

HW 2

ECE 356/ COMPCSI 356: Computer Network Architectures:

Homework must be done individually. The homework is due at 11:59pm on 04/10/24. Please submit your solutions as a single PDF file via Gradescope. Show all steps of your derivations.

1. (3 pts) Suppose host A is sending to a multicast group; the recipients are leaf nodes of a tree rooted at A with depth n and with each nonleaf node having m children; there are thus m^n recipients.
 - a. How many individual link transmissions are involved if A sends a multicast message to all recipients? (1pt)
 - b. How many individual link transmissions are involved if A sends a unicast message to each individual recipient? (1pt)
 - c. Suppose A sends to all recipients, but some messages are lost and retransmission is necessary. Unicast retransmissions to what fraction of the recipients is equivalent, in terms of individual link transmissions, to a multicast retransmission to all recipients? (1pt)

- 2

3. (2 pts) Suppose we are using the Jacobson/Karels algorithm to estimate the TimeOut in TCP, where $\mu=1$, $\phi=4$, and $\delta = 0.1$. The current EstimatedRTT and Deviation are 110 ms and 10 ms, respectively. Suppose the measured SampleRTT is 80 ms for a new segment. Compute the updated EstimatedRTT, Deviation, and TimeOut.

4. (2 pts) Suppose a congestion-control scheme results in a collection of competing flows that achieve the following throughput rates: 100 KBps, 260 KBps, 310 KBps, 85 KBps, and 120 KBps. Calculate the fairness index for this scheme.