Use the following diagram of an AS for the next three exercises:



Figure -For Exercises 1, 2, & 3

1. Complete the BGP routing table for the AS. Add rows as necessary.

|  |  |
| --- | --- |
| Prefix | BGP Next Hop |
| 198.96.222/24 | R4 |
| 15.45.128/18 | R2 |
| 72.11.22/24 | R1 |
| 98.96/12 | R6 |

1. Complete the IGP Routing Table for each router. Add rows as necessary.

R1 IGP Routing Table

|  |  |
| --- | --- |
| Router | IGP Path |
| R2 | R5 |
| R3 | R5 |
| R4 | R5 |
| R5 | R5 |
| R6 | R5 |

R2 IGP Routing Table

|  |  |
| --- | --- |
| Router | IGP Path |
| R1 | R5 |
| R3 | R5 |
| R4 | R5 |
| R5 | R5 |
| R6 | R5 |

R3 IGP Routing Table

|  |  |
| --- | --- |
| Router | IGP Path |
| R1 | R5 |
| R2 | R5 |
| R4 | R5 |
| R5 | R5 |
| R6 | R6 |

R4 IGP Routing Table

|  |  |
| --- | --- |
| Router | IGP Path |
| R1 | R5 |
| R2 | R5 |
| R3 | R5 |
| R5 | R5 |
| R6 | R5 |

R5 IGP Routing Table

|  |  |
| --- | --- |
| Router | IGP Path |
| R1 | R1 |
| R2 | R2 |
| R3 | R3 |
| R4 | R4 |
| R6 | R3 |

R6 IGP Routing Table

|  |  |
| --- | --- |
| Router | IGP Path |
| R1 | R3 |
| R2 | R3 |
| R3 | R3 |
| R4 | R3 |
| R5 | R3 |

1. Complete the Combined Routing Table for each router. Add rows as necessary.

R1 Combined Routing Table

|  |  |
| --- | --- |
| Prefix | IGP Path |
| 15.42.128/18 | R5 |
| 198.96.222/24 | R5 |
| 98.96/12 | R5 |

R2 Combined Routing Table

|  |  |
| --- | --- |
| Prefix | IGP Path |
| 72.11.22/24 | R5 |
| 198.96.222/24 | R5 |
| 98.96/12 | R5 |

R3 Combined Routing Table

|  |  |
| --- | --- |
| Prefix | IGP Path |
| 72.11.22/24 | R5 |
| 15.42.128/18 | R5 |
| 198.96.222/24 | R5 |
| 98.96/12 | R6 |

R4 Combined Routing Table

|  |  |
| --- | --- |
| Prefix | IGP Path |
| 72.11.22/24 | R5 |
| 15.42.128/18 | R5 |
| 98.96/12 | R5 |

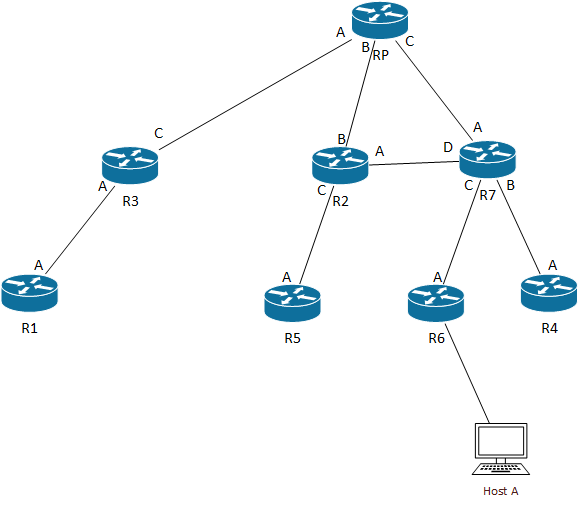
R5 Combined Routing Table

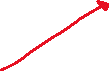
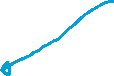
|  |  |
| --- | --- |
| Prefix | IGP Path |
| 72.11.22/24 | R1 |
| 15.42.128/18 | R2 |
| 198.96.222/24 | R4 |
| 98.96/12 | R3 |

R6 Combined Routing Table

|  |  |
| --- | --- |
| Prefix | IGP Path |
| 72.11.22/24 | R3 |
| 15.42.128/18 | R3 |
| 198.96.222/24 | R3 |

1. Fill in the Multicast Forwarding Tables listed for the domain depicted in the diagram below. Use the following messages to populate the tables—show the results of each message, crossing out any entries that would be overwritten. Show all intermediate entries in the table, i.e., populate the tables based on what happens as each message is sent. Add rows to the tables as necessary.





Messages

1. R4 joins multicast group 230.15.45.116
2. R1 joins multicast group 230.15.45.116
3. R5 joins multicast group 230.15.45.116
4. Host A sends to multicast group 230.15.45.116

RP Multicast Forwarding Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| MSG # | Source IPv4 address | Multicast group IPv4 address | Incoming Interface | Outgoing Interfaces |
| ~~1~~ | ~~\*~~ | ~~230.15.45.116~~ | ~~N/A~~ | ~~C~~ |
| ~~2~~ | ~~\*~~ | ~~230.15.45.116~~ | ~~N/A~~ | ~~AC~~ |
| ~~3~~ | ~~\*~~ | ~~230.15.45.116~~ | ~~N/A~~ | ~~ABC~~ |
| 4 | Host A | 230.15.45.116 | C | A, B, C |

R1 Multicast Forwarding Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| MSG # | Source IPv4 address | Multicast group IPv4 address | Incoming Interface | Outgoing Interfaces |
| ~~2~~ | ~~\*~~ | ~~230.15.45.116~~ | ~~N/A~~ | ~~A~~ |
| 4 | Host A | 230.15.45.116 | A | N/A |

R2 Multicast Forwarding Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| MSG # | Source IPv4 address | Multicast group IPv4 address | Incoming Interface | Outgoing Interfaces |
| 3 | ~~\*~~ | ~~230.15.45.116~~ | ~~B~~ | ~~C~~ |
| 4 | Host A | 230.15.45.116 | B | C |

R3 Multicast Forwarding Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| MSG # | Source IPv4 address | Multicast group IPv4 address | Incoming Interface | Outgoing Interfaces |
| ~~2~~ | ~~\*~~ | ~~230.15.45.116~~ | ~~C~~ | ~~A~~ |
| 4 | Host A | 230.15.45.116 | C | A |

R4 Multicast Forwarding Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| MSG # | Source IPv4 address | Multicast group IPv4 address | Incoming Interface | Outgoing Interfaces |
| ~~1~~ | ~~\*~~ | ~~230.15.45.116~~ | ~~A~~ | ~~N/A~~ |
| 4 | Host A | 230.15.45.116 | A | N/A |

R5 Multicast Forwarding Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| MSG # | Source IPv4 address | Multicast group IPv4 address | Incoming Interface | Outgoing Interfaces |
| ~~3~~ | ~~\*~~ | ~~230.15.45.116~~ | ~~A~~ | ~~N/A~~ |
| 4 | Host A | 230.15.45.116 | A | N/A |

R6 Multicast Forwarding Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| MSG # | Source IPv4 address | Multicast group IPv4 address | Incoming Interface | Outgoing Interfaces |
| 4 | Host A | 230.15.45.116 | N/A | A |

R7 Multicast Forwarding Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| MSG # | Source IPv4 address | Multicast group IPv4 address | Incoming Interface | Outgoing Interfaces |
| ~~1~~ | ~~\*~~ | ~~230.15.45.116~~ | ~~A~~ | ~~B~~ |
| 4 | Host A | 230.15.45.116 | C | A, B |

1. Fill in the MPLS routing tables for network shown in the below diagram. Use the following messages to populate the tables. Add rows as necessary.

Diagram

Description automatically generated

1. Router R4 binds the label value 82 to the prefix 148.2.3/24
2. Router R4 advertises that the label value 82 is bound to the prefix 148.2.3/24
3. Router R2 binds the label value 15 to the prefix 148.2.3/24
4. Router R2 advertises that the label value 15 is bound to the prefix 148.2.3/24
5. Router R6 binds the label value 45 to the prefix 88.90.0/22
6. Router R6 advertises that the label value 45 is bound to the prefix 88.90.0/22
7. Router R3 binds the label value 72 to the prefix 88.90.0/22
8. Router R3 advertises that the label value 72 is bound to the prefix 88.90.0/22
9. Router R2 binds the label value 22 to the prefix 88.90.0/22
10. Router R2 advertises that the label value 22 is bound to the prefix 88.90.0/22
11. Router R3 binds the label value 55 to the prefix 15.45/16
12. Router R3 advertises that the label value 55 is bound to the prefix 15.45/16
13. Router R2 binds the label value 43 to the prefix 15.45/16
14. Router R2 advertises that the label value 43 is bound to the prefix 15.45/16
15. Router R5 binds the label value 12 to the prefix 18.3.129/22
16. Router R5 advertises that the label value 12 is bound to the prefix 18.3.129/22
17. Router R2 binds the label value 32 to the prefix 18.3.129/22
18. Router R2 advertises that the label value 32 is bound to the prefix 18.3.129/22

R1 Routing Table

|  |  |  |  |
| --- | --- | --- | --- |
| Label | Prefix | Interface | Remote Label |
|  | 148.2.3 | B | 15 |
|  | 88.90.0 | B | 22 |
|  | 15.45 | B | 43 |
|  | 18.3.129 | B | 32 |

R2 Routing Table

|  |  |  |  |
| --- | --- | --- | --- |
| Label | Prefix | Interface | Remote Label |
| 15 | 148.2.3 | D | 82 |
| 22 | 88.90.0 | A | 72 |
| 43 | 15.45 | A | 55 |
| 32 | 18.3.129 | C | 12 |

R3 Routing Table

|  |  |  |  |
| --- | --- | --- | --- |
| Label | Prefix | Interface | Remote Label |
| 72 | 88.90.0 | C | 45 |
| 55 | 15.45 | A |  |

R4 Routing Table

|  |  |  |  |
| --- | --- | --- | --- |
| Label | Prefix | Interface | Remote Label |
| 82 | 148.2.3 | B |  |

R5 Routing Table

|  |  |  |  |
| --- | --- | --- | --- |
| Label | Prefix | Interface | Remote Label |
| 12 | 18.3.129 | B |  |

R6 Routing Table

|  |  |  |  |
| --- | --- | --- | --- |
| Label | Prefix | Interface | Remote Label |
| 45 | 88.90.0 | B |  |