KFUPM - COMPUTER ENGINEERING DEPARTMENT
COE-341 – Data and Computer Communication
Quiz 4 – Due date: April 7th, 2012

Student Name:

Student Number:

Problem (20 points) Radio Frequency Propagation and Channel Capacity – Please note that this quiz carries double the weight of other quizzes.

Student MUST show the required formulas and calculations.

It is desired to design a sequence of identical microwave links connecting a communication center in Dammam to a peer center in Riyadh that is 440 km away. The parameters for the microwave link are as follows. The links operate at the 10 GHz frequency range with the transmit/receive system has a bandwidth equal to 10 MHz. 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 100 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 30 dB, respectively. Let the cost for each the two towers, the one at the communication center in Dammam and the one at the communication center in Riyadh, be equal to 100 KSAR, while the cost for intermediate towers be equal to 200 KSAR.

a) Compute the cost for the required sequence of microwave links.

b) Assume the desired capacity is increased to 200 Mbps, repeat part (a).

b) Assume the desired capacity is increased to 500 Mbps, repeat part (a).