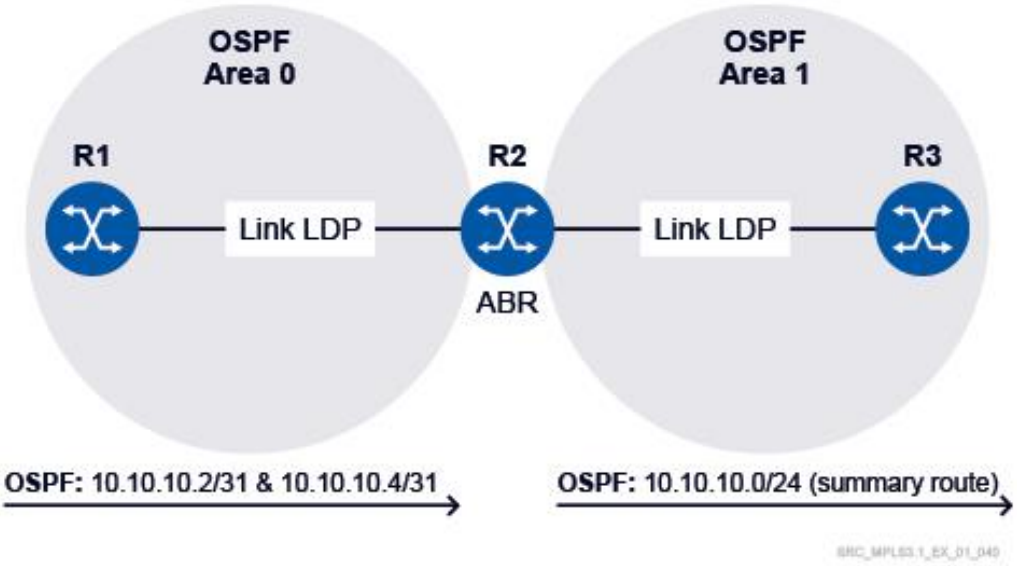
Nokia Multiprotocol Label Switching (exam number: 4A0-103)

The following questions will test your knowledge and prepare you for the Nokia Multiprotocol Label Switching written exam. Compare your responses with the Answer Key at the end of the document.

1. Which of the following statements about an established LDP session is TRUE?
    A. It uses a UDP connection with an arbitrary port number.
    B. It uses a UDP connection with well-known port number 646.
    C. It uses a TCP connection with an arbitrary port number.
    D. It uses a TCP connection with well-known port number 646.

2. Consider the exhibit. Router R2 advertises an OSPF summary route 10.10.10.0/24 into Area 1. Router R3 receives labels for individual FECs 10.10.10.2/32 and 10.10.10.4/32. These two FECs are installed in router R3's LIB but not in the LFIB. What needs to be done on router R3 to install these labels into its LFIB?



A. Disable route summarization on router R3.
B. Enable LDP aggregate prefix match.
C. Create an import policy to accept 10.10.10.2/32 and 10.10.10.4/32.
D. Disable LDP exact match on 10.10.10.2/32 and 10.10.10.4/32.

3. Consider the exhibit. Why is the ingress label for the last entry not in use?

```
A:admin@R6# show router ldp bindings

===============================================================================
LDP Bindings (IPv4 LSR ID 10.10.10.6)
             (IPv6 LSR ID ::)
===============================================================================
Label Status:
        U - Label In Use, N - Label Not In Use, W - Label Withdrawn
        S - Status Signaled Up,  D - Status Signaled Down, e - Label ELC
        WP - Label Withdraw Pending, BU - Alternate For Fast Re-Route
Service Type:
        E - Epipe Service, V - VPLS Service, M - Mirror Service
        A - Apipe Service, F - Fpipe Service, I - IES Service, R - VPRN service
        P - Ipipe Service
FEC Flags:
        LF - Lower FEC, UF - Upper FEC, M - Community Mismatch,
        BA - ASBR Backup FEC
===============================================================================
LDP IPv4 Prefix Bindings
===============================================================================
Prefix
Peer                                        FEC-Flags
IgrLbl                                      EgrLbl
EgrNextHop                                  EgrIntf/LspId
-------------------------------------------------------------------------------
10.10.10.2/32
10.10.10.2:0
  --                                        524286
10.2.3.2                                    1/1/4

10.10.10.3/32
10.10.10.2:0
524287U                                       --
  --                                          --

10.10.10.4/32
10.10.10.2:0
524284N                                     524287
10.2.3.2                                    1/1/4
```

A. The router cannot do a SWAP of this label.
B. The label does not match the egress label for the same FEC.
C. The label is for a FEC for which the next-hop is the peer router.
D. The label was signaled in error.

4. When the "oam lsp-ping ldp prefix 192.10.1.2/32" command is issued, which of the following statements best describes what happens with the MPLS Echo Request packets?
   A. They are sent unlabeled to the prefix 192.10.1.2/32.
   B. They are sent within the LDP tunnel that is signaled for 192.10.1.2/32.
   C. They are sent within the RSVP-TE tunnel that is signaled for 192.10.1.2/32.
   D. They are not sent because the command is missing an LSP name.

5. Consider the exhibit. An LSP has been configured with one-to-one FRR backup protection. Which of the following statements about the LSP is TRUE?

```
PE1# show  router  mpls lsp "toPE2" path detail

<<<<< output omitted >>>>>

Adaptive          : Enabled              Oper Metric          : 100
Preference        : n/a
Path Trans        : 1                    CSPF Queries         : 2
Failure Code      : badNode
Failure Node      : 10.10.10.1
Explicit Hops     :
    No Hops Specified
Actual Hops       :
    10.1.2.1 (10.10.10.1) @ #                  Record Label        : N/A
 -> 10.1.3.3 (10.10.10.3)                      Record Label        : 262143
 -> 10.2.3.2 (10.10.10.2)                      Record Label        : 262142
Computed Hops     :
    10.1.2.1(S)
 -> 10.1.2.2(S)
Resignal Eligible: False
Last Resignal     : n/a                  CSPF Metric          : 100
In Prog MBB :
 MBB Type         : GlobalRevert         Next Retry In        : 27 sec
 Started At       : 09/28/2016 23:08:14  Retry Attempt        : 0
 Failure Code     : noError              Failure Node         : n/a
 Signaled BW      : 0 Mbps

Detour Status     : Active               Detour Type          : Originate
Detour Avoid Nod*: 10.1.2.2              Detour Origin        : 10.10.10.1
Setup Priority    : 7                    Hold Priority        : 0
Class Type        : 0
Detour Active Ti*: 0d 00:00:11           Detour Up Time       : 0d 00:00:44
In Interface      : n/a                  In Label             : n/a
Out Interface     : 1/1/3                Out Label            : 262143
NextHop           : 10.1.3.3
Explicit Hops     :
    10.1.3.1(S)
 -> 10.1.3.3(S)
 -> 10.2.3.2(S)
```

A. The current next-hop for this LSP on PE1 is 10.1.2.2.
B. The router with router-id 10.10.10.1 has detected and repaired a failure on this LSP.
C. This LSP has link and node protection on the router with router-id 10.10.10.3.
D. No failure has occurred on this LSP.

6. Which object in the PATH message indicates the protection method requested by the head-end router to the downstream routers?
    A. Record Route
    B. Session_Attribute
    C. Detour
    D. Fast_Reroute

7. Consider the exhibit. When the primary path of LSP "toPE4" goes down, which secondary LSP path is signaled first?

```
(gl)[/configure router "Base" mpls]
A:admin@PE1# info
    admin-state enable
    path "loose" {
        admin-state enable
    }
    path "loose-1" {
        admin-state enable
    }
    path "loose-2" {
        admin-state enable
    }
    path "loose-3" {
        admin-state enable
    }
    lsp "toPE4" {
        admin-state enable
        type p2p-rsvp
        to 10.10.10.4
        fast-reroute {
        }
        primary "loose" {
        }
        secondary "loose-1" {
        }
        secondary "loose-2" {
            exclude-admin-group {
                group ["RED"]
            }
        }
        secondary "loose-3" {
        }
    }

A:admin@PE1# /configure routing-options if-attribute admin-group "RED" value 3
```

    A. loose-1
    B. loose-2
    C. loose-3
    D. A random secondary LSP path is signaled.

8. Consider the exhibit. The primary path for the LSP is already established. What happens to the incoming traffic if the primary path goes down?

```
(gl)[/configure router "Base" mpls]
A:admin@PE1# info
    resignal-timer 30
    lsp "toPE4" {
        admin-state enable
        type p2p-rsvp
        to 10.10.10.4
        fast-reroute {
            frr-method one-to-one
        }
        primary "loose" {
        }
        secondary "loose-2" {
        }
    }
```

A. Incoming traffic is switched to the detour tunnel indefinitely until the primary path is restored.
B. Incoming traffic is switched to the detour tunnel, then switched to the secondary path after it is signaled and established.
C. Incoming traffic is switched to the secondary path after the resignal timer expires.
D. Incoming traffic is switched to the secondary path immediately.

9. Consider the exhibit. Both RSVP-TE and LDP tunnels have been established in the core network. Which of the following is selected as the MPLS shortcut tunnel by default on a Nokia 7750 SR?

```
(gl)[/configure router "Base" bgp]
A:admin@R1# info
    next-hop-resolution {
        shortcut-tunnel {
            family ipv4 {
                resolution any
            }
        }
    }
```

   A. An RSVP-TE tunnel is selected.
   B. An LDP tunnel is selected.
   C. No tunnel is selected. BGP uses the best IPv4 next hop.
   D. Either RSVP-TE or LDP tunnel that has the longest uptime.

10. Which of the following statements about MPLS encapsulation for Layer 2 VPN services is TRUE?
   A. The customer's Layer 2 header is removed at the iLER.
   B. The customer's Layer 2 header is removed at the eLER.
   C. The iLER adds a service provider Layer 2 header to the MPLS frame which carries the customer payload.
   D. The eLER builds a new Layer 2 header before forwarding the frame to the CE device.

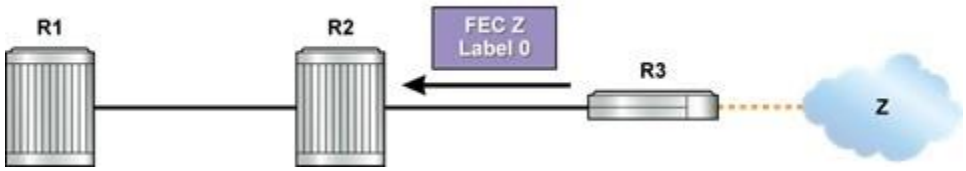
11. Which of the following statements about the traffic engineering capabilities of MPLS is FALSE?
   A. Traffic engineered label switch paths help engineers correct hyper aggregation issues.
   B. Traffic engineering enables network engineers to optimize the use of network resources.
   C. Paths other than the lowest cost path can be utilized with traffic engineering.
   D. Traffic engineering enables network engineers to use ECMP for load balancing.

12. Which of the following statements about label signaling in MPLS is FALSE?
   A. An IGP routing protocol is required in the core network to make it MPLS-capable.
   B. Routers exchange label bindings for IP prefixes that are known to them.
   C. Label binding information is transferred to the data plane where it is stored in the LIB.
   D. A selection process might be performed on the LIB when constructing the LFIB.

13. Which of the following statements about the data plane forwarding process of an MPLS labeled packet is FALSE?
    A. Labels are pushed onto the packet as it enters the MPLS network.
    B. The FEC lookup is done at the egress of the LER on data packets.
    C. The outgoing label is obtained using the Label Forwarding Database of MPLS routers.
    D. All labels are removed from the packet before it leaves the MPLS network.

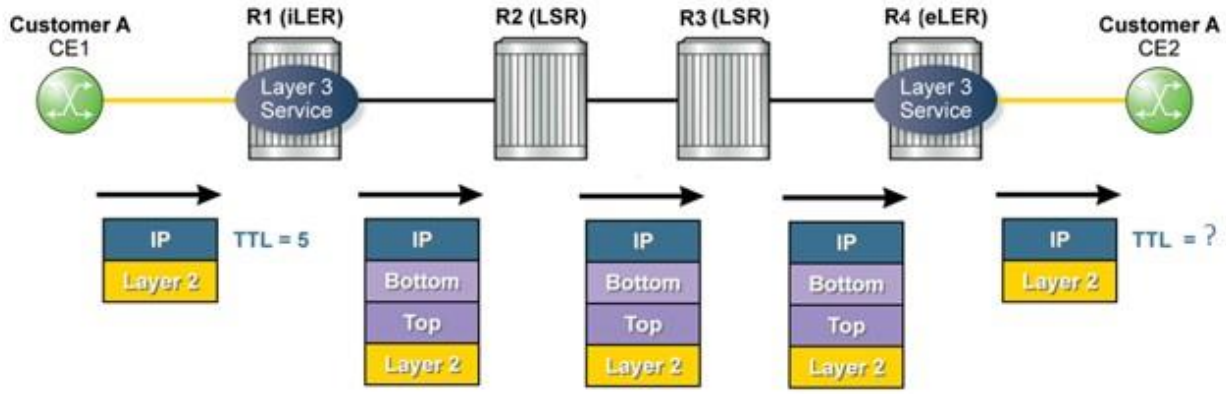
14. Which field in the MPLS header is used to carry QoS information?
    A. TTL
    B. S
    C. Label
    D. EXP

15. Consider the exhibit. Router R3 advertises a label binding for its FEC Z with a label value of 0. What would router R2 do when it receives an MPLS labeled packet from router R1 that is destined to FEC Z?



    A. Pop the label from the packet.
    B. Swap the label with a label value of 0.
    C. Swap the label with a label value of 3.
    D. Forward the packet to router R3 based on the IP header.

16. Consider the exhibit. An unlabeled packet enters the iLER with an IP TTL value of 5. All routers are Nokia 7750 SRs. What is the value of the IP TTL when the packet leaves the egress router R4?

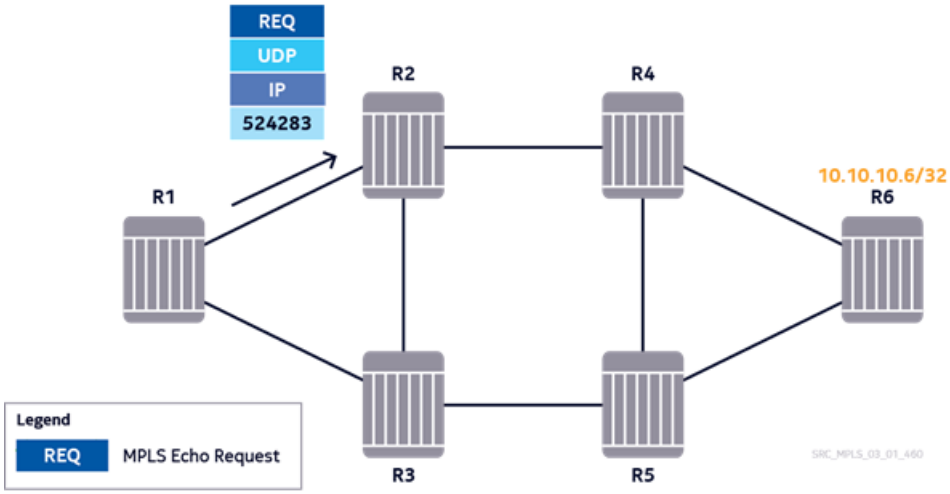


A. 1
B. 2
C. 3
D. 4
E. 5

17. Which of the following statements about MPLS encapsulation for Layer 3 VPN services is FALSE?
    A. The customer's Layer 3 header is preserved at the iLER.
    B. The customer's Layer 2 header is preserved at the iLER.
    C. The customer's Layer 3 header is preserved at the eLER.
    D. The eLER builds a new Layer 2 header before forwarding the frame to the CE device.

18. An adjacency is established between two LDP routers using Hello messages. Which statement about transport addresses exchanged in Hello messages is FALSE?
    A. Each router chooses between the directly connected interface IP address or the system IP address to use as the transport address.
    B. On a Nokia 7750 SR, the transport address is set to the directly connected interface address by default.
    C. The transport addresses are used to determine which router initiates the TCP session between the two routers.
    D. The transport addresses are used to determine which IP addresses the routers use to establish the TCP session.

19. Consider the exhibit. All links have the same cost in the shown network. How many MPLS Echo Request packets does router R1 send for the lsp-trace command?




```
A:admin@R1# oam lsp-trace ldp prefix 10.10.10.6/32
lsp-trace to 10.10.10.6/32: 0 hops min, 0 hops max, 104 byte packets
1  10.10.10.2  rtt=0.70ms rc=8(DSRtrMatchLabel) rsc=1
...
[Snipped Output]
...
```

A. 1
B. 3
C. 4
D. 8

20. A Nokia 7750 SR enabled with LDP has multiple equal cost paths to a given FEC. After ECMP is enabled on the router, which of the following statements will be FALSE?
    A. The number of entries in the LIB will increase.
    B. The number of entries in the FIB will increase.
    C. The router will have multiple LSP tunnels for the given FEC.
    D. The router will generate a single label for the given FEC.

21. Consider the exhibit. The policy shown in the exhibit is applied as an LDP export policy. In addition to the FECs learned from its neighbors, which FECs now appear in the router's LIB?

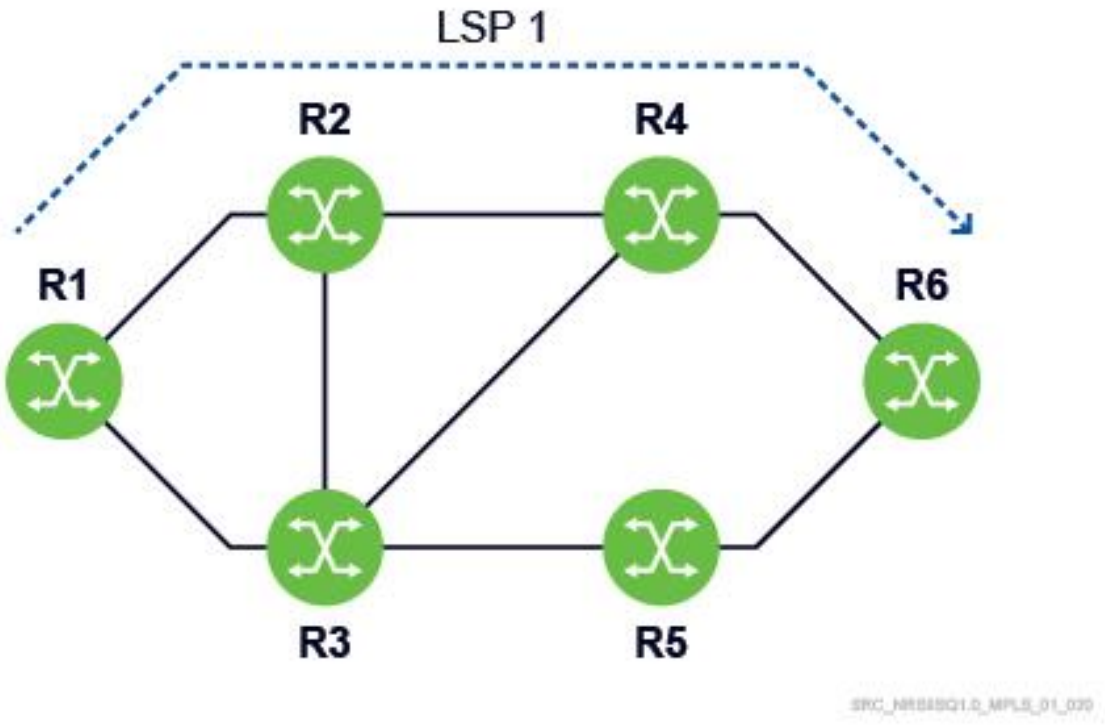
```
(gl)[/configure policy-options]
A:admin@R1# info
    prefix-list "rej_loopbacks" {
        prefix 192.168.7.0/24 type longer {
        }
    }
    policy-statement "LDP_export" {
        entry 10 {
            from {
                prefix-list ["rej_loopbacks"]
            }
            action {
                action-type reject
            }
        }
        entry 20 {
            from {
                protocol {
                    name [direct]
                }
            }
            action {
                action-type accept
            }
        }
    }
```

A. Local FECs that are in the 192.168.7.0/24 address space
B. Local FECs that are not in the 192.168.7.0/24address space
C. All FECs that are not in the 192.168.7.0/24address space
D. Only the system IP FEC

22. Which of the following statements about RSVP-TE LSP configuration on a Nokia 7750 SR is FALSE?
    A. Both MPLS and RSVP contexts need to be enabled on all LSRs.
    B. The LSP tunnel destination address must always be a system IP address.
    C. At least one path definition is needed for an LSP.
    D. A path may be used in different LSPs.

23. Which of the following statements about RSVP sessions created for an LSP is FALSE?
    A. An RSVP session is established on all the routers along the path of an LSP.
    B. Tunnel ID, LSP ID, and Session Name are used to uniquely identify an RSVP session on a router.
    C. The RSVP sessions for different LSP-paths of an LSP share the same LSP ID.
    D. RSVP sessions need to be periodically refreshed to keep the LSP operational.

24. Consider the exhibit. LSP 1 is configured to traverse R1-R2-R4-R6. When router R4 receives the PATH message from router R2, it does not find a route to the next-hop. Which of the following actions does router R4 initiate?

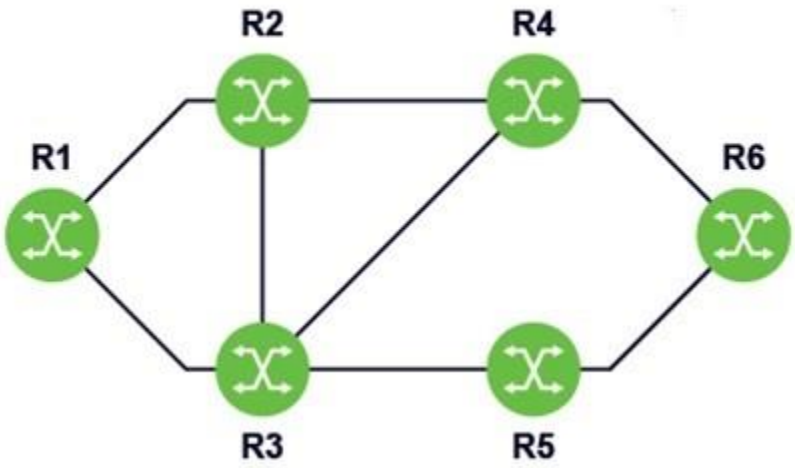


    A. R4 sends a Path Error message upstream to the head-end router R1.
    B. R4 sends a Path Error message upstream to router R2.
    C. R4 sends a Path Tear message upstream to the head-end routerR1.
    D. R4 sends a Path Tear message upstream to router R2.

25. An LSR is configured with RSVP-TE refresh reduction and transmits Summary Refresh messages on its RSVP-TE interfaces. Which object in the Summary Refresh message identifies individual LSPs that the router wishes to refresh?
    A. Message IDs
    B. LSP IDs
    C. Tunnel IDs
    D. Tunnel IDs and LSP IDs

26. Which of the following is NOT a benefit of traffic engineering?
    A. The ability to administratively define customized LSP Paths
    B. The ability to use link coloring to select a path
    C. The ability to limit the number of routers a path can traverse
    D. The ability to select the best path based on traffic congestion

27. Which of the following is an administration constraint that can be used to ensure that an LSP follows the path R1-R3-R4-R6?



    A. Hop-limit
    B. Loose hops
    C. Administrative groups
    D. Shared risk link groups

28. Which of the following statements about Link TLVs in Type 10 Opaque LSAs is TRUE?
    A. Link TLVs are used to advertise router IDs.
    B. Routers only send Link TLVs for interfaces on which RSVP is enabled.
    C. One LSA can contain multiple Link TLVs.
    D. One Link TLV can carry TE-related information about multiple links.

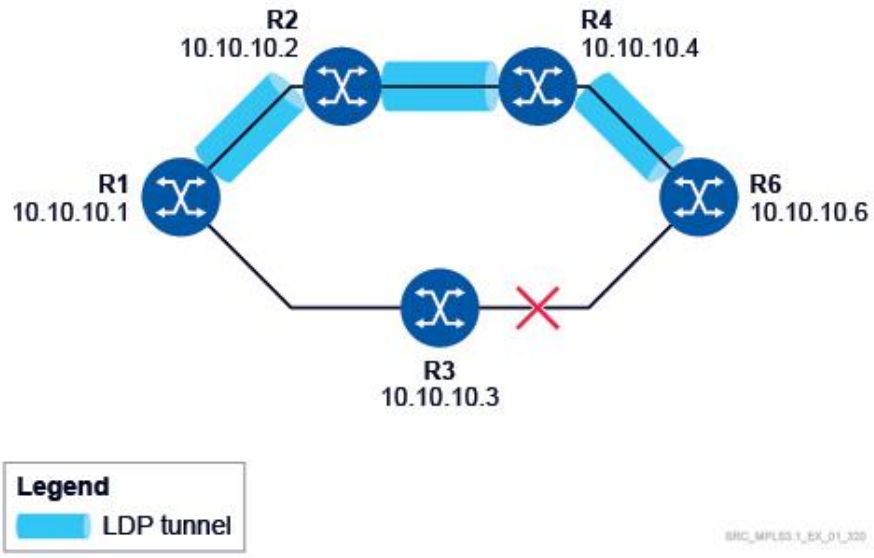
29. Which of the following statements about CSPF is FALSE?
    A. CSPF is used to make path calculations with additional administrative constraints.
    B. A CSPF calculation is performed on every RSVP-TE based LSP.
    C. The head-end router performs the CSPF calculation for an LSP.
    D. CSPF consults the TED to calculate the LSP path.

30. Which of the following statements about LSP path configuration on a Nokia 7750 SR is FALSE?
    A. A fully loose path may be configured with no hops.
    B. A fully loose path may be configured with a single hop.
    C. A path configuration must contain at least one strict hop.
    D. A fully strict path fails if one of the path hops becomes unavailable.

31. Which of the following statements about MPLS shortcuts for BGP traffic is TRUE?
    A. They eliminate the need to run IGP on all routers within an AS.
    B. They make use of MPLS resiliency features available within an AS.
    C. CSPF is required for MPLS shortcuts to work.
    D. They can be used for both iBGP and eBGP sessions.

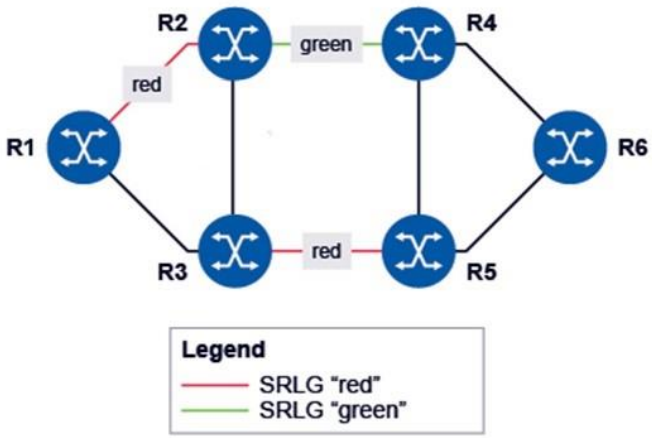
32. Which of the following statements about 6PE technology is TRUE?
    A. P routers run only IPv4.
    B. PE routers run only IPv6.
    C. An IPv6 explicit null label is added as the outer label.
    D. An IPv4 explicit null label is added as the outer label.

33. Consider the exhibit. An LDP tunnel is established on R1-R2-R4-R6 because the link between routers R3 and R6 is down. With the LDP-IGP Sync feature enabled, and after the link is restored, which of the following is TRUE?



A. Router R1 continues to use R1-R2-R4-R6 until this path goes down.
B. Router R1 continues to use R1-R2-R4-R6 until the LDP-IGP Sync feature is disabled.
C. Router R3 starts the LDP-Sync timer once the LDP session R3-R6 is established.
D. A new path is established on R1-R3-R6 as soon as R1 receives a new label for router R6 from router R3.

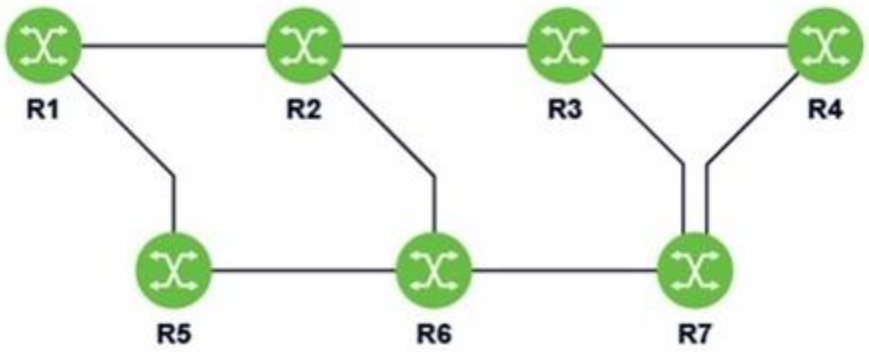
34. Consider the exhibit. An LSP primary path takes R1-R2-R4-R6. Its fully loose standby secondary path is configured for SRLG. All links are of equal cost. Which links does the secondary path traverse?



A. No secondary path is established.
B. The secondary path takes R1-R3-R2-R4-R6.
C. The secondary path takes R1-R3-R5-R6.
D. The secondary path takes R1-R2-R3-R5-R6.

35. Which of the following statements about the one-to-one FRR protection method is FALSE?
A. A separate protection tunnel is established for each protected LSP.
B. A one-to-one FRR protection tunnel is called a bypass tunnel.
C. A protection tunnel can be configured to provide node protection or link protection.
D. A link protection tunnel is signaled if a node protection tunnel cannot be established.

36. Consider the exhibit. An LSP traverses the path R1-R2-R3-R4 and is enabled with facility FRR using node protection. Which router is the merge point when router R1 assumes the PLR role?

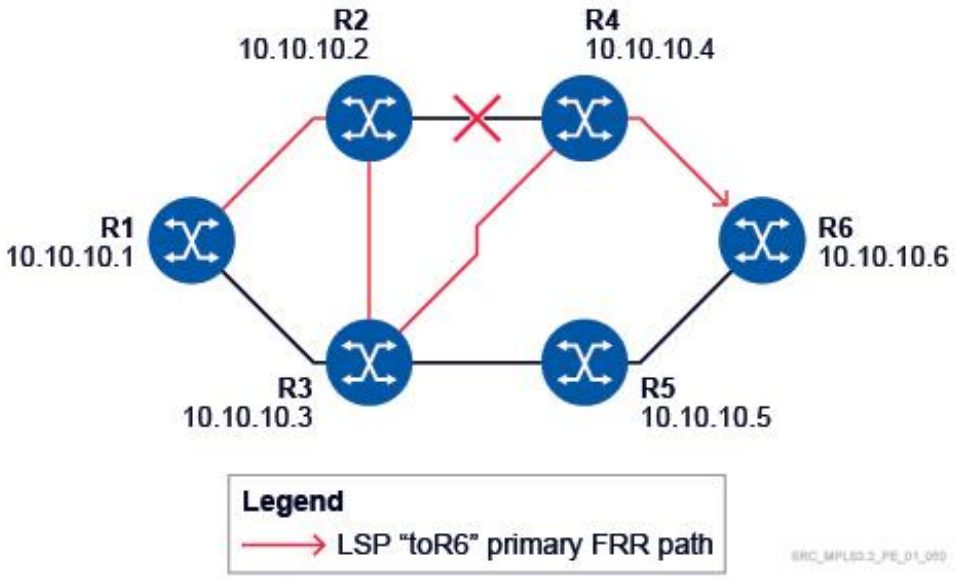


A. R2
B. R3
C. R4
D. R6
E. R7

37. An LSP with FRR protection is brought up. When will a point of local repair (PLR) router on the primary path calculate and signal its detour?
    A. After receiving the PATH message
    B. After receiving the first periodic PATH message
    C. After receiving the first RESV message
    D. After receiving the second RESV message

38. Which RSVP object is used by the FRR facility protection to determine the label that a merge point (MP) router expects when the bypass tunnel is used?
    A. Fast_Reroute
    B. Session_Attribute
    C. Detour
    D. Record Route

39. Consider the exhibit. A fully loose LSP "toR6" is enabled with FRR protection. All links have the same cost. After the link between R2 and R4 goes down, traffic traverses the FRR path R1-R2-R3-R4-R6. Which of the following statements about this CSPF-enabled LSP on a Nokia 7750 SR is TRUE?



A. The LSP will remain on the current path indefinitely unless another failure occurs.
B. The LSP will switchover to a better path as soon as router R1 becomes aware of the link failure.
C. The LSP will switchover to a better path after the retry timer expires.
D. The LSP will switchover to a better path after the resignal timer expires.

40. Which of the following statements about setting up a tunnel with TE constraints across areas in a multi-area IGP domain is FALSE?
A. Type 10 Opaque LSAs are blocked at the Area Border Routers.
B. Administrative groups may be propagated from one IGP domain to another.
C. Shared risk link groups (SRLG) may be propagated from one IGP domain to another.
D. Head-end router does a partial CSPF calculation to its local area border router and the tail end is included as a loose node.

Answer Key

1. D	11. D	21. B	31. B
2. B	12. C	22. B	32. A
3. C	13. B	23. C	33. C
4. B	14. D	24. A	34. A
5. B	15. B	25. A	35. B
6. D	16. C	26. D	36. B
7. A	17. B	27. C	37. D
8. B	18. B	28. B	38. D
9. A	19. B	29. B	39. C
10. C	20. A	30. C	40. C

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Document code:SR1911039726EN (July) CID 207218