

## Comp 7005 – Data Communication Principles

### Assignment Three – November, 2009

**Due Date:** 1730 hrs - Tuesday, November 17, 2009

**Criteria:** You may work in groups of two. Assignments must be word-processed and submitted by the date and time specified above.

**Note:** Clearly state any assumptions that you make in the solution of any of the questions. Substantiate your answers and show all your work for each problem – the answer alone is insufficient to receive credit for the question.

#### Section A

Work out the following problems in your textbook:

**Chapter 4:** P24.

**Chapter 5:** P17, P18.

Verbatim

#### Section B

1. Assume that you have been given the following information for a system link:

Frequency of operation = 2.45 GHz

Transmit power = 15 dBm (Output power of the transmitting access point)

Connector + Cable loss = 3 dB (applied at both the transmit and receive ends)

Transmit/Receive antennae gain = 9 dBi

Receive power = Assume that the receiver gets the minimum required signal to meet its sensitivity specification (-50 dBm for a typical access point at 54 Mbit/s)

Distance = 1 Km.

Determine the link budget for this system. Comment on whether or not this is enough of a margin for the system to function reliably.

2. A LinksysWRT-54G 802.11g wireless base station/router transmits 20 mW into a monopole antenna (assume antenna gain = 1.5 dBi). The signal is received by a laptop with antenna gain -1.5 dBi. Express your answers to the following questions in both mW and dBm.
- (a) Estimate the received power at 200 m for free-space propagation.
  - (b) Estimate the received power at 2 km for free-space propagation.
  - (c) Suppose that we need a minimum received power of -80 dBm for the receiver at the laptop to properly work. Determine whether the receiver will work at the distances in (a) and (b).
  - (d) Now suppose that you replace the monopole antenna in the Linksys router by a parabolic dish antenna with gain 15 dBi. Repeat (a), (b), and (c).