TCP/IP Networking 2017 Test 7

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Grading:
For each question, exactly one of the four proposed answers is correct. If the good answer and only the good answer box is crossed ⇒ +1 point. If one bad answer box is crossed and no other box is crossed ⇒ $-\frac{1}{3} = -0.333$ point. If 0 or more than 1 answer box is crossed ⇒ +0 point.
⟵ Please encode your SCIPER number here and write your full name in the box below. ↓

Name, First Name:

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Question 1 Bart is running the centralized Bellman-Ford algorithm over a network that is not connected. Nodes i and j are such that there is no path from i to j. Bart tries to estimate the distance from node i to node j; let $d^k(i,j)$ be the estimate obtained after the k^{th} iteration of the centralized Bellman-Ford algorithm.
Say what is true, depending on the initial conditions.

☐ If the initial conditions are such that $d^0(i,k) = \infty$ then $\lim_{k\to\infty} d^k(i,j) = \infty$, namely the algorithm does not stop ("count to infinity"); in contrast, if the initial value $d^0(i,k)$ is finite, the algorithm may converge to a final finite value, which is then incorrect since the true distance is infinite.

☐ Regardless of initial conditions, $d^k(i,j)$ converges to some finite value in a finite number of steps. The final value is incorrect since the true distance is infinite.

☐ Regardless of initial conditions, $d^k(i,j)$ asymptotically approaches some finite value (i.e. $\lim_{k\to\infty} d^k(i,j)$ exists and is finite) but does not stop. The limiting value is incorrect since the true distance is infinite.

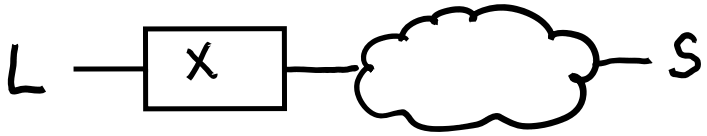
☐ Regardless of initial conditions, $\lim_{k\to\infty} d^k(i,j) = \infty$, namely the algorithm does not stop ("count to infinity").

Question 2 Say what is true:

1. A PTR DNS record can be used to map an IP address to a name.
2. An AAAA DNS record can be used to map a name to an IPv6 address.

☐ Both.
☐ None.
☐ 2 and not 1.
☐ 1 and not 2.

Question 3 Lisa's device (L) uses TCP to transfer a page from the web server S. The cloud represents switches and routers. Depending on whether X is a NAT or a web proxy, how many TCP connections does the transfer involve ?



- ☐ 2 when X is a NAT, 1 when X is a web proxy.
- ☐ 2 when X is a NAT, 2 when X is a web proxy.
- ☐ 1 when X is a NAT, 2 when X is a web proxy.
- ☐ 1 when X is a NAT, 1 when X is a web proxy.

Question 4 Say what is true.

1. If IP packets from AS A to AS B are routed along the AS path $A - X - Y - Z - B$ then packets from B to A must follow the reverse path $B - Z - Y - X - A$.
2. When route flap damping is enabled, it may happen that a BGP router ignores a route that was recently advertised again.

- ☐ None.
- ☐ Both.
- ☐ 1 and not 2.
- ☐ 2 and not 1.

Question 5 What does the "End-to-end principle" advocate ?

- ☐ There should be only two transport protocols, namely UDP and TCP.
- ☐ Layers above layer 3 should not have intermediate systems.
- ☐ Packet losses should be repaired in end-systems when the loss rate is low, and hop-by-hop if the loss rate is high.
- ☐ A sliding window should be used when the bandwidth-delay product is large.

Question 6 In a connected network, depending on the initial conditions, when does the centralized Bellman-Ford converge to the true distances ?

- ☐ If the initial distances are $\geq$ the true distances, otherwise it is not guaranteed to converge to the true values.
- ☐ Always.
- ☐ If the initial distances are $\leq$ the true distances, otherwise it is not guaranteed to converge to the true values.
- ☐ If the inital values are not too far from the true distances, otherwise it is not guaranteed to converge to the true values.

Question 7 A BGP router R receives from BGP neighbours the three routes.

(1) `DESTINATION = 2001:b0b0/31; AS-PATH = A B C, NEXT-HOP = 2002:baba:bebe:e::1`

(2) `DESTINATION = 2001:b0b0/32; AS-PATH = D, NEXT-HOP = 2002:baba:bfbf:f::1`

(3) `DESTINATION = 2001:b0b1/32; AS-PATH = D, NEXT-HOP = 2002:baba:bfbf:f::1`

There is no redistribution of BGP routes into an IGP; BGP routes are injected into the IP forwarding tables. Say which statement is true.

- ☐ The BGP decision process at R may select all three routes as best routes. If this happens, packets at this router with destination `2001:b0b0:baba::1` are forwarded towards `2002:baba:bfbf:f::1`.
- ☐ The BGP decision process at R may not select all three routes as best routes.
- ☐ The BGP decision process at R must select routes (2) and (3) as best routes and not route (1).
- ☐ The BGP decision process at R may select all three routes as best routes. If this happens, packets at this router with destination `2001:b0b0:baba::1` are forwarded towards `2002:baba:bebe:e::1`.

Question 8 When a dual-stack host connects to a single-stack web server, how does it know whether IPv4 or IPv6 should be used ?

- ☐ By sending an ICMP message ("ping") to the web server with IPv4 and IPv6, and seeing what works.
- ☐ By sending a TCP SYN packet over IPv4 and IPv6 and seeing what works.
- ☐ By the DNS.
- ☐ By trying ARP and NDP and seeing what works.

Question 9 Lisa downloads a web page from an https URL using QUIC over a single QUIC connection. After the initial QUIC/TLS handshake, the transfer of the web page starts. The page contains multiple objects; the web server implementation uses one QUIC stream per object. One QUIC packet is lost during the transfer; this packet contains stream data of the first object of the page and no stream data of other objects; no other packet is lost in either direction. May it happen that the second object is displayed on Lisa's screen before the loss is repaired ?

- ☐ No, because the second and following objects must wait until the loss is repaired and the transfer of the first object is completed.
- ☐ It depends whether the transfer is over IPv4 or IPv6.
- ☐ Yes.
- ☐ It depends whether ECN is used.

Question 10 Lisa downloads a web page from an https URL using HTTP/2 over TLS over a single TCP connection. After the initial TCP and TLS handshakes, the transfer of the web page starts. The page contains multiple objects. One packet is lost during the transfer of the first sent objectt; no other packet is lost in either direction. Say which is true.

- ☐ Regardless of the TLS version, it may happen that the second object is displayed on Lisa's screen before the loss is repaired.
- ☐ If TLS 1.3 is used, the second and following objects must wait until the loss is repaired and the transfer of the first object is completed. If TLS 1.2 is used, it may happen that the second object is displayed on Lisa's screen before the loss is repaired.
- ☐ If TLS 1.2 is used, the second and following objects must wait until the loss is repaired and the transfer of the first object is completed. If TLS 1.3 is used, it may happen that the second object is displayed on Lisa's screen before the loss is repaired.
- ☐ Regardless of the TLS version, the second and following objects must wait until the loss is repaired and the transfer of the first object is completed.