ELEX 7860 : Wireless System Design
2022 Winter Term

Midterm 2
10:30 – 11:20
Friday, March 4, 2022
SW01-3150

This exam has four (4) questions on one (1) pages. The marks for each question are as indicated. There are a total of thirteen (13) marks. Answer all questions. Write your answers and all rough work in this paper and nowhere else. Show your work. Draw a box around your final answer. Numerical answers must include units. Books and notes are allowed. No electronic devices other than calculators are allowed. **Show your work.**

This exam paper is for:

Paper, Test 1   A00123456

Each exam is equally difficult.

Answer your own exam.

Do not start until you are told to do so.

Name: _____

BCIT ID: _____

Signature: _____

(0)

Question 1   4 marks

What is the effective area of an antenna that has a directivity of 8 (linear units) and an efficiency of 50% at a frequency of 24 GHz? Give your answer in square millimetres.

Question 2   4 marks

A communication link between earth and the moon (at a distance of 384×10^6 m) operates at a frequency of 1.5 GHz and uses antenna gains of 0 dBi and 60 dBi on each end of the link. If the transmit power is 10 W, what is the received power? Give your answer in dBm.

Question 3   3 marks

What is the effective area of the larger of the two antennas in the previous question? If it were circular, what would be the diameter?

Question 4   2 marks

Measurements of NLOS path loss in a neighbourhood show that for distances between 100 m and 1000 m the mean is approximated by a power law with a path loss exponent of 2.5 . If the mean path loss at 100 m is 50 dB, what is the expected mean path loss at a distance of 400 m?