Chapters 6 – 7: Routing Essentials and EIGRP Exam (Answers)

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CCNPv8 ENCOR (Version 8.0) – Routing Essentials and EIGRP Exam

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1. Which type of routing protocol uses LSAs and TLVs to support extended features?
- path vector
- **link-state**
- hybrid
- distance vector

Explanation: Link-state routing protocols include capabilities such as LSAs for OSPF and TLVs (type/length/value) for IS-IS that allow them to support extended features.

2. What are two characteristics of link-state routing protocols? (Choose two.)

- They can load balance across unequal metric cost paths.
- They use path attributes to determine the best loop-free path.
- They periodically send full routing table updates to directly connected neighbors.
- **They provide routers with a synchronized identical map of the network.**
- **They use more CPU and memory resources than distance vector protocols do.**

Explanation: Link-state protocols like OSPF and ISIS use more CPU and memory resources than distance vector protocols do because they maintain a complete synchronized map of the network and run the SPF algorithm to determine the best path.

3. What data is used by OSPF and ISIS for loop prevention?

- hop count to the destination

- feasible distance calculation to the destination
- autonomous system path to the destination
- **a synchronized map of the network**

Explanation: OSPF and ISIS are link-state routing protocols. As link-state routing protocols they have a synchronized and identical map of the network. Using the complete map of the network, every router in the network then runs the Dijkstra shortest path first (SPF) algorithm to calculate the best shortest loop-free paths.

4. Which routing protocol incorporates characteristics of both distance vector and link-state protocols?

- iBGP
- EBGP
- SIS
- **EIGRP**

Explanation: As a hybrid routing protocol, EIGRP incorporates the characteristics of both distance vector and link-state protocols. It uses bandwidth and other metrics rather than hop count to determine the best path and this information is advertised to all neighbors.

5. How do EIGRP routers establish and maintain neighbor relationships?

- by exchanging routing tables with directly attached routers
- by exchanging neighbor tables with directly attached routers
- by comparing known routes to information received in updates
- by dynamically learning new routes from neighbors
- **by exchanging hello packets with neighboring routers**

Explanation: EIGRP uses hello messages to establish and maintain neighbor relationships.

6. A router has installed several routes into the routing table. How will the router determine which route to use to forward packets?

- the lowest administrative distance
- the highest metric
- the lowest metric
- **the longest prefix match**

Explanation: The route chosen for forwarding a packet is the route with the longest prefix length matching the destination network of the packet. The metric and administrative distance are used to determine which routes will appear in the routing table.

7. What is the effect of configuring the ipv6 unicast-routing command on a router?

- to assign the router to the all-nodes multicast group
- to permit only unicast packets on the router
- **to enable the router as an IPv6 router**
- to prevent the router from joining the all-routers multicast group

Explanation: When the ipv6 unicast-routing command is implemented on a router, it enables the router as an IPv6 router. Use of this command also assigns the router to the all-routers multicast group.

8. Why would a floating static route be configured with an administrative distance that is higher than the administrative distance of a dynamic routing protocol that is running on the same router?

- to load-balance the traffic
- to act as a gateway of last resort
- **to be used as a backup route**
- to be the priority route in the routing table

Explanation: By default, dynamic routing protocols have a higher administrative distance than static routes. Configuring a static route with a higher administrative distance than that of the dynamic routing protocol will result in the dynamic route being used instead of the static route. However, should the dynamically learned route fail, then the static route will be used as a backup.

9. Which static route statement shows a recursive IPv6 static route?

- ipv6 route 2001:db8:cafe:1::/56 S0/0/0
- ipv6 route 0::/0 S0/0/0
- ipv6 route 0::/0 S0/0/0 254
- ipv6 route 2001:db8:cafe:1::/56 S0/0/0 2001:db8:1000:10::1
- **ipv6 route 2001:db8:cafe:1::/56 2001:db8:1000:10::1**

Explanation: In a recursive static route, only the next-hop IPv6 address is specified. As a consequence, the router must perform a recursive route table lookup to find an exit interface associated with the network of the IPv6 address.

10. Refer to the exhibit. Which command will properly configure an IPv6 static route on R2 that will allow traffic from PC2 to reach PC1 without any recursive lookups by router R2?
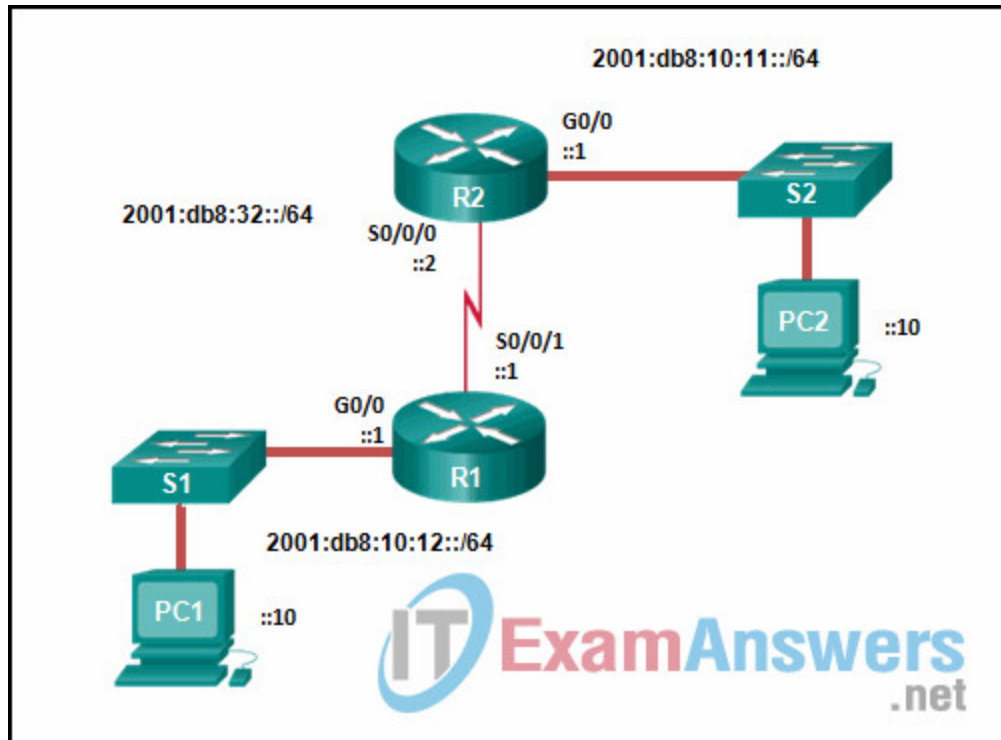
- **R2(config)# ipv6 route 2001:db8:10:12::/64 S0/0/0**
- R2(config)# ipv6 route ::/0 2001:db8:32::1
- R2(config)# ipv6 route 2001:db8:10:12::/64 S0/0/1
- R2(config)# ipv6 route 2001:db8:10:12::/64 2001:db8:32::1

Explanation: A nonrecursive route must have an exit interface specified from which the destination network can be reached. In this example 2001:db8:10:12::/64 is the destination network and R2 will use exit interface S0/0/0 to reach that network. Therefore, the static route would be ipv6 route 2001:db8:10:12::/64 S0/0/0.

11. Refer to the exhibit. Router R1 has an OSPF neighbor relationship with the ISP router over the 192.168.0.32 network. The 192.168.0.36 network link should serve as a backup when the OSPF link goes down. The floating static route command ip route 0.0.0.0 0.0.0.0 S0/0/1 100 was issued on R1 and now traffic is using the backup link even when the OSPF link is up and functioning. Which change should be made to the static route command so that traffic will only use the OSPF link when it is up?
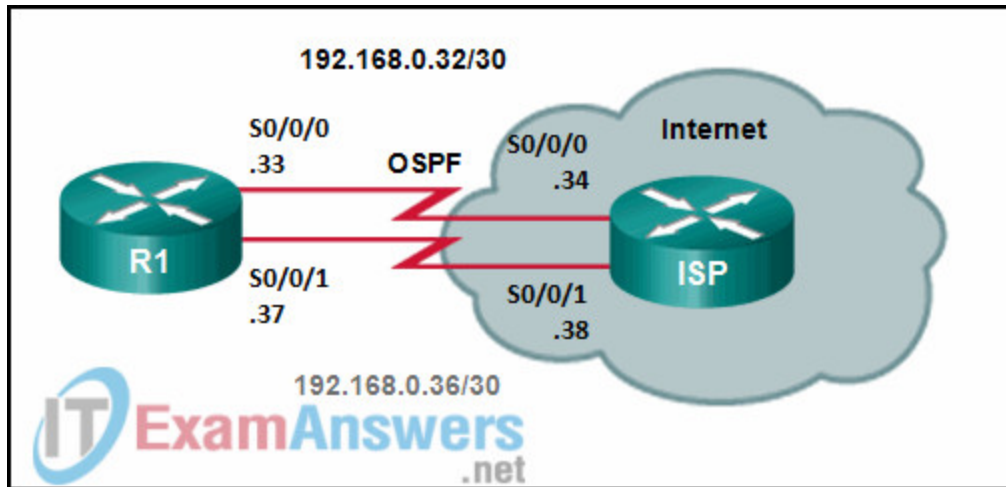
- Add the next hop neighbor address of 192.168.0.36.
- Change the administrative distance to 1.
- Change the destination network to 192.168.0.34.
- **Change the administrative distance to 120.**

Explanation: The problem with the current floating static route is that the administrative distance is set too low. The administrative distance will need to be higher than that of OSPF, which is 110, so that the router will only use the OSPF link when it is up.

12. What is used by BGP to guarantee a loop free path to reach a destination?

- the count of router hops to reach a destination
- the cumulative cost as measured in bandwidth
- **a record of each autonomous system that a routing advertisement has traversed**
- a distance calculation based on cumulative delay and minimum bandwidth

Explanation: BGP is a path vector protocol which uses several path attributes to determine the best path. To prevent loops BGP updates include a record of each autonomous system that the routing advertisement traversed. A BGP router that receives the update should not see its own AS in the AS Path. If it did, it would indicate a loop.

13. What is the purpose for creating VRFs on a router?

- **to isolate paths**
- to determine the vector to reach a destination network
- to prevent routing loops
- to keep a record of all autonomous systems that routing advertisements have traversed

Explanation: Virtual routing and forwarding, or VRF, is a technology that creates several separate virtual routers on a single physical router. Each of the virtual routers acts as an independent and separate router so that their paths are isolated from each other.

14. Which technology creates segmentation between network interfaces, IP addresses, and routing tables?

- **virtual routing and forwarding**
- virtual LANs
- multiprotocol label switching
- virtual router redundancy protocol

Explanation: Virtual routing and forwarding, or VRF, is a technology that creates several separate virtual routers on a single physical router. Each of the virtual routers acts as an independent and separate router so that their paths are isolated from each other.

15. Refer to a portion of an EIGRP topology table:

```
P 172.18.3.0/24, 1 successors, __ is 2172416
via 172.18.4.3 (2172416/28160), Serial0/0/1
P 172.18.5.0/24, 1 successors, __ is 2495120
via 172.18.6.3 (2495120/227692), Serial0/1/0
P 192.168.24.0/24, 1 successors, __ is 2684416
via 192.168.13.5 (2684416/2072316), Serial0/0/0
via 172.18.4.3 (2854912/2342912), Serial0/0/1
P 10.34.1.0/24, 1 successors, __ is 3072
via 10.13.1.3 (3072/2937), GigabitEthernet0/1
via 10.14.1.4 (5376/2937), GigabitEthernet0/2
```

What is the reported distance of the successor route for 172.18.3.0/24?

- 2684416
- 2172416
- 2072316
- **28160**

16. What is the administrative distance of a directly connected interface?

- 20
- 5
- **0**
- 1

17. Refer to the exhibit. R2 has two possible paths to the 192.168.10.4 network. What would make the alternate route meet the feasibility condition?

```
R2# show ip eigrp topology
EIGRP-IPv4 Topology Table for AS(1)/ID(2.2.2.2)
Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
       r - reply Status, s - sia Status

<output omitted>

P 192.168.10.4/30, 1 successors, FD is 3523840
        via 192.168.10.10 (3523840/2169856), Serial0/0/1
        via 172.16.3.1 (41024000/2169856), Serial0/0/0

<output omitted>
```

- a feasible distance greater than 41024000
- **a reported distance less than 3523840**
- an administrative distance less than 170
- a reported distance greater than 41024000

Explanation: To meet the feasibility condition, the reported distance (RD) to a network must be less than the current feasible distance to the same destination network. In this example the current feasible distance is 3523840. This means that to be a feasible successor, a route would need a reported distance less than 3523840.

18. Which protocol number is used to indicate that an EIGRP packet is encapsulated in an IP packet?

- 6
- 17
- **88**
- 89

Explanation: In an IP packet header, the field protocol number indicates which protocol is used in the encapsulated PDU. 6 is TCP, 17 is UDP, 88 is EIGRP, and 89 is OSPF.

19. Match the description to the EIGRP packet type. (Not all options are used.)

used to propagate routing information to EIGRP neighbors		hello packets
used to acknowledge the receipt of an EIGRP message that was sent using reliable delivery		used for neighbor discovery and to maintain neighbor adjacencies
used for neighbor discovery and to maintain neighbor adjacencies		query packets
sent in response to an EIGRP query		used to query routes from neighbors
used to query routes from neighbors		reply packets

query packets

used to query routes from neighbors

reply packets

sent in response to an EIGRP query

update packets

used to propagate routing information to EIGRP neighbors

acknowledgment packets

used to acknowledge the receipt of an EIGRP message that was sent using reliable delivery

database description packets

Explanation: EIGRP uses five different packet types include:

- **Hello packets** – Used for neighbor discovery and to maintain neighbor adjacencies.
- **Update packets** – Used to propagate routing information to EIGRP neighbors.
- **Acknowledgment packets** – Used to acknowledge the receipt of an EIGRP message that was sent using reliable delivery.
- **Query packets** – Used to query routes from neighbors.
- **Reply packets** – Sent in response to an EIGRP query.

20. Which statement describes the autonomous system number used in EIGRP configuration on a Cisco router?

- It carries the geographical information of the organization.
- It is a globally unique autonomous system number that is assigned by IANA.
- **It functions as a process ID in the operation of the router.**
- It identifies the ISP that provides the connection to network of the organization.

Explanation: The autonomous system number used in the EIGRP configuration is not associated with the Internet Assigned Numbers Authority (IANA) globally assigned autonomous system numbers that are used by external routing protocols. It just functions as a process ID, which is necessary because a router may run multiple instances of EIGRP. Each instance of EIGRP can be configured to support and exchange routing updates for different networks. An organization has the freedom to choose its own AS number in the EIGRP configuration.

21. Which bandwidth value is used when calculating the EIGRP metric of a route?

- **the slowest bandwidth of all outgoing interfaces between the source and destination**
- the slowest bandwidth of all interfaces on the router
- the fastest bandwidth of all interfaces on the router
- the fastest bandwidth of all outgoing interfaces between the source and destination

Explanation: The bandwidth factor that is used to calculate the composite metric of the EIGRP is defined as the slowest bandwidth of all outgoing interfaces between the source and destination.

22. Refer to the exhibit. All the routers that are displayed are part of the EIGRP domain. Assuming EIGRP metric weights are not altered in the configurations, which path will a packet take that originates from a host on the 192.168.1.0/24 network and is going to a host on the 192.168.2.0/24 network?

- R1, R2, R3
- R1, R5, R3
- R1, R4, R3
- **R1, R2, R5, R3**

Explanation: EIGRP only uses the slowest bandwidth in its composite metric. The slowest bandwidth in the path R1, R2, R5, R3 is 64 kb/s and thus offers the best path to the 192.168.2.0/24 network.

23. Which two metric weights are set to one by default when costs in EIGRP are being calculated? (Choose two.)

- k6
- **k3**
- **k1**
- k4
- k5
- k2

Explanation: By default, k1 and k3 are set to one and k2, k4, and k5 are set to zero during cost calculation by the EIGRP process. There is no k6 value.

24. Which routing protocol supports load balancing across links with unequal costs?

- OSPFv2
- OSPFv3
- **EIGRP**
- RIPv2

Explanation: Routing protocols with two or more paths to a destination network can load balance traffic across multiple paths. EIGRP is the only routing protocol that supports load balancing across unequal cost paths.

25. How has the EIGRP routing protocol improved by having interface delay measured in picoseconds instead of microseconds?

- It allows for a larger number of networks.
- It speeds up convergence.
- It improves performance and communication time between directly connected neighbor routers.
- **It provides better metrics for high speed interfaces.**

Explanation: The original values used to calculate EIGRP metrics were in microseconds for delay and kilobytes per second for bandwidth. When using EIGRP wide metrics, the delay units are picoseconds and within the formula, the metric is found by multiplying by 65,535 instead of 256, thus providing support of interface bandwidth up to 655 terabits per second.

26. If all router Ethernet interfaces in an EIGRP network are configured with the default EIGRP timers, how long will a router wait by default to receive an EIGRP packet from its neighbor before declaring the neighbor unreachable?

- 10 seconds
- **15 seconds**
- 20 seconds
- 30 seconds

Explanation: EIGRP uses the hold time as the maximum time it should wait for receiving a hello packet (or other EIGRP packets) from its neighbor before declaring that the neighbor is unreachable. By default the hold time is 3 times greater than the hello interval. On LAN interfaces, the default hello time is 5 seconds and the default hold time is 15 seconds.

27. What two conditions will result in an EIGRP route going into the active state? (Choose two.)

- The router is not sending queries.
- **The successor is down.**
- The network has been recalculated.
- **There is no feasible successor.**
- One neighbor has not met the feasibility condition.

Explanation: If a successor is no longer available, and there is no feasible successor, an EIGRP route will be put into the active state while the router actively searches for a new path to the destination.

28. An EIGRP router loses the route to a network. Its topology table contains two feasible successors to the same network. What action will the router take?

- The router will query neighbors for an alternate route.
- **The best alternative backup route is immediately inserted into the routing table.**
- The router uses the default route.
- The DUAL algorithm is recomputed to find an alternate route.

Explanation: Because EIGRP uses the DUAL algorithm, the router is able to maintain information on all potential loop-free backup routes. In the event of the failure of a routing table entry, the router immediately inserts the best backup route into the routing table.

29. Which feature of the EIGRP routing protocol can provide fast re-convergence without DUAL recomputation in the event of a route failure?

- having a route in the active state
- having a successor route
- **having a feasible successor route**
- having a route in the passive state

Explanation: EIGRP avoids DUAL recomputation of routes whenever possible by maintaining a list of backup routes (feasible successors) in the topology table already determined to be loop-free. If the primary route (the successor route, which is in the passive state) in the routing table fails, the best backup route is immediately added to the routing table. A route in the active state is in the process of being recomputed by DUAL.

30. What are two benefits of applying summarization to networks within a company that uses the EIGRP routing protocol? (Choose two.)

- **reduced impact when a route goes active**
- reduced number of routers that must maintain a neighbor adjacency
- reduced number of Layer 3 switches required
- reduced number of hops the packet must travel throughout the network
- **reduced size of routing tables**

Explanation: When summarization is applied within any routing protocol, the routing tables within the organization are smaller. An added benefit to EIGRP-enabled routers is that when a route goes active during convergence or when a link has gone down and there is no feasible successor, the number of routers that receive query packets is reduced.

31. Refer to a portion of an EIGRP topology table:

```
P 172.18.3.0/24, 1 successors, __ is 2172416
via 172.18.4.3 (2172416/28160), Serial0/0/1
P 172.18.5.0/24, 1 successors, __ is 2495120
via 172.18.6.3 (2495120/227692), Serial0/1/0
P 192.168.24.0/24, 1 successors, __ is 2684416
via 192.168.13.5 (2684416/2072316), Serial0/0/0
via 172.18.4.3 (2854912/2342912), Serial0/0/1
P 10.34.1.0/24, 1 successors, __ is 3072
via 10.13.1.3 (3072/2937), GigabitEthernet0/1
via 10.14.1.4 (5376/2937), GigabitEthernet0/2
```

What is the metric for the successor route for 10.34.1.0/24?

- 2937
- 2495120
- **3072**

- 227692

32. What is the administrative distance of a static route?

- 5
- **1**
- 20
- 0

33. Refer to a portion of an EIGRP topology table:

```
P 172.18.3.0/24, 1 successors, __ is 2172416
via 172.18.4.3 (2172416/28160), Serial0/0/1
P 172.18.5.0/24, 1 successors, __ is 2495120
via 172.18.6.3 (2495120/227692), Serial0/1/0
P 192.168.24.0/24, 1 successors, __ is 2684416
via 192.168.13.5 (2684416/2072316), Serial0/0/0
via 172.18.4.3 (2854912/2342912), Serial0/0/1
P 10.34.1.0/24, 1 successors, __ is 3072
via 10.13.1.3 (3072/2937), GigabitEthernet0/1
via 10.14.1.4 (5376/2937), GigabitEthernet0/2
```

What is the metric for the feasible successor route for 10.34.1.0/24?

- 3072
- 2495120
- **5376**
- 2937

34. What is the administrative distance of an EIGRP summary route?

- 110
- **5**
- 90
- 20

35. What is the administrative distance of an IS-IS route?

- 0
- 5
- 1
- **115**