EE 706: Communication Networks

Instructor: Saravanan Vijayakumaran

Indian Institute of Technology Bombay

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Code A

Quiz 2 : **10 points** (45 min) February 15, 2012

0. Write down the code of your question paper next to your roll number. [0 points]

1. In a system using stop-and-wait ARQ, assume that the timeout duration T_t is larger than the round-trip time (RTT) T_1. Assume that the RTT is deterministic and includes the processing times at the destination and source. Suppose that the source wants to send four frames to the destination. If every third frame transmission and every second ACK transmission is corrupted, how much time elapses before the ACK for the fourth frame is completely processed at the source? Draw a timing diagram to support your answer. Note that a frame transmission occurs when a frame is transmitted for the first time or when it is retransmitted. [2 points]

2. Suppose a system using go-back-N ARQ uses a 4-bit sequence number in both frames and ACKs. Suppose $N = 7$ and RTT $= 6T_f$ where T_f is the frame transmission time. Assume that the RTT is deterministic and includes the processing times at the destination and source. Assume that the first frame has sequence number 0 and its transmission begins at $t = 0$. If every second ACK transmission is corrupted, draw the timing diagram showing the sequence of frames transmitted upto $t = 14T_f$. [2 points]

3. In a system using stop-and-wait ARQ, assume the following where T is a constant. [6 points]

   (a) The channel between the source and destination is full duplex.

   (b) The one way propagation delay is deterministic and equal to T.

   (c) The frame transmission time is fixed and equal to $T_f = 4T$.

   (d) The ACK transmission time is fixed and equal to $T_a = 2T$.

   (e) The sum of the processing delays at source and destination in a single round trip is a random variable which is uniformly distributed between 0 and $2T$.

   (f) The timeout duration is fixed and equal to $T_t = 9T$.

   (g) If timeout occurs before an ACK is completely processed, retransmission begins immediately irrespective of the ACK contents.

   (h) If an ACK processing completes during a frame transmission, the transmission corresponding to the ACK (if any) begins after the current frame transmission completes.

   Let X be the time spent in successfully transmitting a frame (this should include the ACK transmission and processing times). Assume that frame errors occur but there are no ACK errors i.e. $P_{AE} = 0$. Calculate the expected value of X.