S-72.3340 Optical Networks

Exercise 1

1) In an experiment designed to measure the attenuation coefficient of an optical fiber, the output power from optical source is coupled onto a length of the fiber and measured at the other end. If a 10-km long spool of fiber is used the received optical power is -20 dBm. Under identical conditions but with a 20-km long spool of fiber (instead of the 10-km long spool), the received optical power is -23 dBm. What is the value of the fiber attenuation coefficient (in dB/km)?

2) A very simple line code used in early optical data networks is called *bit stuffing*. The objective of this code is to prevent long runs of 1s and 0s but not necessarily to achieve DC balance. The encoding works as follows. Suppose the maximum number of consecutive 1s that are allowed in the bit stream is k. Then the encoder inserts a 0 bit whenever it sees k consecutive 1 bits in the input sequence.
   a) Suppose the incoming data to be transmitted is 11111111111001000000 (read left to right). What is the encoded bit stream, assuming $k = 5$?
   b) What is the algorithm used by the decoder to recover the data? Suppose the received bit stream is 0111110101111100011 (read left to right). What is the decoded bit stream?