CS 348: Problem-Solving Tutorial 1

Do problems from the textbook (Computer Networks, by Petersen-Davie, 5th Edition):
Chapter 1: Solutions to Exercises 4, 6, 14, 17, 27 are provided.
Chapter 2: Solutions to Exercises 7, 19, 25, 32 are provided.

Lecture 10: Slide 20.
Lecture 12: Slide 17, 20.

4. Calculate the total time required to transfer a 1.5-MB file in the following cases, assuming an RTT of 80 ms, a packet size of 1 KB data, and an initial $2 \times$ RTT of "handshaking" before data is sent:

  (a) The bandwidth is 10 Mbps, and data packets can be sent continuously.

  (b) The bandwidth is 10 Mbps, but after we finish sending each data packet we must wait one RTT before sending the next.

  (c) The link allows infinitely fast transmit, but limits bandwidth such that only 20 packets can be sent per RTT.

  (d) Zero transmit time as in (c), but during the first RTT we can send one packet, during the second RTT we can send two packets, during the third we can send four (2^{3-1}), etc. (A justification for such an exponential increase will be given in Chapter 6.)

14. Suppose a 128-kbps point-to-point link is set up between the Earth and a rover on Mars. The distance from the Earth to Mars (when they are closest together) is approximately 55 Gm, and data travels over the link at the speed of light—3×10^8 m/s.

  (a) Calculate the minimum RTT for the link.

  (b) Calculate the delay $\times$ bandwidth product for the link.

  (c) A camera on the rover takes pictures of its surroundings and sends these to Earth. How quickly after a picture is taken can it reach Mission Control on Earth? Assume that each image is 5 Mb in size.