Problem 1.

If we divide 1001 into 10101010000 we get 10010111, with a remainder of R = 001.

Problem 2.

The length of a polling round is

$$N(Q/R + t_{poll}).$$

The number of bits transmitted in a polling round is NQ. The maximum throughput therefore is

$$\frac{NQ}{N(Q/R + t_{poll})} = \frac{R}{1 + \dfrac{t_{poll}R}{Q}}$$

Problem 3

Suppose nodes A and B are on the same 10 Mbps Ethernet Segment, and then propagation delay between the two nodes is 225 bit times. Suppose node A begins transmitting a frame, and before it finishes, B begins transmitting a frame.

(1) Calculate the propagation delay in second, not bit time.

$225*(1/10*10^6)$

(2) If A transmits a 512 bits packet and transmits at bit time 0, when (in term of bit time) should B begin transmission to avoid collision with A's transmission?

225+512 total bit times.

3) If three nodes collide, in the best case, what is the maximum number of retransmissions among the three nodes? *Hint: The best case is that nodes trying to choose different random number. The worst case is that nodes choosing the same random number all the time (Of course, this does not happen because of the randomness of the process).*

In the best case, the maximum is 3, i.e., they never retransmit at the same time.