1.  (2 points) You are transmitting a 10,000 bits packet over a 2,000 km fiber optic link. How fast/slow should the transmission rate on the link be so that the propagation delay on the link is approximately equal to the packet transmission time?

2.  (3 points) Packets arrive at an average rate of 100,000 packets per second at a router queue that can hold 500 (average size) packets and that feeds a 1 Gbps ($10^9$ bits/sec) link. The average packet length is 5,000 bits. What is the traffic load or intensity on the link? What is the average number of packets in the queue? How does this value change if the packet arrival rate increases to 200,000 packets/sec?

3. (5 points) A user connects to the Internet via a 2 Mbits/sec DSL connection and accesses the New York Times web page. The page itself is 275 kbytes and includes references to a total of 100 images and objects, each on average 25 kbytes (you can assume that 1 kbytes = 1,000 bytes). The roundtrip time (RTT) between the user and the server hosting the web page is 20 msecs.

Approximately how long does it take for the page (including images) to appear on the user's screen, assuming <u>persistent HTTP</u>?

How long would it take using non-persistent HTTP (assume a single connection)?