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**Semester:** 05  
**Subject:** Computer Communication & Network

### OPEN ENDED LAB

**Dr.A.Q Khan Institute Of Computer Science & Information Technology**  
**Department Of Computer Engineering**

#### Rubrics:

Marks	Beginning 1	Developing 2	Accomplished 3	Exemplary 4
<b>Lab Report</b> [CLO1, C2, PLO2]	<i>The lab report does not follow the guidelines for formatting.</i>	<i>Presents some sections of the lab in the correct order. Three or more sections are not in the correct order; missing heading or title;</i>	<i>Presents most sections of the lab in the correct order, one or two sections may not be in the correct order; heading or title missing or not complete;</i>	<i>Presents all the sections of the lab in the correct order with correct formatting: includes correct heading, section headings and title of lab;</i>

## **VLAN Design**

1. **How will you segment the network into VLANs for departments?**
  - Assign VLAN IDs for each department (Finance, Sales, HR, IT).
2. **What is the rationale for the VLAN configuration?**
  - Ensure traffic isolation, security, and performance.
3. **How to configure VLANs on Cisco switches?**
  - Use commands to create VLANs and assign ports.

## **Dynamic Routing Protocols**

4. **Which dynamic routing protocol to use?**
  - OSPF or BGP for scalability and performance.
5. **How to configure OSPF/BGP for dynamic routing?**
  - Step-by-step router configuration for inter-VLAN routing.
6. **How to configure inter-VLAN routing?**
  - Use Router-on-a-Stick or Layer 3 switches.

## **Bandwidth Management**

7. **How to manage bandwidth and prevent bottlenecks?**
  - Implement QoS, traffic shaping, or link aggregation.
8. **How does OSPF/BGP handle traffic load?**
  - Load balancing and route optimization.

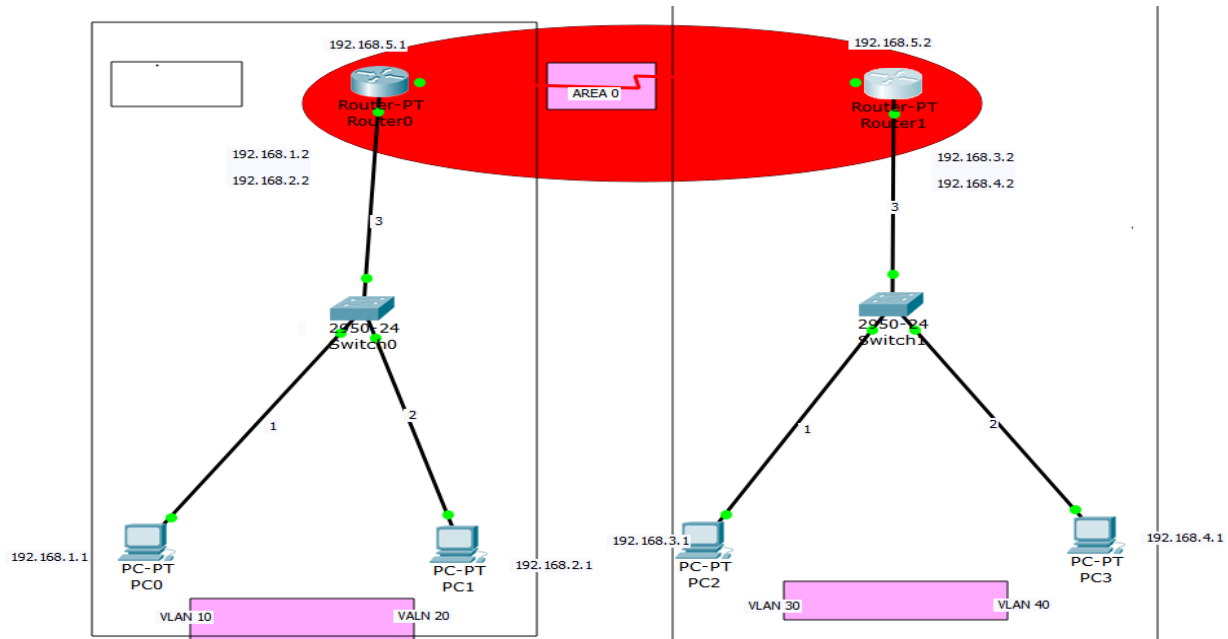
## **Simulation and Testing**

9. **How to simulate the network in Cisco Packet Tracer?**
  - Build topology and test dynamic routing.
10. **How to monitor network performance?**
  - Use SNMP, NetFlow, or Cisco Performance Monitor.

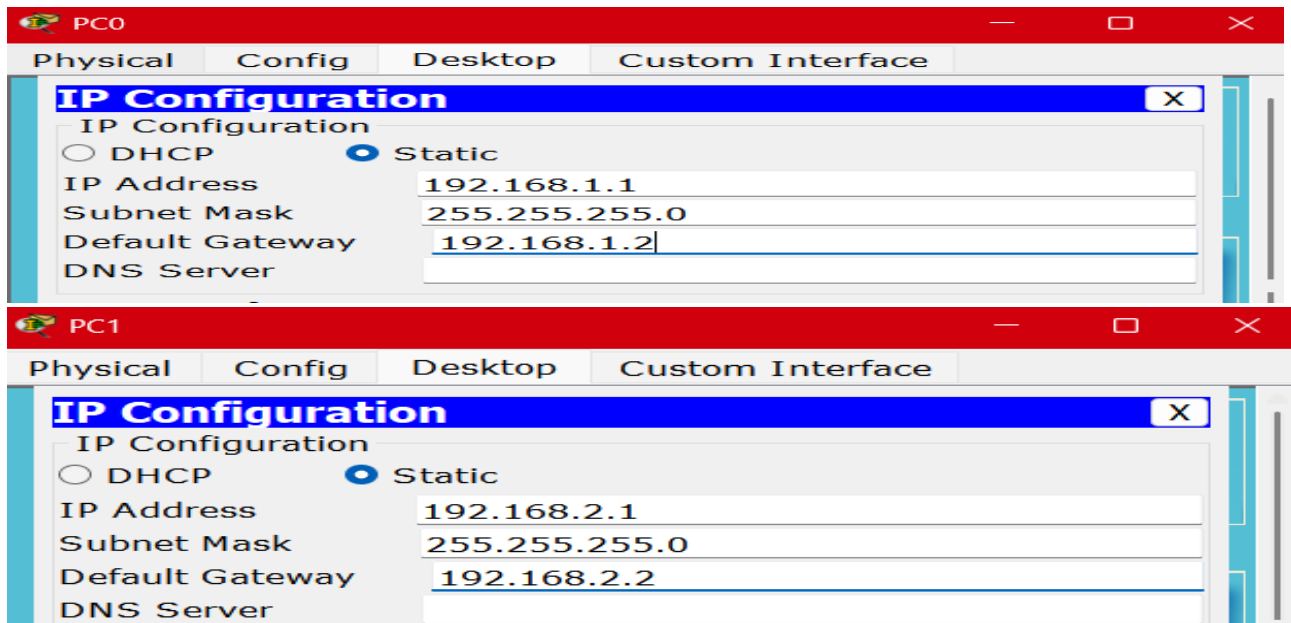
## **Literature Review**

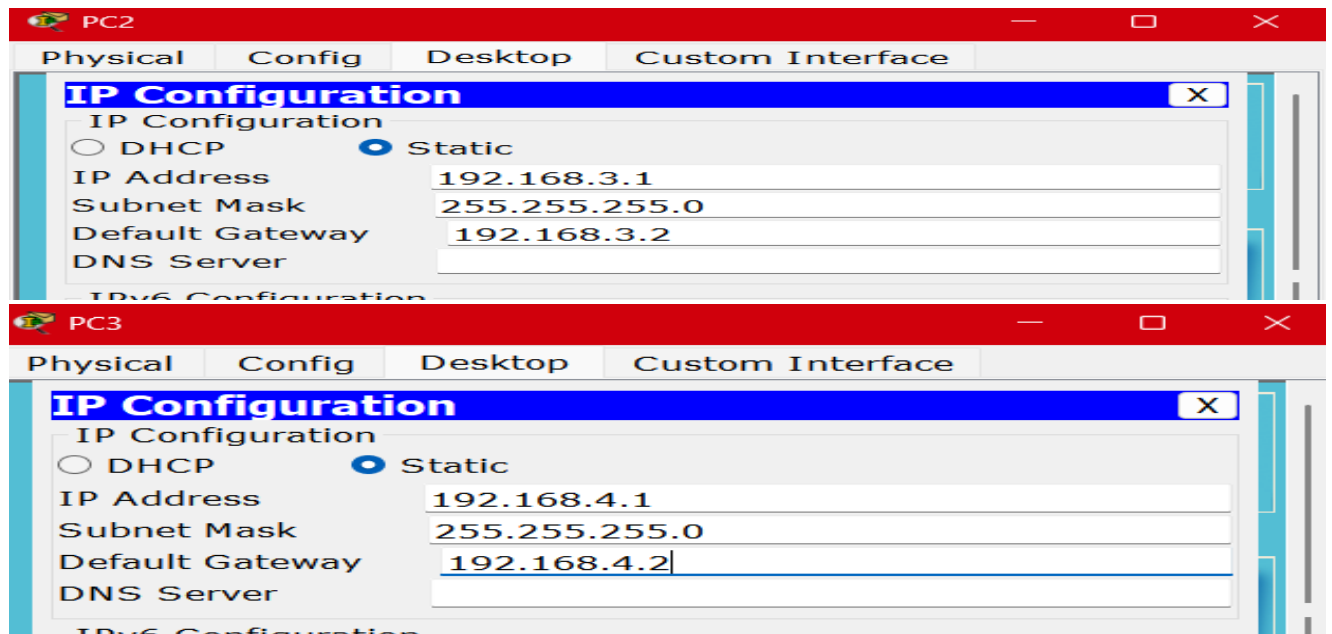
11. **What real-world solutions exist for VLAN and dynamic routing management?**
  - Analyze corporate case studies using OSPF/BGP.
12. **How do existing solutions solve traffic bottlenecks?**
  - Evaluate benefits of VLAN and routing protocols.

## Network Design:

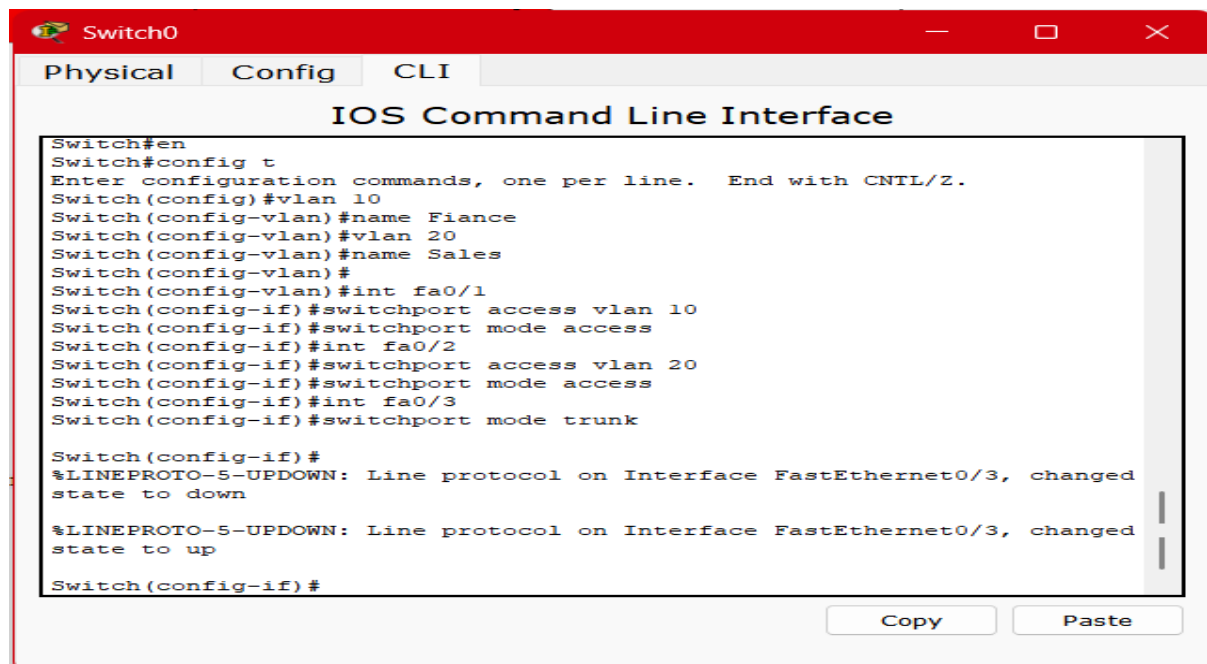


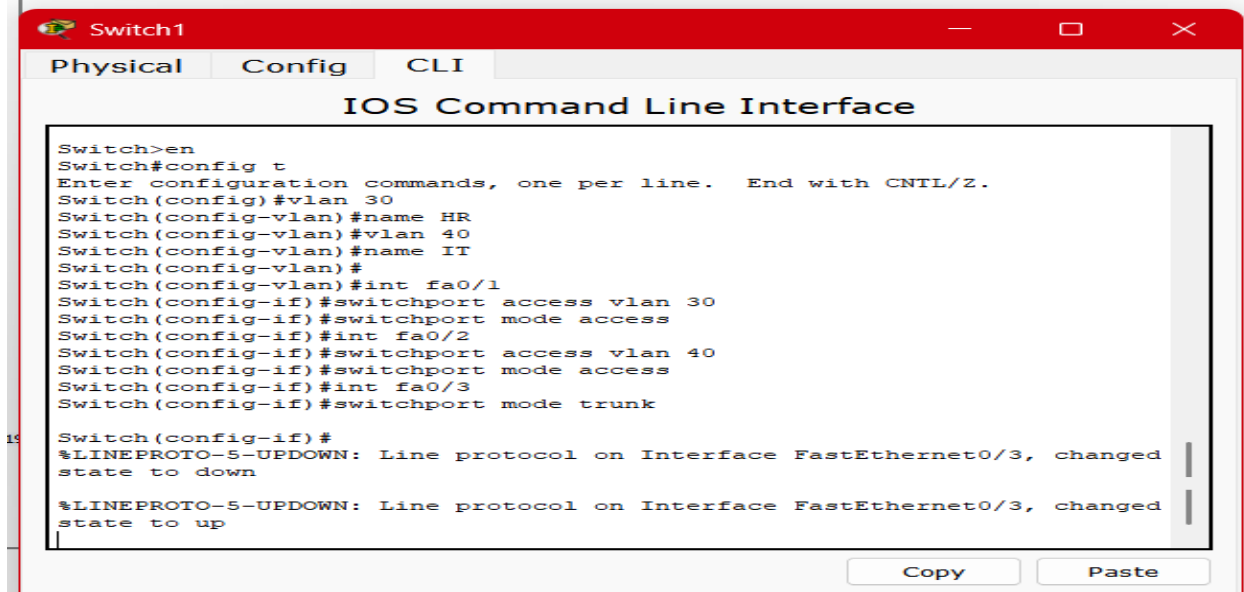
## PC CONFIGURATION:



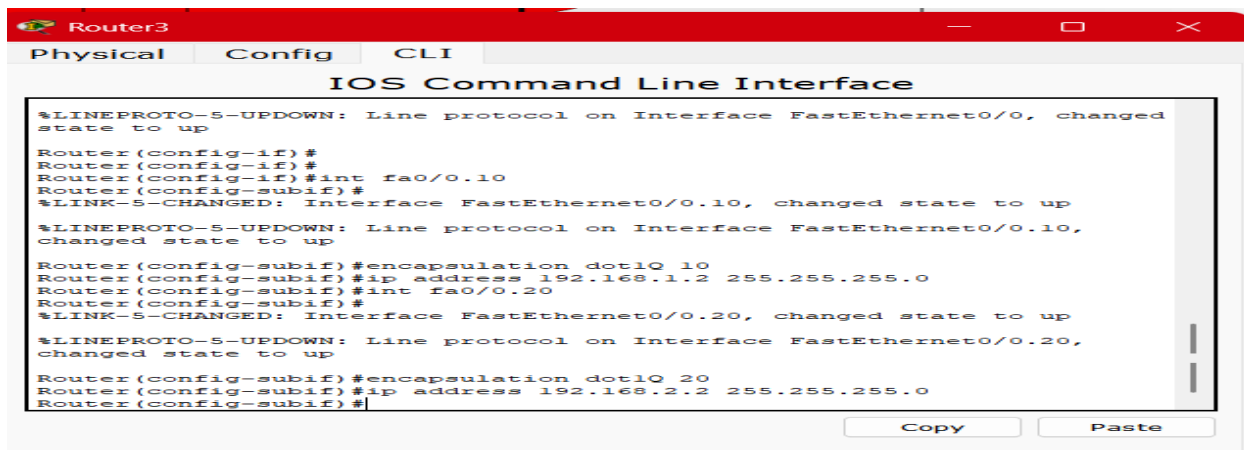
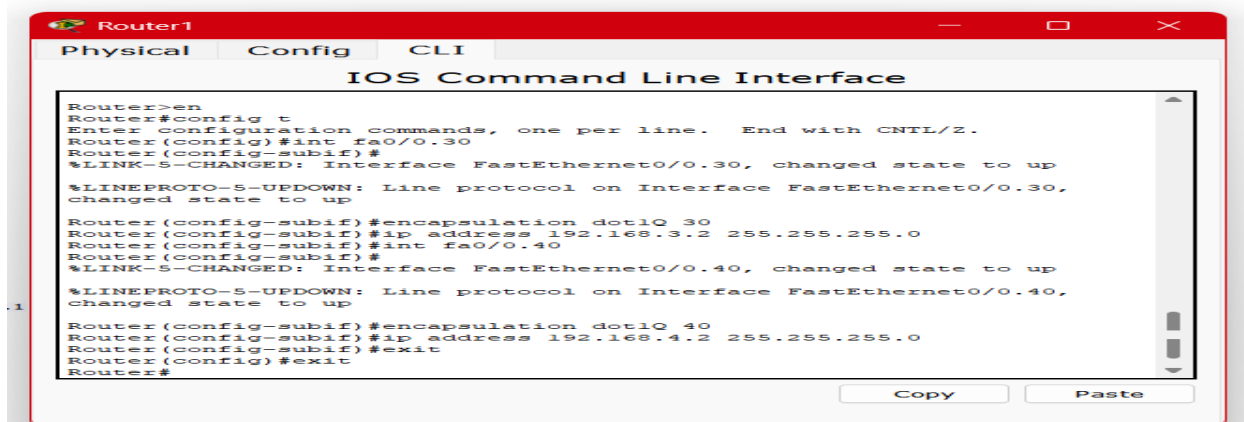


## SWITCH CONFIGURATION:





## ROUTER CONFIGURATION:



## OSFF CONFIGURATION:

```
Router3
Physical Config CLI
IOS Command Line Interface
Router(config-subif)#
%LINK-5-CHANGED: Interface FastEthernet0/0.20, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.20,
changed state to up
Router(config-subif)#encapsulation dot1Q 20
Router(config-subif)#ip address 192.168.2.2 255.255.255.0
Router(config-subif)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router ospf 1
Router(config-router)#network 192.168.1.0 0.0.0.255 area 0
Router(config-router)#network 192.168.2.0 0.0.0.255 area 0
Router(config-router)#network 192.168.3.0 0.0.0.255 area 0
Router(config-router)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
Copy Paste
```

```
Router(config-router)#network 192.168.3.0 0.0.0.255 area 0
Router(config-router)#network 192.168.4.0 0.0.0.255 area 0
Router(config-router)#network 192.168.5.0 0.0.0.255 area 0
Router(config-router)#exit
```

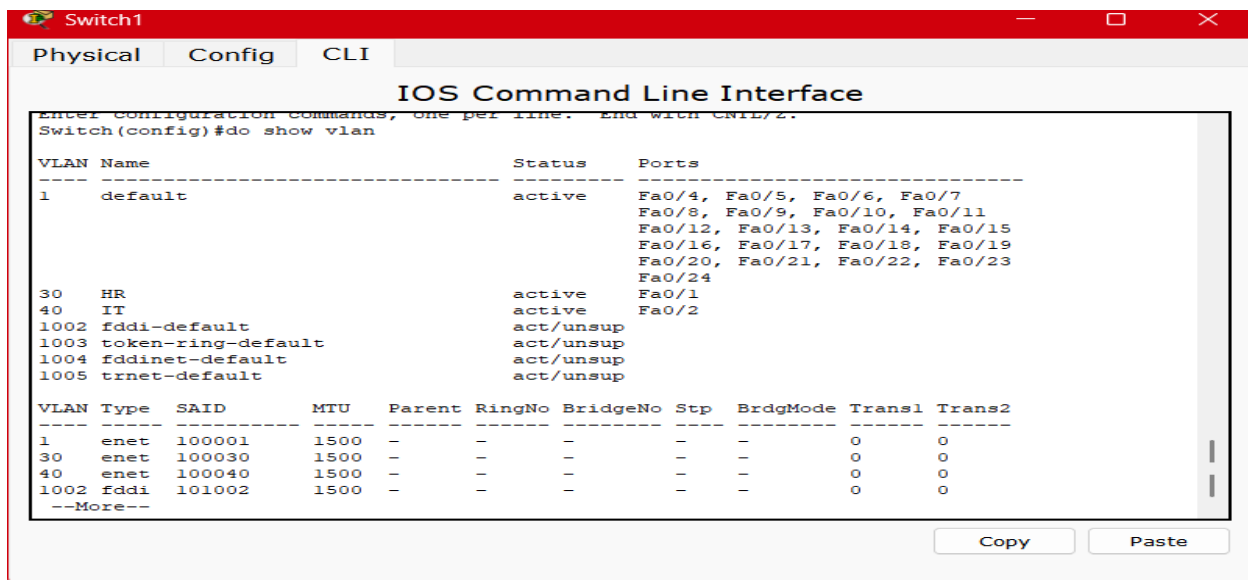
## FINAL RESULTS:

## VLSM SHOW:

```
Switch0
Physical Config CLI
IOS Command Line Interface
Switch(config)#do show vlan

VLAN Name                Status    Ports
-----
1    default                active    Fa0/4, Fa0/5, Fa0/6, Fa0/7
                                           Fa0/8, Fa0/9, Fa0/10, Fa0/11
                                           Fa0/12, Fa0/13, Fa0/14, Fa0/15
                                           Fa0/16, Fa0/17, Fa0/18, Fa0/19
                                           Fa0/20, Fa0/21, Fa0/22, Fa0/23
                                           Fa0/24
10   Fiance                  active    Fa0/1
20   Sales                  active    Fa0/2
30   HR                     active
40   IT                     active
1002 fddi-default          act/unsup
1003 token-ring-default   act/unsup
1004 fddinet-default       act/unsup
1005 trnet-default         act/unsup

VLAN Type  SAID      MTU   Parent RingNo BridgeNo Stp  BrdgMode Trans1 Trans2
-----
1    enet   100001    1500  -     -     -     -     -       0       0
10   enet   100010    1500  -     -     -     -     -       0       0
--More--
Copy Paste
```



### OSPF RESULT:

```
Router(config)#do 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        192.168.1.0/24 [110/65] via 192.168.5.1, 00:07:51, Serial2/0
O        192.168.2.0/24 [110/65] via 192.168.5.1, 00:07:51, Serial2/0
C        192.168.3.0/24 is directly connected, FastEthernet0/0.30
C        192.168.4.0/24 is directly connected, FastEthernet0/0.40
C        192.168.5.0/24 is directly connected, Serial2/0
```

```
Router(config)#do show ip ospf
Routing Process "ospf 1" with ID 192.168.5.2
Supports only single TOS(TOS0) routes
Supports opaque LSA
SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
Minimum LSA interval 5 secs, Minimum LSA arrival 1 secs
Number of external LSA 0. Checksum Sum 0x00000000
Number of opaque AS LSA 0. Checksum Sum 0x00000000
Number of DCbitless external and opaque AS LSA 0
Number of DoNotAge external and opaque AS LSA 0
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
External flood list length 0
  Area BACKBONE(0)
    Number of interfaces in this area is 3
    Area has no authentication
    SPF algorithm executed 2 times
    Area ranges are
    Number of LSA 2. Checksum Sum 0x0090a6
    Number of opaque link LSA 0. Checksum Sum 0x00000000
    Number of DCbitless LSA 0
    Number of indication LSA 0
    Number of DoNotAge LSA 0
    Flood list length 0
```

```

Router(config)#
Router(config)#do 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      192.168.1.0/24 is directly connected, FastEthernet0/0.10
C      192.168.2.0/24 is directly connected, FastEthernet0/0.20
O      192.168.3.0/24 [110/65] via 192.168.5.2, 00:09:47, Serial2/0
O      192.168.4.0/24 [110/65] via 192.168.5.2, 00:09:47, Serial2/0
C      192.168.5.0/24 is directly connected, Serial2/0
Router(config)#





```

```

Router(config)#do show ip ospf
Routing Process "ospf 1" with ID 192.168.5.1
Supports only single TOS(TOS0) routes
Supports opaque LSA
SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs
Number of external LSA 0. Checksum Sum 0x000000
Number of opaque AS LSA 0. Checksum Sum 0x000000
Number of DCbitless external and opaque AS LSA 0
Number of DoNotAge external and opaque AS LSA 0
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
External flood list length 0
  Area BACKBONE(0)
    Number of interfaces in this area is 3
    Area has no authentication
    SPF algorithm executed 4 times
    Area ranges are
      Number of LSA 2. Checksum Sum 0x0090a6
    Number of opaque link LSA 0. Checksum Sum 0x000000
    Number of DCbitless LSA 0
    Number of indication LSA 0
    Number of DoNotAge LSA 0
    Flood list length 0
--More--

```

**SUCCESSFUL:**

Realtime										
Fire	Last Status	Source	Destination	Type	Color	Time(se)	Periodic	Num	Edit	Delete
	Successful	PC0	PC3	ICMP		0.000	N	0	(edit)	(delete)
	Successful	PC3	PC0	ICMP		0.000	N	1	(edit)	(delete)