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<input type="checkbox"/> 3	<input type="checkbox"/> 3	<input type="checkbox"/> 3	<input type="checkbox"/> 3	<input type="checkbox"/> 3	<input type="checkbox"/> 3
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<input type="checkbox"/> 8	<input type="checkbox"/> 8	<input type="checkbox"/> 8	<input type="checkbox"/> 8	<input type="checkbox"/> 8	<input type="checkbox"/> 8
<input type="checkbox"/> 9	<input type="checkbox"/> 9	<input type="checkbox"/> 9	<input type="checkbox"/> 9	<input type="checkbox"/> 9	<input type="checkbox"/> 9

**Grading:**

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

$\leftarrow$  Please encode your SCIPER number here and write your full name in the box below.  $\downarrow$

Name, First Name:

.....

**Question 1** A UDP application implements congestion control by means of Multiplicative Increase, Multiplicative Decrease.

- |  |   |
|--|---|
| <input type="checkbox"/> This will not prevent congestion collapse.      | <input type="checkbox"/> This application is TCP-friendly.                                  |
| <input type="checkbox"/> This will have roughly similar effects as AIMD. | <input checked="" type="checkbox"/> This form of congestion control has a fairness problem. |

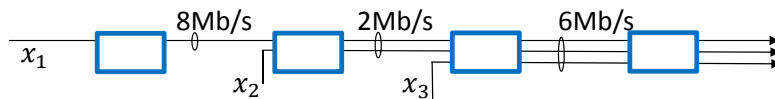
**Question 2** In a network where all TCP connections have the same RTT, TCP allocates rates according to ...

- |  |  |
|--|--|
| <input type="checkbox"/> max-min fairness.   | <input type="checkbox"/> maximization of the sum of all rates. |
| <input checked="" type="checkbox"/> a utility fairness close to proportional fairness. | <input type="checkbox"/> proportional fairness.                |

**Question 3** TCP 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:

- |  |   |
|--|---|
| <input checked="" type="checkbox"/> $x_1 = 122$ pps, $x_2 = 30.5$ pps. | <input type="checkbox"/> $x_1 = 122$ pps, $x_2 = 61$ pps. |
| <input type="checkbox"/> $x_1 = 122$ pps, $x_2 = 122$ pps.             | <input type="checkbox"/> $x_1 = 61$ pps, $x_2 = 122$ pps. |

**Question 4** The proportionally fair allocation is, in Mb/s ...



- |   |  |
|---|--|
| <input type="checkbox"/> $x_1 = 0.5$ , $x_2 = 0.5$ , $x_3 = 5$ .        | <input type="checkbox"/> $x_1 = 0.5$ , $x_2 = 1.5$ , $x_3 = 4$ . |
| <input checked="" type="checkbox"/> $x_1 = 1$ , $x_2 = 1$ , $x_3 = 4$ . | <input type="checkbox"/> $x_1 = 1.5$ , $x_2 = 0.5$ , $x_3 = 4$ . |

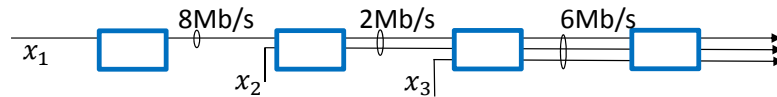
**Question 5** TCP connections 1 and 2 have same RTT = 0.1 sec and same MSS but different loss probabilities,  $q_1 = 0.01$  and  $q_2 = 0.04$ . The throughputs are approximately:

- |   |  |
|---|--|
| <input type="checkbox"/> $x_1 = 122$ pps, $x_2 = 30.5$ pps. | <input type="checkbox"/> $x_1 = 61$ pps, $x_2 = 122$ pps.            |
| <input type="checkbox"/> $x_1 = 122$ pps, $x_2 = 122$ pps.  | <input checked="" type="checkbox"/> $x_1 = 122$ pps, $x_2 = 61$ pps. |

**Question 6** When a packet of a TCP connection is lost due to transmission error and not due to congestion:

- the TCP connection reduces its rate if ECN is not enabled.
  the TCP connection reduces its rate.
- the TCP connection reduces its rate if ECN is enabled.
  the TCP connection does not reduce its rate.

**Question 7** The max-min fair allocation is, in Mb/s ...



- $x_1 = 1, x_2 = 1, x_3 = 4.$ 
  $x_1 = 0.5, x_2 = 0.5, x_3 = 5.$
- $x_1 = 0.5, x_2 = 1.5, x_3 = 4.$ 
  $x_1 = 1.5, x_2 = 0.5, x_3 = 4.$

**Question 8** When a TCP connection is in slow start:

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

**Question 9** In a network where the set of feasible rates is convex and bounded, how many proportionally fair allocation are there ?

- Exactly one.
  Zero or one.
- Exactly two.
  One or more.

**Question 10** In a network where the set of feasible rates is convex and bounded, how many max-min fair allocation are there ?

- Exactly one.
  Exactly two.
- One or more.
  Zero or one.