Problem #1

(i) Assume that a channel has bandwidth B Hz and no noise. How does the maximum achievable bit rate depend on B?

(ii) A telephone channel has bandwidth 3000 Hz and signal-to-noise ratio 30 dB. what is the maximum achievable bit rate?

(iii) Explain the physical mechanism that causes modal dispersion in an optical fiber. Similarly for material dispersion. Does the maximum allowable bit rate depend on the spectral width of the optical transmitter? If yes, how?

(iv) How can we recover a specific signal in an FDM transmission?

Problem #2

(i) Which is best for bursty traffic, circuit or packet switching?

(ii) Out of all the ways for multiplexing different flows of information, which is the most efficient? Why? What are its limitations?

(iii) Which layer of the OSI model is responsible for the encryption of data? Which one is responsible for the routing?

Problem #3

(i) Explain why the SRP and the GO BACK N protocols, both with window size W = 1, are equivalent to the ABP protocol.

(ii) What do the round trip assumptions and W = 1 imply about the propagation time and the acknowledgment transmission time for the above protocols?

(iii) Derive the efficiency of the ABP under round trip assumptions. Assume that the probability that a packet or its acknowledgment is corrupted by noise is equal to *p*. Show that this efficiency is, as expected, the same as the efficiency of the GO BACK N protocol with W = 1.