



### TCP/IP Networking, 2018, Quiz 5

Use the separate answer sheet to return your answers. Do not return this sheet. We recommend that you first write your tentative answers on this sheet. In a second phase, when you are certain about your answers, you can mark them on the answer sheet.

For each question there is exactly one correct answer. If the good answer and only the good answer box is marked  $\Rightarrow +1$  point. If one bad answer box is marked and no other box is marked  $\Rightarrow -\frac{1}{3}$  point. If 0 or more than 1 answer box is marked  $\Rightarrow 0$  point.

**Question 1** When a packet of a TCP connection is lost due to transmission error and not due to congestion:

- A the TCP connection reduces its rate if ECN is not enabled.
- B the TCP connection reduces its rate if ECN is enabled
- C the TCP connection does not reduce its rate.
- D the TCP connection reduces its rate.

**Question 2** A TCP-CUBIC application is expected to obtain a higher throughput than if it would be using TCP-Reno...

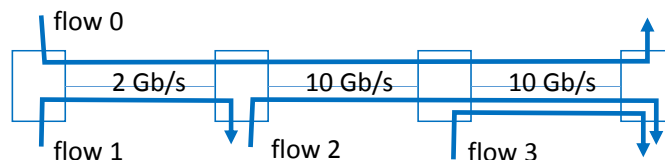
- A when the available bitrate is small and the round trip time is large.
- B when the available bitrate and the round trip time are large.
- C when ECN is not supported.
- D when ECN is supported.

**Question 3** Say which is true

1. The goal of Explicit Congestion Notification (ECN) is to avoid packet losses due to congestion in routers, when combined with TCP congestion control.
2. When a TCP-Reno connection detects a loss by timeout, it goes into slow-start.

- A Both.
- B None.
- C 1 and not 2.
- D 2 and not 1.

**Question 4** The capacities of the 3 links (shown as lines between boxes) are 2 Gb/s and 10 Gb/s. There are no constraints other than the link capacities shown on the figure. The rates of the flows (shown as arrows) in Gb/s are  $x_0, x_1, x_2$  and  $x_3$ .



Which of the following allocations are Pareto-efficient ?

1.  $x_0 = 1, x_1 = 1, x_2 = 2, x_3 = 7$ .
2.  $x_0 = 1, x_1 = 1, x_2 = 4.5, x_3 = 4.5$ .

- A 2 and not 1.
- B Both.
- C 1 and not 2.
- D None.



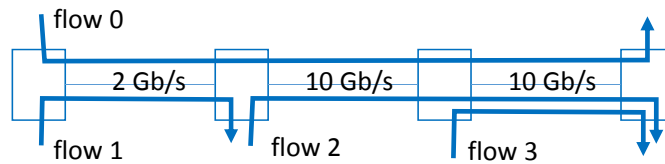
**Question 5** A DC-TCP connection competes with TCP-Cubic connections in a network that handles all connections in the same way. All TCP connections have the same round-trip time. Say which is true.

- A The DC-TCP connections obtain the same throughput as the TCP-Cubic connections.
- B The DC-TCP connections obtain less throughput than the TCP-Cubic connections.
- C The DC-TCP connections obtain more throughput than the TCP-Cubic connections when the common RTT is large, otherwise both throughputs are similar.
- D The DC-TCP connections obtain more throughput than the TCP-Cubic connections.

**Question 6** When a TCP connection is in slow start:

- A the congestion window increases linearly as long as there is no loss.
- B the congestion window increases logarithmically as long as there is no loss.
- C the congestion window increases exponentially as long as there is no loss.
- D the congestion window remains constant until there is a loss.

**Question 7** The capacities of the 3 links (shown as lines between boxes) are 2 Gb/s and 10 Gb/s. There are no constraints other than the link capacities shown on the figure. The rates of the flows (shown as arrows) are allocated according to max-min fairness.



What is the rate allocated to flow 3 ?

- A 4.5 Gb/s.
- B  $\frac{10}{3}$  Gb/s.
- C 1 Gb/s.
- D 3 Gb/s.

**Question 8** TCP-Reno connections 1 and 2 have same loss rate  $q = 0.01$  and same MSS but different RTTs,  $T_1 = 0.1$  sec and  $T_2 = 0.4$  sec. The throughputs are approximately (in packets per second):

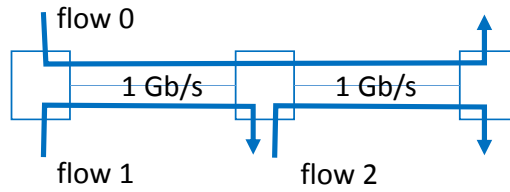
- A  $x_1 = 122$  pps,  $x_2 = 122$  pps.
- B  $x_1 = 122$  pps,  $x_2 = 30.5$  pps.
- C  $x_1 = 122$  pps,  $x_2 = 61$  pps.
- D  $x_1 = 61$  pps,  $x_2 = 122$  pps.

**Question 9** Homer designs a congestion control application for a UDP application and uses Multiplicative Increase, Multiplicative Decrease. Say which is true.

- A This form of congestion control has a fairness problem.
- B This application is TCP-friendly.
- C This application is TCP-friendly in networks where RED is not deployed.
- D This application is TCP-friendly in networks where RED is deployed.



**Question 10** The capacities of the 2 links (shown as lines between boxes) are 1 Gb/s each. There are no constraints other than the link capacities shown on the figure. The rates of the flows (shown as arrows) in Gb/s are  $x_0, x_1$  and  $x_2$ . Which allocation is proportionally fair ?



A  $x_0 = \frac{1}{3}, x_1 = \frac{2}{3}, x_2 = \frac{2}{3}$ .

C  $x_0 = \frac{1}{3}, x_1 = \frac{1}{3}, x_2 = \frac{1}{3}$ .

B  $x_0 = 0, x_1 = 1, x_2 = 1$ .

D  $x_0 = \frac{1}{2}, x_1 = \frac{1}{2}, x_2 = \frac{1}{2}$ .



+1/4/57+