0.0.0
0.0.0.0 192.168.2.2

Task - 2

Router .2

Router(config) # ip route 0.0.0.0
0.0.0.0 192.168.2.1

Task - 3

Router - 3

Router(config) # ip route 0.0.0.0
0.0.0.0 192.168.3.1

Router - 4

Router (config) # ip route 0.0.0.0
0.0.0.0 192.168.3.1.

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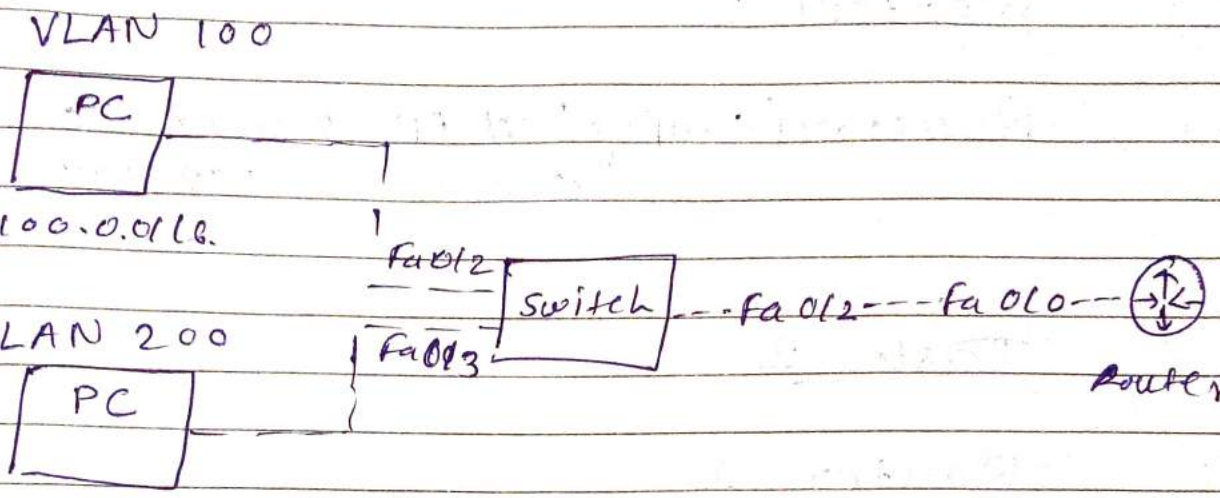
Task - 4

Router 0.

Router # Ping 192.168.4.2.

16) Example of inter VLAN Routing.



Router (config) # interface fastEthernet 0/0.

Router (config-if) # No shutdown.

Router (config-if) # exit.

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(saathi)

Router(config)# interface fastethernet 0/0.100

Router(config-subif)# encapsulation dot1Q 100

Router(config-subif)# ip address 10.100.0.1 255.255.0

Router(config-subif)#exit

VLAN 200

Router(config)# interface fastethernet 0/0.200.

Router(config-subif)# encapsulation dot1Q 200

Router(config-subif)# ip address 10.200.0.1 255.255.0.0.

Router(config-subif)# exit

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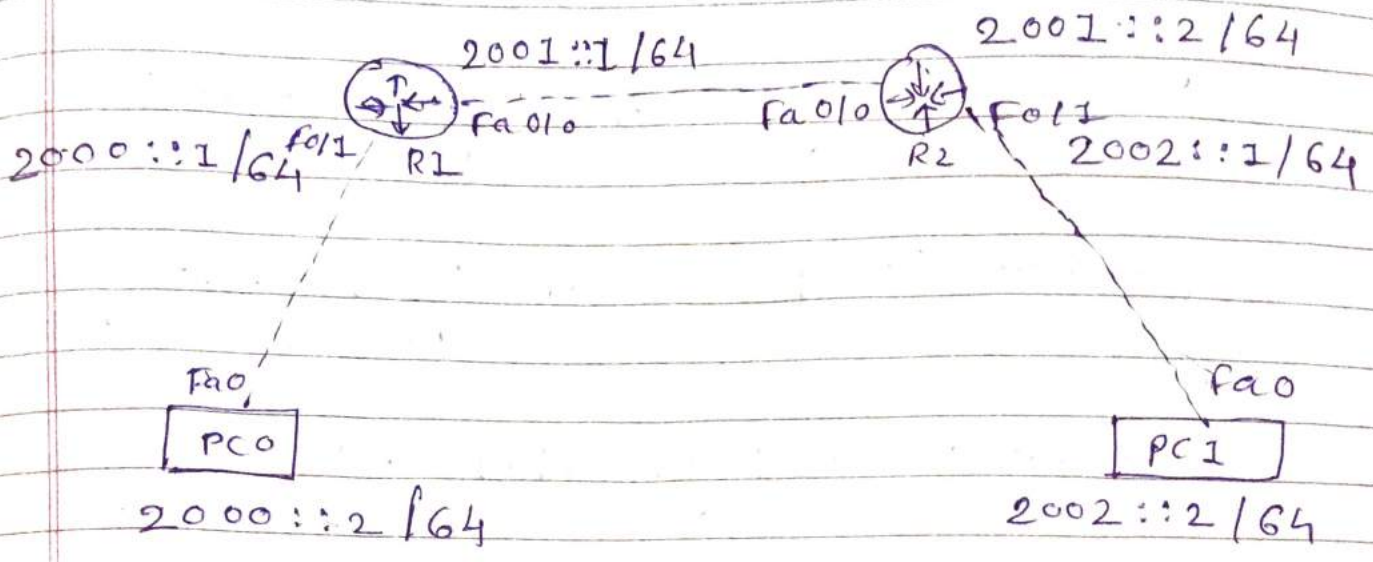
19) Example of IPV6 - RIP



R1 Configure:-

R1 > Enable.
R1# Config t

R1(config) # IPV6 Unicast-routing.
R1(config) # int fa 0/0
R1(config-if) # ipv6 add 2001::1/64

R1(config-if) # ipv6 rip satish enable
R1(config-if) # no shut
R1(config-if) # exit.
R1(config) # int fa0/1
R1(config-if) # IPV6 add 2000::1/64
R1(config-if) # IPV6 rip satish enable.
R2(config-if) # no shut

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R2

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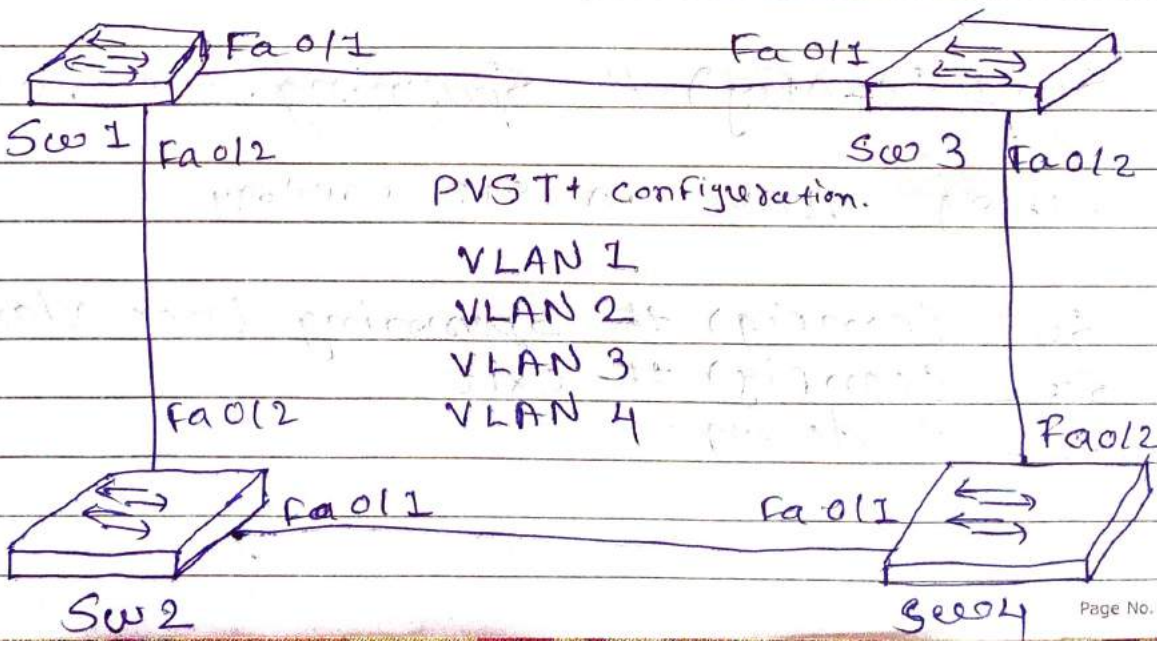
R2> enable.
R2# Config t
R2(Config)# ipv6 Unicast-routing.
R2(Config)# in fa 0/0.
R2(Config-if)# ipv6 add 2001::2/64
R2(Config-if)# ipv6 rip Sutish enable
R2(config-if)# no shut
R2(Config-if)# exit
R2((Config-if)# ip address 2002::1/64
R2(Config-if)# ipv6 rip Sutish enable
R2(Config-if)# no shut.

→ show ipv6 route.
show ipv6 rip database
show ipv6 protocol

this command Run in RJ Router

20) Exmple of Per VLAN Spanning tree.



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→ Defining VLAN

```
Sw 1 # Configure t
Sw1 (config) # Vlan 2
Sw 1 (config-vlan) # Vlan 3
SW 1 (config-vlan) # Vlan 4
SW 1 (config-vlan) # exit
```

→ Switch interfaces as trunk

```
Sw 1 (config) # interface fastethernet 011
Sw 1 (config-if) # switchport mode trunk
Sw 1 (config-if) # switchport trunk allowed Vlan 1-4
Sw1 (config-if) # exit

Sw 1 (config) # interface fastethernet 012
Sw 1 (config-if) # Switchport mode trunk
Sw 1 (config-if) # Switchport trunk allowed Vlan
                    1-4
```

→ Setting STP mode as PVST+

~~Sw 1 # Spanning~~

```
Sw 1 (config) # Spanning-tree mod pvst
```

→ Setting VLANs in STP Topology

```
Sw1 (config) # Spanning-tree Vlan 1-4
Sw 1 (config) # exit
SW 1 # do wr
```

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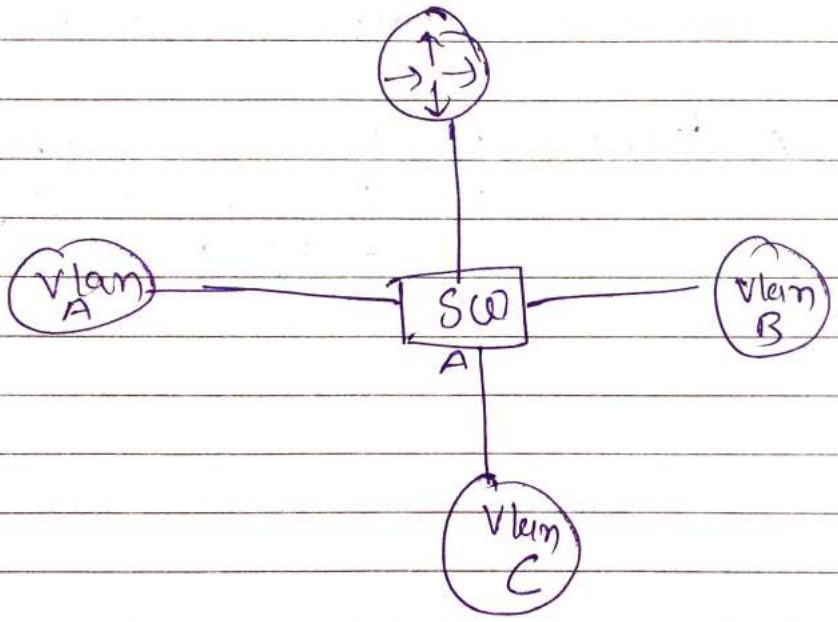
Verification of PVST+ Configuered.

Command

- Show Spanning-tree Summaviy
- Show spanning-tree
- Show spanning-tree Vlan Vlan-id
- Show Spanning-tree interface interface
- Show Spanning-tree detail.

21) Example - VLAN Access Port and Trunk por



VLAN Access Port.

Switch A (config) # interface fa 0/0
Switch A(config-if) # Switchport mode access
Switch A (config-if)# Switchport Access Vlan 2

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VLAN Trunk Configuration

Switch A (config) # interface fa 0/1
Switch A (config-if) # switchport mode trunk
Switch A (config-if) # switchport nonegotiate

Switch (config) # interface fa0/1
Switch (config-if) # Switchport mode dynamic desirable

Switch (config-if) # Switchport mode dynamic auto

Switch A (config-if) # Switch port trunk encapsulation dot1.9