3) a) i) IPv4 address: 32-bit long, typically written in dotted-decimal format, IPv6 address: 128 bits long, typically written as hex values separated by colons

**ii) Fairly sure not examinable**

**iii) Fairly sure not examinable**

**iv) Fairly sure not examinable (can’t find any mention of this)**

v) Full-mesh: every host connected to every other host, Star: every host connected to every other host indirectly through a switch

**b) No longer examinable**

c) i) Handles incoming mail

ii) Time-to-live, i.e: how soon the record needs to be updated when it is cached. In this case it is 14120 seconds, which is roughly 4 hours. The email server isn’t likely to change, so this is reasonable.

iii) The DNS record must have been cached locally (0.1ms is too quick for a request even to a geographically close DNS server)

4a) Inter-AS and Intra-AS routing algorithms will be used in this example. Intra-AS algorithms such as OSPF will be used to route packets within their AS to a border router, where the packet will be forwarded using an Inter-AS routing algorithm like BGP to its destination AS. From there, an intra-AS routing algorithm will again be used to route the packet to the destination host.

b) I’m not sure whether the question wants us to apply the distance-vector algorithm to all of the hosts or just the AS in which R1 resides. Also not sure what “complete information” means?

Highlight = initialising (start with assumption that each router knows the “cost” to reach each of its directly connected neighbours)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | R1 | R2 | R3 | R4 | R5 | R6 | R7 | R8 |
| D\_R1 | 0 | 14 | 5 | 42 | ∞ | ∞ | ∞ | ∞ |
| D\_R2 | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ |
| D\_R3 | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ |
| D\_R4 | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | R1 | R2 | R3 | R4 | R5 | R6 | R7 | R8 |
| D\_R1 | 0 | 14 | 5 | 42 | **17** | **102** | ∞ | ∞ |
| D\_R2 | 14 | 0 | 3 | ∞ | ∞ | 88 | ∞ | ∞ |
| D\_R3 | 5 | 3 | 0 | ∞ | 12 | ∞ | ∞ | ∞ |
| D\_R4 | 42 | ∞ | ∞ | 0 | 3 | ∞ | ∞ | ∞ |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | R1 | R2 | R3 | R4 | R5 | R6 | R7 | R8 |
| D\_R1 | 0 | 14 | 5 | 42 | 17 | 102 | ∞ | ∞ |
| D\_R2 | 14 | 0 | 3 | **56** | **15** | 88 | **96** | ∞ |
| D\_R3 | 5 | 3 | 0 | **15** | 12 | **91** | **29** | ∞ |
| D\_R4 | 42 | **56** | **15** | 0 | 3 | ∞ | **20** | ∞ |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | R1 | R2 | R3 | R4 | R5 | R6 | R7 | R8 |
| D\_R1 | 0 | 14 | 5 | 42 | 17 | **96** | **34** | ∞ |
| D\_R2 | 14 | 0 | 3 | **18** | 15 | 88 | **32** | **98** |
| D\_R3 | 5 | 3 | 0 | 15 | 12 | **37** | 29 | **31** |
| D\_R4 | **20** | **18** | 15 | 0 | 3 | **28** | 20 | **22** |

c) Pros:

- gives a reasonable estimate of how far away the router is, and so gives a reasonable estimate of how long the packet will take to get to the router.

- measuring latency of a request is simple

Cons: Doesn’t take into account the data rate of the connection, or potential link congestion.

d) R6, as a border router, could issue malicious BGP advertisements telling routers to forward their packets to it for any given site. If the advertisement is attractive to the other routers, they will send their packets. R6 can then do whatever it wants with that data, including reading it or acting as a man-in-the-middle.