

ELEX 7860 : Wireless System Design  
2021 Winter Term

Quiz 1  
10:30 PM – 11:20 PM  
Wednesday, April 17, 2020

This quiz has three (3) questions on four (4) pages. The marks for each question are as indicated. There are a total of twelve (12) marks.

Download this quiz and write your answers in the space provided. You may print the quiz and write the answers by hand, mark up this document using a tablet, or edit the file with a word processor.

Books and notes are allowed but you may not communicate with anyone else during the quiz.

Please sign the following declaration to confirm your understanding of this:

This work is solely my own effort and I understand the consequences of plagiarism and other offences described in BCIT Policy 5104.

Signed: \_\_\_\_\_

Answer all questions. *Show your work*. Draw a box around your final answer. Numerical answers must include units.

When you are done, export your document to a **PDF** file. Submit the PDF file to the Quiz 1 Assignment folder on the course web site before the submission deadline, 11:20 AM . If you submit multiple times only the most recent submission will be marked.

**Only PDF files will be marked.**

Name: \_\_\_\_\_

BCIT ID: \_\_\_\_\_

Question	Mark	Max.
1		3
2		4
3		5
Total		12

## Question 1

3 marks

A vehicle is receiving a Rayleigh-fading signal that has a mean received signal level of  $-60$  dBm. The received signal is considered faded when it is below  $-76$  dBm. What fraction of the time is the signal faded?

## Question 2

4 marks

The same vehicle as above is travelling at 100 km/h and receiving a signal at a frequency of 1900 MHz. It is receiving data at a rate of 100 kb/s. Assuming Clarke's multipath model applies, how many bits, on average, are transmitted during each fade? Assume the same mean and 'faded' signal levels as in the previous question.

### Question 3

5 marks

A signal arrives at a portable receiver over three paths with the following path lengths and attenuations:

- 300 m, 60 dB
- 100 m, 54 dB
- 50 m, 50 dB

For example, a signal transmitted with a power of 0 dBm would be received over the first path 1  $\mu$ s later at a level of -60 dBm.

- (a) What is the mean excess delay of this channel?
- (b) What is the RMS delay spread?