

MIDTERM EXAM 1
13:30 PM – 14:20 PM
February 21, 2019

This exam has two (2) questions on two (2) pages. The marks for each question are as indicated. There are a total of eleven (11) 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:

Exam 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: _____

Question	Mark	Max.
1		7
2		4
Total		11

Question 1**7 marks**

This question asks you to compute the received signal power at a distance of 1 km under two propagation conditions. In both cases the frequency is 900 MHz, the transmit power is 10 W, the transmit antenna gain is 13 dBi and the receive antenna gain is 0 dBi.

What is the received signal strength, in dBm, if:

- (a) the signal propagates over a free-space path?
- (b) the signal propagates over a NLOS path with a path loss exponent of $n = 2.5$ and the received power at a distance of 100 m is -40 dBm?

Hint: The path loss in dB is the difference between the transmitted signal level (in dBm) and the received signal level (in dBm).

Question 2**4 marks**

A signal is received over multipath channel. The probability distribution of the received signal amplitude has a Rayleigh distribution. The mean signal level is -80 dBm. The angle of arrival of the signal is uniform over $(0, 2\pi)$. The receiver is moving at a speed of 100 km/hr and the carrier frequency is 2.4 GHz.

- (a) What fraction of the time is the signal level below -93 dBm?
- (b) How often (in Hz) does the signal amplitude drop below this level?

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This exam paper is for:

Exam 2 A00123456

Each exam is equally difficult.

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Name: _____

BCIT ID: _____

Signature: _____

Question	Mark	Max.
1		7
2		4
Total		11

Question 1**7 marks**

This question asks you to compute the received signal power at a distance of 1 km under two propagation conditions. In both cases the frequency is 900 MHz, the transmit power is 20 W, the transmit antenna gain is 10 dBi and the receive antenna gain is 0 dBi.

What is the received signal strength, in dBm, if:

- (a) the signal propagates over a free-space path?
- (b) the signal propagates over a NLOS path with a path loss exponent of $n = 2.5$ and the received power at a distance of 100 m is -40 dBm?

Hint: The path loss in dB is the difference between the transmitted signal level (in dBm) and the received signal level (in dBm).

Question 2**4 marks**

A signal is received over multipath channel. The probability distribution of the received signal amplitude has a Rayleigh distribution. The mean signal level is -80 dBm. The angle of arrival of the signal is uniform over $(0, 2\pi)$. The receiver is moving at a speed of 50 km/hr and the carrier frequency is 5.2 GHz.

- (a) What fraction of the time is the signal level below -93 dBm?
- (b) How often (in Hz) does the signal amplitude drop below this level?