KFUPM - COMPUTER ENGINEERING DEPARTMENT

COE-241 – Data and Computer Communication

Assignment 3 – Due date: Nov 25th, 2014

Student Name:
Student Number:

Problem #	Maximum Mark	Mark
1	10	
2	10	
3	10	
4	10	
5	30	
Total	70	

Problem 1 (10 point): Answer the following questions in brief.

a) Specify the factors that determine the antenna gain?

b) In the context of propagation of light or RF signals, what is refraction?

c) Explain the three different RF propagation modes and the corresponding frequency range and potential applications for each propagation mode.

d) List the three optical fiber transmission modes and explain briefly the main reason for differing in capacity to carry high bit rates.

Problem 2 (10 point): Given a 100-Watt power source, what is the maximum allowable length for the following transmission media if a signal of 1 Watt is to be received.

a) 24-gage (0.5 mm) twisted pair operating at 300 kHz.

b) 24-gage (0.5 mm) twisted pair operating at 1 MHz..

c) 0.375 inch (9.5 mm) coaxial cable operating at 1 MHz.

d) 0.375 inch (9.5 mm) coaxial cable operating at 25 MHz.

e) Optical fiber operating at its optimal frequency.

Hint: Use textbook Figure 4.3 for attenuation of the different media.

Problem 3 (10 point): Show that doubling the transmission frequency OR doubling the distance between the transmitting antenna and receiving antenna attenuates the power received by 6 dB.

Problem 4 (10 point): The waveform shown in Figure 4.1 belongs to a Manchester encoded binary data stream. Determine the beginning and end of bit periods (i.e. extract clock information) and give the data sequence.

Figure 4.1: Waveform for Manchester encoded binary data stream.

Problem 5 (30 points): It is desired to design a microwave link operating, between two consecutive towers, at the 10 GHz frequency range. The transmit/receive system has a bandwidth is 20 MHz where the receiver noise temperature is 50,000 Kelvin. Let the towers be of height 20 meters and the desired capacity of the link be equal to 500 Mbps. Assuming the transmit power on the transmitter side is equal to 50 Watts and the corresponding transmit antenna gain and receive antenna gain are equal to 30 dB and 40 dB, respectively:

a) Compute the maximum separation (distance) between the two towers.

b) Assume the desired capacity is increased to 1 Gbps, repeat part (a).

c) Assume the transmit antenna gain is changed to 50 dB, repeat part (a).