Department of Computer Science and Engg, IIT Bombay
CS 348: Computer Networks   Quiz1: 27th Aug 2012, 08:30 – 09:30
Handwritten notes permitted. No photocopies. Weightage: 10%, Max Marks – 30
Answer in the space provided below each question. Extra sheets will not be provided.

Write your Roll Number here: _____

Q1: You are working on your laptop connected to a 100 Mbps Ethernet LAN. You need a 2GB file that is on the server in the same LAN. The entire file is also on your pen drive but you have left the pen drive in another room. You have a dog, sitting beside you, that is trained to bring the pen drive to you. The average speed of the dog is 20 km/hour. Upto what distance does the dog have a higher data rate than 100 Mbps Ethernet? **(5 marks)**

(Hint: The dog should be able to go and bring the pen drive, before the transfer on the LAN completes. Assume continuous data transmission on the LAN (no packetization required).)

Compute how long does it take to transmit 2GB at 100 Mbps. This is the RTT for the dog.

The distance works out to 4/9 of a KM.

% Give partial marks if the ideas are correct but calculations are wrong.

Q2: Consider packet sizes are 1000 bits, transmission rate is 1 Mbps, and propagation delay from source to destination is 15 milliseconds. Assume that acks are very small, processing time for packets and acks is negligible, and there are no errors in transmission. What will be the throughput if we use:

1. Stop-and-Wait ARQ. **(5 marks)**
2. Go-back-N ARQ, with a window size of 20 packets. **(5 marks)**

For stop-and-wait, only one packet can be transmitted per RTT (30ms). So in 1 second, approx 33 packets are sent, giving throughput of 33 kbps.

For Go-back-N, there is no error, so it is just sliding window of 20. 20 packets can be transmitted per RTT (30ms).
So in 1 second, approx 660 packets are sent, giving throughput of 660 kbps.

% Give partial marks if the ideas are correct but calculations are wrong.

Q3: Suppose we want to transmit the message 1011001001001011 and protect it from errors using the CRC8 polynomial $x^8 + x^2 + x^1 + 1$. Use polynomial long division to determine the message that should be transmitted. **(5 marks)**

Take the message 1011 0010 0100 1011 and append 8 zeros.
Divide by 1 0000 0111 (x8 + x2 + x1 + 1). The remainder is 1001 0011.

Transmit the original message with this remainder appended,
resulting in 1011 0010 0100 0011 1001 0011.

% Give partial marks if the ideas are correct but calculations are wrong.

Q4: In ALOHA protocol, a station transmits whenever it has data. In slotted-ALOHA, a station transmits only at the beginning of the next time slot. State one advantage of using slotted-ALOHA over ALOHA. State one drawback. **(5 marks)**

Advantage: Throughput doubles, as stations can collide only with other transmitting in their slot.

Disadvantage: Slot synchronization implementation complexity.

% For other answers, give partial marks as per your judgement. Be consistent in marking.

Q5: Your friend claims that the non-persistent CSMA protocol performs better than the 1-persistent CSMA protocol. Do you agree? If yes, justify your answer. If not, give a scenario for a counter-example. **(5 marks)**

Yes, if you assume that there are many nodes in the network and each having data to transmit (heavy load).

No, under light load. Transmissions are so infrequent that the probability of finding medium free is high.

% For other answers, give partial marks as per your judgement. Be consistent in marking.