

10 Principles of Communications (jac22)

- (a) One simple equation for mean throughput experienced by a TCP connection is proportional to

$$\frac{MSS}{RTT \cdot \sqrt{p}}$$

where  $MSS$  is the maximum segment size, or in other words, the data packet size;  $RTT$  is the round trip time; and  $p$  is the packet loss probability.

Explain this equation, starting from the basic AIMD behaviour of TCP's congestion control and avoidance window adjustment algorithm. Assume that a TCP flow is unidirectional and all data packets are maximum size, and that packet losses only happen due to congestion. In your answer, please explain any other assumptions, for example concerning the round trip time and link capacities on the path from sender to recipient. [10 marks]

- (b) A clever person decides to mitigate the  $1/RTT$  “unfairness” in the TCP throughput by building a scheduler that uses weighted round robin, and assigns weights to TCP flows, in *inverse proportion* to their  $RTT$ .

Give reasons why this might not be an appropriate solution. Also give reasons why this might not be easy to implement. [10 marks]