1. Why do we insist on a rigid separation of layers in the layered network model? In particular why it is important that the network layer not know anything about the data link protocol or even the frame format?

2. If the flag byte of a frame is 01111110 and the data string to be sent in the frame is

1011111011111110010111110

what is the bit string after bit stuffing is done on the data string?

3. What kind of application might benefit more from use of simple error correction (even a very simple error correction that fixes small errors) vs. the use of error detection?

4. Find the Hamming distance

   a. between 1111011 and 1101101
   b. between 1101101 and 1110111
   c. between 1110111 and 1111011

5. For the data sequence 10111011 and with a CRC generator \( x^2 + 1 \) (101)

   a. What is the message sent – including the CRC bits?


   b. If the sixth bit from the left (in the received bit string) is inverted during transmission, show how this error is detected at the receiver.

6. Why does the data link protocol put the CRC in the trailer, and not the header, of a frame?

7. In the simplex protocol for a noisy channel, what are the factors that dictate the length of time the sender waits for an acknowledgment before sending a duplicate frame?

8. For a cable of length 100 km, at the T1 data rate, and with the propagation speed in the cable of \( 2 \times 10^8 \) m/sec, how many bits “fit” in the cable?