NET3008 – Advanced Routing **NAME:____CAROLINA AYALA___**
Midterm – 18F

Time: 150 minutes
Marks: Total score out of 60.

If you are uncertain what a question is asking, make reasonable assumptions, write those assumptions down on this paper, and continue answering the question.
Last page is left blank, use it to answer any questions if you require extra space, labeling the question for clarity.

Part A: Concept Questions **1 Points per Question**

Clearly explain the following:
All or Nothing

A. What is a converged network?

FLG. Page 8
A converged network describe the state of the network in which all routers have the same view of the network topology

B. List three benefits of route summarization

FLG. Page 9
(1) Small routing tables
(2) Reduces the number of routing updates
(3) Lower convergence time

C. What is the split horizon rule?

FLG. Page 16
It prevents a routing update that is received on an interface from being forwarded out of the same interface

D. What are the two main data structures used by the CEF?

FLG. Page 21
(1) FIB, Forwarding Information Base, which is a copy of the routing table
(2) Adjacency Table, that includes L2 addressing information

E. What is asymmetric routing?

FLG. Page 5
When traffic flows that use a different path for the return path than the original path. It occurs in networks that have redundant links.

F. What does the ICMP Type 3 `Destination Unreachable` message signify?

01.Q
If a packet enters a router destined for an address that the router does not know how to reach, the router can let the sender know by sending a `Destination Unreachable` ICMP message back to the sender.

G. When does a route goes into the SIA state?

FLG -
When a router loses a route and sends a query message to its neighbors, it is expecting a response to that query message in a form of a reply packet.

If the router does not receive a reply to all the outstanding queries within 3 minutes (the default time), the route goes into the **stuck-in-active** (SIA) state. This timer is called the active timer. Once the active timer expires, the neighbor relationship is reset. This setting causes the router to go active on all routes that were known through the lost neighbor and to re-advertise all the routes that it knows to the lost neighbor.

H. What does a `passive` state in the EIGRP topology table signify?

FLG. Page 81
The network is up and operational. This state signifies normal conditions.

I. What is the formula for selection a feasible successor?

FLG. Page 91
AD(FS) < FD(S)

J. How does the `EIGRP stub` feature limit the query range?

FLG. Page 96
Stub routers are not queried. Routers configured as stub do not forward EIGRP learned routes to other neighbours, and more importantly, nonstub routers do not send query messages to stub routers.

K. Which address best summarizes the IPv6 addresses 2001:CC1E:2AB3:1A**3**C::/64
2001:CC1E:2AB3:1A**4**D::/64

Only interested in 3 and 4(third hex from fourth hextet)
3 = 0011
4 = 0100
Number of bits:
2001:CC1E:2AB3: = 48
1A = 8
1 bit equal for 3 & 4 = 1
2001:CC1E:2AB3:1A00/57

L. How often does OSPF flood each LSA record to maintain an accurate database?

03.B.OSPF.Multiarea – Slide #27
LSRefleshTime. Every 30 minutes

M. How does the LSA Type 4 differs from other LSAs?

06Wk
LSA Type 4 contains information about the existence of the ASBR on the OSPF autonomous system. It does not carry information about a route!

N. A network design shows area 1 with **three** internal routers, area 0 with **four** internal routers, and area 2 with **five** internal routers. Additionally, one ABR (ABR1) connects areas 0 and 1, plus a different ABR (ABR2) connects areas 0 and 2. How many Type 1 LSAs would be listed in ABR2's LSDB?

06Wk
As an ABR connected to areas 0 and 2, ABR2 will have LSDB entries for both area 0 and area 2.
In area 0, ABR2 learns Type 1 LSAs from the four routers internal to area 0, plus ABR1, and plus 1 for the area 0 Type 1 LSA that ABR2 creates for itself.
In area 2, **ABR2** learns 1 each for the five routers internal to area 2, plus the 1 Type 1 LSA ABR2 created for itself inside area 2.
The total is **12**.

O. How does a routing table reflect the link-state information of an **intra-area** route?
03.B.OSPF.Multiarea – Slide #34
Contributes to routes marked as "O" or "C"

Part B: **3 Points per Question**

A. **R1** is internal to area 1, and **R2** is internal to area 2. Subnet `10.1.1.0/24` exists in area 2 as a connected subnet off R2. **ABR1** connects area 1 to backbone area 0, and **ABR2** connects area 0 to area 2. Clearly explain the sequences of LSAs needed so **R1** can calculate it's best route for `10.1.1.0/24`

R2's Type 1 LSA exists only in area 2's LSDB.
If R2 is connected to a transit network a Type 2 LSA for subnet 10.1.1.0/24 will be generated by the DR, also only exists in area 2's LSDB.
ABR2 will generate a Type 3 LSA Summary and flood it to area 0
ABR1 will receive the Type 3 from ABR2
ABR1 will generate a Type 3 Summary with the information for subnet 10.1.1.0/24 and flood it to area 1

B. Router **R1** has working interfaces S0/0, S0/1, and S0/2, with IP address/prefix combinations of `10.10.10.1/24, 10.10.11.2/24`, and `10.10.12.3/22`. **R1**'s configuration includes the commands `router eigrp 9` and `network 10.0.0.0`. The `show ip eigrp interfaces` command lists S0/0 and S0/1 in the command output, but not S0/2. Clearly explain the reason for the omission?

S0/2 might be configured as a passive interface.

The `show ip eigrp interfaces` command displays interfaces on which EIGRP has been enabled but omits passive interfaces. Making the interface passive would omit the interface from the output of this command.

C. The output of `show ip eigrp topology` on Router **R1** shows the following output, which is all the output related to subnet `10.11.1.0/24`. How many feasible successor routes does **R1** have for `10.11.1.0/24`?

```
P 10.11.1.0/24, 2 successors, FD is 2172423
     via 10.1.1.2 (2172423/28167), Serial0/0/0
     via 10.1.1.6 (2172423/28167), Serial0/0/1
```

This command lists all successor and feasible successor routes. The output states that two successors exist, and only two routes (listed with the "via..." text) exist. So, no feasible successor routes exist.

D. Enterprise Router **R1** connects an enterprise to the Internet. **R1** needs to create and advertise a **default route** into the enterprise using EIGRP. Which are the required steps to configure and advertise this route?

(1) Create the default route on R1 using the `ip route 0.0.0.0 0.0.0.0 next-hop-ip` command.
(2) `redistribute static` the statically configured default route.
Or (3) Configure the `network 0.0.0.0` command.

The default route must first be configured statically. Then, either this route must be redistributed as a static route into EIGRP or pulled into EIGRP by virtue of the network 0.0.0.0 EIGRP subcommand .

E. Routers **R1, R2, R3**, and **R4** connect to the same `10.10.10.0/24` LAN-based subnet. OSPF is fully working in the subnet. Later, **R5**, whose OSPF priority is higher than the other four routers, joins the subnet. Clearly explain the OSPF database exchange process require over this subnet so the network can reconverge again. Include in your explanation multicast addresses uses as well as identify LSAs carried over the new LSUs/

R5 will send its DD, LSR, and LSU packets to the `224.0.0.6` all-DR-routers multicast address. The DR will inform R5 about LSAs by sending its DD, LSR, and LSU packets to the `224.0.0.5` all-OSPF-routers multicast address.

Because the subnet was stable before R5 arrived, the other routers will have elected a DR and BDR. OSPF does not preemptively elect a new DR or BDR, so R5 will be neither (DROther). As a result, R5's messages to the DR will be sent to the 224.0.0.6 all-DR-routers multicast address, and the DR's messages directed to R5 will be sent to the 224.0.0.5 all-SPF-router address

F. Router **R1** lists the following output from a `show` command. Clearly explain how the GUA and the link-local address this interface have been configured, as well indicate what groups have this interface joint.

```
R1# show ipv6 interface f0/0
FastEthernet0/0 is up, line protocol is up
IPv6 is enabled, link-local address is FE80::213:19FF:FE12:3456
No Virtual link-local address(es):
Global unicast address(es):
   2000::4:213:19FF:FE12:3456, subnet is 2000:0:0:4::/64 [EUI]
Joined group address(es):
   FF02::1
   FF02::2
   FF02::1:FF12:3456
```

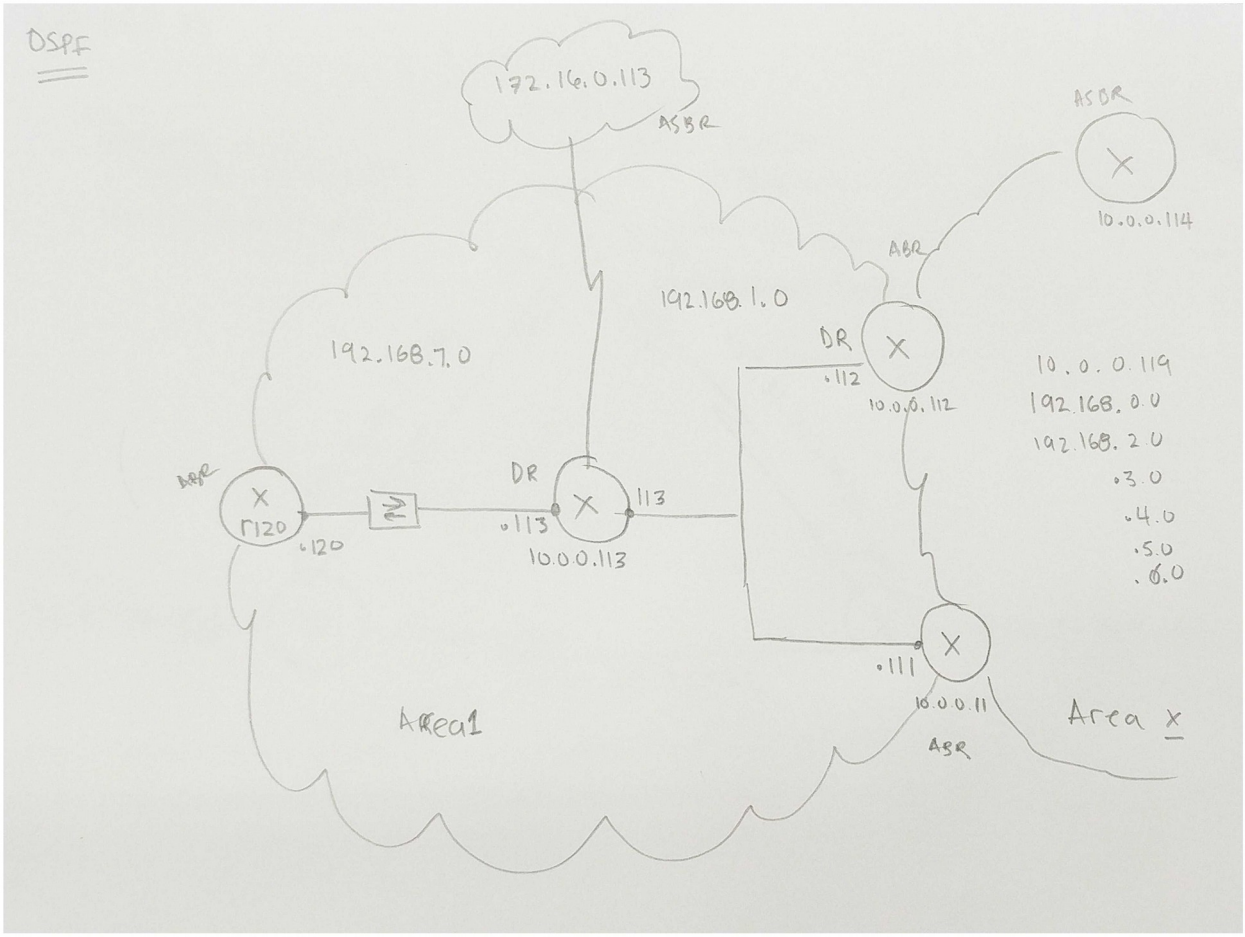
Link-local and GUA are using EUI, addresses based on MAC address: 21319123456
Joint multicast groups:
::1 → All nodes in this link
::2 → All routers in this link
FF02::1:FF12:3456 → Solicited multicast node address for NS/NA

G. Router **R1** directly connects to subnet `10.1.1.0/24` with its Gi0/0 interface. **R1** can ping four other working OSPF routers in that subnet. **R1** is neither the designated router (DR) nor backup DR (BDR). OSPF is working correctly on all five routers. What would you expect to see from the `show ip ospf neighbors` command in **R1** off Gi0/0? Drawing the topology will help you answering this question.

The show ip ospf neighbors command lists **four** neighbors off Fa0/0.
The show ip ospf neighbors command lists **two** neighbors off Fa0/0 in the FULL state.
On a LAN, the non-DRs form fully adjacent neighborships with only the DR and BDR, giving R1 two neighbors in the FULL state. The other two neighbors settle into the 2-Way state.

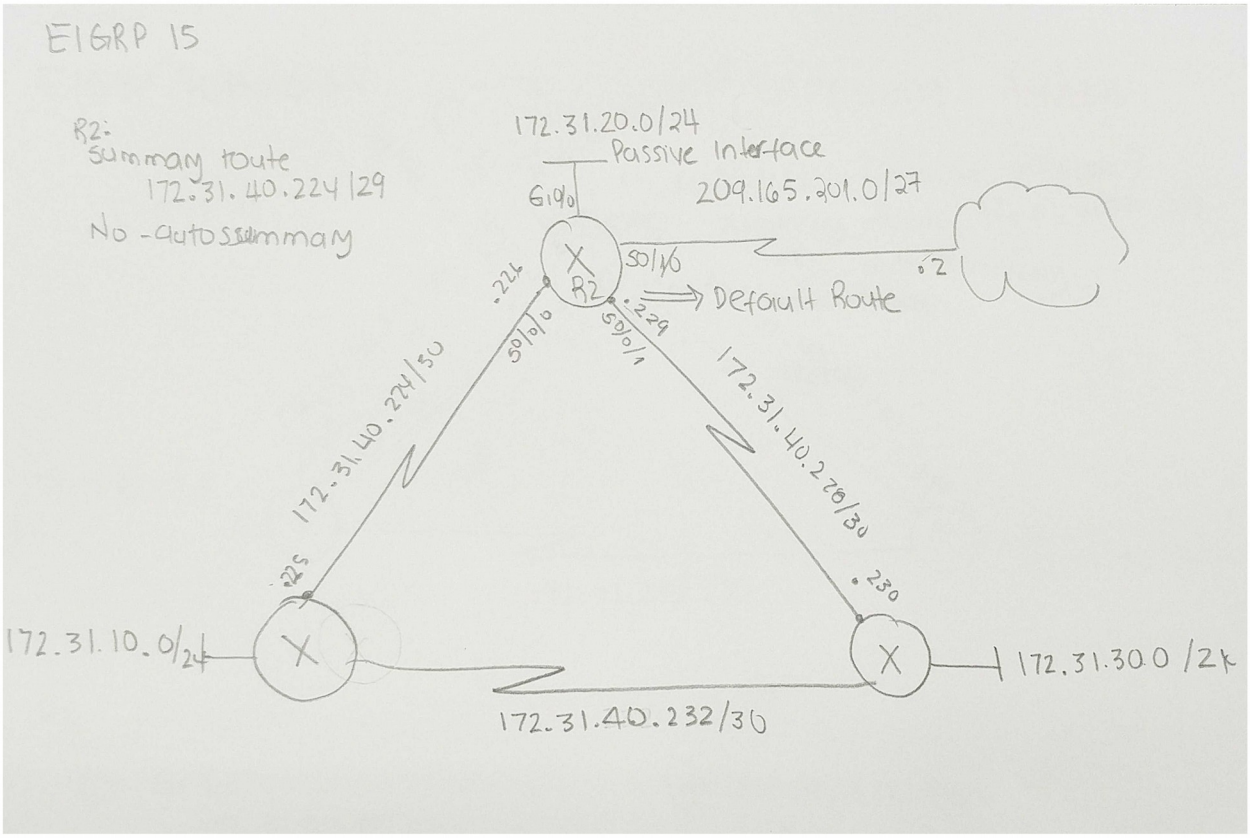
Part C: OSPF LSAs **15 Points**

Given the outputs commands taken at **R1** (information provided in extra sheet), draw a topology diagram for Area 1. Include as much information as possible, as IP addresses, router-IDs, network ID and netmask, network types. Identify if possible your ABR and ASBR.



Part D: EIGRP Topology **10 Points**

Given the outputs commands taken at **R2** (information provided in extra sheet), draw as much of the network topology. Give as much information about the routing protocol used as possible, including if information is available to you, the AS number used, passive interfaces set, use of summarization, load balancing, IP address and networks.



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