Q1 True or False

Q1.1
True.

Q1.2
True.

Q1.3
True.

Q1.4
False. Flooding is not an efficient way to deliver a message from one point in the network to another because routers will flood the message everywhere which is unnecessary and causes extra traffic.

Q1.5
False.

Q1.6
False. Commercial relationships between service providers may enforce them to route their packets through paths that are not the shortest.
Q2 DNS

Q2.1
As stated in the question, the DNS resolution in this example is done in the host’s recursive DNS resolver. As a result, it won’t reach out to the local DNS server and directly asks the root server. The root server replies the IP address of .edu TLD server. Then the host will send a request to .edu server which will reply the IP address of hostmaster.ucsd.edu. The host will send a request to hostmaster.ucsd.edu and will get the IP address of cse123.cs.ucsd.edu. So we need to reach out to 3 DNS servers.

Q2.2
Similar as Q2.1 but now we don’t need to reach out to root server and we can directly ask .edu TLD server as we have its IP address stored in cache.

Q2.3
DNS requests are short messages. Establishing a TCP connection for each of DNS requests is not efficient as we only need to send a short request and get a response back. Instead, we prefer to use UDP that has lower overhead and in case the messages were not delivered properly, we can just resend the request.
Q3 Routing

Q3.1
In the distance vector routing the updates are only sent to the immediate neighbors while in the link state routing the updates are sent out to all the nodes. The second option is wrong because transient forwarding loops can occur in both and the third option is wrong because both protocols are intra-domain routing protocols and also, it does not explain why distance vector routing is more scalable.

Q3.2
Intra-domain protocols try to be as responsive as possible by leveraging knowledge of the entire network. However, some ASes do not wish to reveal the internal topology of their network to other ASes. The first option is wrong because if we could have the full information about the internal topology of each AS and how different ASes are connected, intra-domain routing protocols would be able to compute the shortest path (although there might be disadvantages). The third option is wrong because even in a single AS, we might still have loops and we saw that loops won’t cause intra-domain routing protocols to fail.

Q3.3
First and second option.
Q4 Link State Routing

<table>
<thead>
<tr>
<th>Confirmed</th>
<th>Pending</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A,0,-)</td>
<td>(B,24,B), (C,6,C)</td>
</tr>
<tr>
<td>(A,0,-), (C,6,C)</td>
<td>(B,24,B),(D,8,C)</td>
</tr>
<tr>
<td>(A,0,-), (C,6,C), (D,8,C)</td>
<td>(B,13,C),(F,12,C),(E,11,C)</td>
</tr>
<tr>
<td>(A,0,-), (C,6,C), (D,8,C), (E,11,C)</td>
<td>(B,13,C),(F,12,C)</td>
</tr>
<tr>
<td>(A,0,-), (C,6,C), (D,8,C), (E,11,C), (F,12,C)</td>
<td>(B,13,C), (G,15,C)</td>
</tr>
<tr>
<td>(A,0,-), (C,6,C), (D,8,C), (E,11,C), (F,12,C), (B,13,C)</td>
<td>(G,14,C)</td>
</tr>
</tbody>
</table>

Table 1: Steps for building the routing table for node A in Q4

**Q4.1**
D

**Q4.2**
E

**Q4.3**
F

**Q4.4**
B

**Q4.5**
G

**Q4.6**
B

**Q4.7**
F
Table 2: Steps for building the routing table for node A after D fails in Q4

### Q5 Distance Vector Routing

#### Q5.1

24, 6, ∞, ∞, ∞, ∞

#### Q5.2

∞, 4, 6, 4, 7, 3

#### Q5.3

11, 8, 5, 3, 7, 9

#### Q5.4

13, 6, 8, 11, 12, 14