ELEX 7860 : Wireless System Design
2024 Winter Term

Quiz 2
11:30 – 13:20
Friday, February 02, 2024
SW01-3150

This exam has two (2) questions on two (2) pages. The marks for each question are as indicated. There are a total of ten (10) marks. Answer all questions. Write your answers and all rough work in this paper and nowhere else. Show your work. Underline or 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

You've determined that propagation in a rural area can be modelled by a power law path loss model with exponent of $n = -3$ and a shadow fading standard deviation of $\sigma = 5$ dB.

At a distance of 1 km the SNR is 30 dB.

(a) What is the average SNR at a distance of 3 km?

(b) At this distance, what is the probability that the SNR is less than 10 dB? *Hint: There is a table of the Gaussian CDF on the last page.*

Question 2 — 6 marks

A wireless communication system operates over a Rayleigh fading channel. The system requires an SNR of 10 dB to operate. The system has two receive antennas that experience independent fading. The average SNR on each antenna is 20 dB.

(a) What is the average SNR if maximal-ratio combining diversity is used?

(b) What is the probability that the SNR is too low for the system to operate if selection diversity is used?

(c) What is the probability that the SNR is too low for the system to operate if a single antenna (no diversity) were used and the SNR were the same as in (a)?

Normal CDF

z	P(x<z)
-4.0	3.17E-05
-3.8	7.23E-05
-3.6	1.59E-04
-3.4	3.37E-04
-3.2	6.87E-04
-3.0	1.35E-03
-2.8	2.56E-03
-2.6	4.66E-03
-2.4	8.20E-03
-2.2	1.39E-02
-2.0	0.023
-1.8	0.036
-1.6	0.055
-1.4	0.081
-1.2	0.115
-1.0	0.159
-0.8	0.212
-0.6	0.274
-0.4	0.345
-0.2	0.421
0.0	0.500

ELEX 7860 : Wireless System Design

2024 Winter Term

Quiz 2

11:30 – 13:20

Friday, February 02, 2024

SW01-3150

This exam has two (2) questions on two (2) pages. The marks for each question are as indicated. There are a total of ten (10) marks. Answer all questions. Write your answers and all rough work in this paper and nowhere else. Show your work. Underline or 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 2 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 1 4 marks

You've determined that propagation in a rural area can be modelled by a power law path loss model with exponent of $n = -3$ and a shadow fading standard deviation of $\sigma = 5$ dB.

At a distance of 1 km the SNR is 30 dB.

(a) What is the average SNR at a distance of 3 km?

(b) At this distance, what is the probability that the SNR is less than 10 dB? *Hint: There is a table of the Gaussian CDF on the last page.*

Question 2 6 marks

A wireless communication system operates over a Rayleigh fading channel. The system requires an SNR of 10 dB to operate. The system has two receive antennas that experience independent fading. The average SNR on each antenna is 20 dB.

(a) What is the average SNR if maximal-ratio combining diversity is used?

(b) What is the probability that the SNR is too low for the system to operate if selection diversity is used?

(c) What is the probability that the SNR is too low for the system to operate if a single antenna (no diversity) were used and the SNR were the same as in (a)?

Normal CDF

z	P(x<z)
-4.0	3.17E-05
-3.8	7.23E-05
-3.6	1.59E-04
-3.4	3.37E-04
-3.2	6.87E-04
-3.0	1.35E-03
-2.8	2.56E-03
-2.6	4.66E-03
-2.4	8.20E-03
-2.2	1.39E-02
-2.0	0.023
-1.8	0.036
-1.6	0.055
-1.4	0.081
-1.2	0.115
-1.0	0.159
-0.8	0.212
-0.6	0.274
-0.4	0.345
-0.2	0.421
0.0	0.500

ELEX 7860 : Wireless System Design

2024 Winter Term

Quiz 2

11:30 – 13:20

Friday, February 02, 2024

SW01-3150

This exam has two (2) questions on two (2) pages. The marks for each question are as indicated. There are a total of ten (10) marks. Answer all questions. Write your answers and all rough work in this paper and nowhere else. Show your work. Underline or 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:

Bozorgtar, Danial A01058195

Each exam is equally difficult.

Answer your own exam.

Do not start until you are told to do so.

Name: _____

BCIT ID: _____

Signature: _____

Question 1 — 4 marks

You've determined that propagation in a rural area can be modelled by a power law path loss model with exponent of $n = -3$ and a shadow fading standard deviation of $\sigma = 5$ dB.

At a distance of 1 km the SNR is 30 dB.

(a) What is the average SNR at a distance of 3 km?

(b) At this distance, what is the probability that the SNR is less than 10 dB? *Hint: There is a table of the Gaussian CDF on the last page.*

Question 2 — 6 marks

A wireless communication system operates over a Rayleigh fading channel. The system requires an SNR of 10 dB to operate. The system has two receive antennas that experience independent fading. The average SNR on each antenna is 20 dB.

(a) What is the average SNR if maximal-ratio combining diversity is used?

(b) What is the probability that the SNR is too low for the system to operate if selection diversity is used?

(c) What is the probability that the SNR is too low for the system to operate if a single antenna (no diversity) were used and the SNR were the same as in (a)?

Normal CDF

z	P(x<z)
-4.0	3.17E-05
-3.8	7.23E-05
-3.6	1.59E-04
-3.4	3.37E-04
-3.2	6.87E-04
-3.0	1.35E-03
-2.8	2.56E-03
-2.6	4.66E-03
-2.4	8.20E-03
-2.2	1.39E-02
-2.0	0.023
-1.8	0.036
-1.6	0.055
-1.4	0.081
-1.2	0.115
-1.0	0.159
-0.8	0.212
-0.6	0.274
-0.4	0.345
-0.2	0.421
0.0	0.500

ELEX 7860 : Wireless System Design

2024 Winter Term

Quiz 2

11:30 – 13:20

Friday, February 02, 2024

SW01-3150

This exam has two (2) questions on two (2) pages. The marks for each question are as indicated. There are a total of ten (10) marks. Answer all questions. Write your answers and all rough work in this paper and nowhere else. Show your work. Underline or 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:

Dao, Michael A00964943

Each exam is equally difficult.

Answer your own exam.

Do not start until you are told to do so.

Name: _____

BCIT ID: _____

Signature: _____

Question 1 — 4 marks

You've determined that propagation in a rural area can be modelled by a power law path loss model with exponent of $n = -3$ and a shadow fading standard deviation of $\sigma = 5$ dB.

At a distance of 1 km the SNR is 30 dB.

(a) What is the average SNR at a distance of 3 km?

(b) At this distance, what is the probability that the SNR is less than 10 dB? *Hint: There is a table of the Gaussian CDF on the last page.*

Question 2 — 6 marks

A wireless communication system operates over a Rayleigh fading channel. The system requires an SNR of 10 dB to operate. The system has two receive antennas that experience independent fading. The average SNR on each antenna is 20 dB.

(a) What is the average SNR if maximal-ratio combining diversity is used?

(b) What is the probability that the SNR is too low for the system to operate if selection diversity is used?

(c) What is the probability that the SNR is too low for the system to operate if a single antenna (no diversity) were used and the SNR were the same as in (a)?

Normal CDF

z	P(x<z)
-4.0	3.17E-05
-3.8	7.23E-05
-3.6	1.59E-04
-3.4	3.37E-04
-3.2	6.87E-04
-3.0	1.35E-03
-2.8	2.56E-03
-2.6	4.66E-03
-2.4	8.20E-03
-2.2	1.39E-02
-2.0	0.023
-1.8	0.036
-1.6	0.055
-1.4	0.081
-1.2	0.115
-1.0	0.159
-0.8	0.212
-0.6	0.274
-0.4	0.345
-0.2	0.421
0.0	0.500

ELEX 7860 : Wireless System Design

2024 Winter Term

Quiz 2

11:30 – 13:20

Friday, February 02, 2024

SW01-3150

This exam has two (2) questions on two (2) pages. The marks for each question are as indicated. There are a total of ten (10) marks. Answer all questions. Write your answers and all rough work in this paper and nowhere else. Show your work. Underline or 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:

Gao, Jessica A00939688

Each exam is equally difficult.

Answer your own exam.

Do not start until you are told to do so.

Name: _____

BCIT ID: _____

Signature: _____

Question 1 — 4 marks

You've determined that propagation in a rural area can be modelled by a power law path loss model with exponent of $n = -3$ and a shadow fading standard deviation of $\sigma = 5$ dB.

At a distance of 1 km the SNR is 30 dB.

(a) What is the average SNR at a distance of 3 km?

(b) At this distance, what is the probability that the SNR is less than 10 dB? *Hint: There is a table of the Gaussian CDF on the last page.*

Question 2 — 6 marks

A wireless communication system operates over a Rayleigh fading channel. The system requires an SNR of 10 dB to operate. The system has two receive antennas that experience independent fading. The average SNR on each antenna is 20 dB.

(a) What is the average SNR if maximal-ratio combining diversity is used?

(b) What is the probability that the SNR is too low for the system to operate if selection diversity is used?

(c) What is the probability that the SNR is too low for the system to operate if a single antenna (no diversity) were used and the SNR were the same as in (a)?

Normal CDF

z	P(x<z)
-4.0	3.17E-05
-3.8	7.23E-05
-3.6	1.59E-04
-3.4	3.37E-04
-3.2	6.87E-04
-3.0	1.35E-03
-2.8	2.56E-03
-2.6	4.66E-03
-2.4	8.20E-03
-2.2	1.39E-02
-2.0	0.023
-1.8	0.036
-1.6	0.055
-1.4	0.081
-1.2	0.115
-1.0	0.159
-0.8	0.212
-0.6	0.274
-0.4	0.345
-0.2	0.421
0.0	0.500

ELEX 7860 : Wireless System Design

2024 Winter Term

Quiz 2

11:30 – 13:20

Friday, February 02, 2024

SW01-3150

This exam has two (2) questions on two (2) pages. The marks for each question are as indicated. There are a total of ten (10) marks. Answer all questions. Write your answers and all rough work in this paper and nowhere else. Show your work. Underline or 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:

Goodacre, Garnett A01076151

Each exam is equally difficult.

Answer your own exam.

Do not start until you are told to do so.

Name: _____

BCIT ID: _____

Signature: _____

Question 1 — 4 marks

You've determined that propagation in a rural area can be modelled by a power law path loss model with exponent of $n = -3$ and a shadow fading standard deviation of $\sigma = 5$ dB.

At a distance of 1 km the SNR is 30 dB.

(a) What is the average SNR at a distance of 3 km?

(b) At this distance, what is the probability that the SNR is less than 10 dB? *Hint: There is a table of the Gaussian CDF on the last page.*

Question 2 — 6 marks

A wireless communication system operates over a Rayleigh fading channel. The system requires an SNR of 10 dB to operate. The system has two receive antennas that experience independent fading. The average SNR on each antenna is 20 dB.

(a) What is the average SNR if maximal-ratio combining diversity is used?

(b) What is the probability that the SNR is too low for the system to operate if selection diversity is used?

(c) What is the probability that the SNR is too low for the system to operate if a single antenna (no diversity) were used and the SNR were the same as in (a)?

Normal CDF

z	P(x<z)
-4.0	3.17E-05
-3.8	7.23E-05
-3.6	1.59E-04
-3.4	3.37E-04
-3.2	6.87E-04
-3.0	1.35E-03
-2.8	2.56E-03
-2.6	4.66E-03
-2.4	8.20E-03
-2.2	1.39E-02
-2.0	0.023
-1.8	0.036
-1.6	0.055
-1.4	0.081
-1.2	0.115
-1.0	0.159
-0.8	0.212
-0.6	0.274
-0.4	0.345
-0.2	0.421
0.0	0.500

ELEX 7860 : Wireless System Design

2024 Winter Term

Quiz 2

11:30 – 13:20

Friday, February 02, 2024

SW01-3150

This exam has two (2) questions on two (2) pages. The marks for each question are as indicated. There are a total of ten (10) marks. Answer all questions. Write your answers and all rough work in this paper and nowhere else. Show your work. Underline or 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:

Hudson, Carter A01171319

Each exam is equally difficult.

Answer your own exam.

Do not start until you are told to do so.

Name: _____

BCIT ID: _____

Signature: _____

Question 1 — 4 marks

You've determined that propagation in a rural area can be modelled by a power law path loss model with exponent of $n = -3$ and a shadow fading standard deviation of $\sigma = 5$ dB.

At a distance of 1 km the SNR is 30 dB.

(a) What is the average SNR at a distance of 3 km?

(b) At this distance, what is the probability that the SNR is less than 10 dB? *Hint: There is a table of the Gaussian CDF on the last page.*

Question 2 — 6 marks

A wireless communication system operates over a Rayleigh fading channel. The system requires an SNR of 10 dB to operate. The system has two receive antennas that experience independent fading. The average SNR on each antenna is 20 dB.

(a) What is the average SNR if maximal-ratio combining diversity is used?

(b) What is the probability that the SNR is too low for the system to operate if selection diversity is used?

(c) What is the probability that the SNR is too low for the system to operate if a single antenna (no diversity) were used and the SNR were the same as in (a)?

Normal CDF

z	P(x<z)
-4.0	3.17E-05
-3.8	7.23E-05
-3.6	1.59E-04
-3.4	3.37E-04
-3.2	6.87E-04
-3.0	1.35E-03
-2.8	2.56E-03
-2.6	4.66E-03
-2.4	8.20E-03
-2.2	1.39E-02
-2.0	0.023
-1.8	0.036
-1.6	0.055
-1.4	0.081
-1.2	0.115
-1.0	0.159
-0.8	0.212
-0.6	0.274
-0.4	0.345
-0.2	0.421
0.0	0.500

ELEX 7860 : Wireless System Design

2024 Winter Term

Quiz 2

11:30 – 13:20

Friday, February 02, 2024

SW01-3150

This exam has two (2) questions on two (2) pages. The marks for each question are as indicated. There are a total of ten (10) marks. Answer all questions. Write your answers and all rough work in this paper and nowhere else. Show your work. Underline or 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:

Huen, Tristan A01229161

Each exam is equally difficult.

Answer your own exam.

Do not start until you are told to do so.

Name: _____

BCIT ID: _____

Signature: _____

Question 1 — 4 marks

You've determined that propagation in a rural area can be modelled by a power law path loss model with exponent of $n = -3$ and a shadow fading standard deviation of $\sigma = 5$ dB.

At a distance of 1 km the SNR is 30 dB.

(a) What is the average SNR at a distance of 3 km?

(b) At this distance, what is the probability that the SNR is less than 10 dB? *Hint: There is a table of the Gaussian CDF on the last page.*

Question 2 — 6 marks

A wireless communication system operates over a Rayleigh fading channel. The system requires an SNR of 10 dB to operate. The system has two receive antennas that experience independent fading. The average SNR on each antenna is 20 dB.

(a) What is the average SNR if maximal-ratio combining diversity is used?

(b) What is the probability that the SNR is too low for the system to operate if selection diversity is used?

(c) What is the probability that the SNR is too low for the system to operate if a single antenna (no diversity) were used and the SNR were the same as in (a)?

Normal CDF

z	P(x<z)
-4.0	3.17E-05
-3.8	7.23E-05
-3.6	1.59E-04
-3.4	3.37E-04
-3.2	6.87E-04
-3.0	1.35E-03
-2.8	2.56E-03
-2.6	4.66E-03
-2.4	8.20E-03
-2.2	1.39E-02
-2.0	0.023
-1.8	0.036
-1.6	0.055
-1.4	0.081
-1.2	0.115
-1.0	0.159
-0.8	0.212
-0.6	0.274
-0.4	0.345
-0.2	0.421
0.0	0.500

ELEX 7860 : Wireless System Design

2024 Winter Term

Quiz 2

11:30 – 13:20

Friday, February 02, 2024

SW01-3150

This exam has two (2) questions on two (2) pages. The marks for each question are as indicated. There are a total of ten (10) marks. Answer all questions. Write your answers and all rough work in this paper and nowhere else. Show your work. Underline or 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:

Huynh, Ken A00988874

Each exam is equally difficult.

Answer your own exam.

Do not start until you are told to do so.

Name: _____

BCIT ID: _____

Signature: _____

Question 1 — 4 marks

You've determined that propagation in a rural area can be modelled by a power law path loss model with exponent of $n = -3$ and a shadow fading standard deviation of $\sigma = 5$ dB.

At a distance of 1 km the SNR is 30 dB.

(a) What is the average SNR at a distance of 3 km?

(b) At this distance, what is the probability that the SNR is less than 10 dB? *Hint: There is a table of the Gaussian CDF on the last page.*

Question 2 — 6 marks

A wireless communication system operates over a Rayleigh fading channel. The system requires an SNR of 10 dB to operate. The system has two receive antennas that experience independent fading. The average SNR on each antenna is 20 dB.

(a) What is the average SNR if maximal-ratio combining diversity is used?

(b) What is the probability that the SNR is too low for the system to operate if selection diversity is used?

(c) What is the probability that the SNR is too low for the system to operate if a single antenna (no diversity) were used and the SNR were the same as in (a)?

Normal CDF

z	P(x<z)
-4.0	3.17E-05
-3.8	7.23E-05
-3.6	1.59E-04
-3.4	3.37E-04
-3.2	6.87E-04
-3.0	1.35E-03
-2.8	2.56E-03
-2.6	4.66E-03
-2.4	8.20E-03
-2.2	1.39E-02
-2.0	0.023
-1.8	0.036
-1.6	0.055
-1.4	0.081
-1.2	0.115
-1.0	0.159
-0.8	0.212
-0.6	0.274
-0.4	0.345
-0.2	0.421
0.0	0.500

ELEX 7860 : Wireless System Design

2024 Winter Term

Quiz 2

11:30 – 13:20

Friday, February 02, 2024

SW01-3150

This exam has two (2) questions on two (2) pages. The marks for each question are as indicated. There are a total of ten (10) marks. Answer all questions. Write your answers and all rough work in this paper and nowhere else. Show your work. Underline or 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:

Kang, On A01159649

Each exam is equally difficult.

Answer your own exam.

Do not start until you are told to do so.

Name: _____

BCIT ID: _____

Signature: _____

Question 1 — 4 marks

You've determined that propagation in a rural area can be modelled by a power law path loss model with exponent of $n = -3$ and a shadow fading standard deviation of $\sigma = 5$ dB.

At a distance of 1 km the SNR is 30 dB.

(a) What is the average SNR at a distance of 3 km?

(b) At this distance, what is the probability that the SNR is less than 10 dB? *Hint: There is a table of the Gaussian CDF on the last page.*

Question 2 — 6 marks

A wireless communication system operates over a Rayleigh fading channel. The system requires an SNR of 10 dB to operate. The system has two receive antennas that experience independent fading. The average SNR on each antenna is 20 dB.

(a) What is the average SNR if maximal-ratio combining diversity is used?

(b) What is the probability that the SNR is too low for the system to operate if selection diversity is used?

(c) What is the probability that the SNR is too low for the system to operate if a single antenna (no diversity) were used and the SNR were the same as in (a)?

Normal CDF

z	P(x<z)
-4.0	3.17E-05
-3.8	7.23E-05
-3.6	1.59E-04
-3.4	3.37E-04
-3.2	6.87E-04
-3.0	1.35E-03
-2.8	2.56E-03
-2.6	4.66E-03
-2.4	8.20E-03
-2.2	1.39E-02
-2.0	0.023
-1.8	0.036
-1.6	0.055
-1.4	0.081
-1.2	0.115
-1.0	0.159
-0.8	0.212
-0.6	0.274
-0.4	0.345
-0.2	0.421
0.0	0.500

ELEX 7860 : Wireless System Design

2024 Winter Term

Quiz 2

11:30 – 13:20

Friday, February 02, 2024

SW01-3150

This exam has two (2) questions on two (2) pages. The marks for each question are as indicated. There are a total of ten (10) marks. Answer all questions. Write your answers and all rough work in this paper and nowhere else. Show your work. Underline or 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:

Kebedov, Omar A01179213

Each exam is equally difficult.

Answer your own exam.

Do not start until you are told to do so.

Name: _____

BCIT ID: _____

Signature: _____

Question 1 — 4 marks

You've determined that propagation in a rural area can be modelled by a power law path loss model with exponent of $n = -3$ and a shadow fading standard deviation of $\sigma = 5$ dB.

At a distance of 1 km the SNR is 30 dB.

(a) What is the average SNR at a distance of 3 km?

(b) At this distance, what is the probability that the SNR is less than 10 dB? *Hint: There is a table of the Gaussian CDF on the last page.*

Question 2 — 6 marks

A wireless communication system operates over a Rayleigh fading channel. The system requires an SNR of 10 dB to operate. The system has two receive antennas that experience independent fading. The average SNR on each antenna is 20 dB.

(a) What is the average SNR if maximal-ratio combining diversity is used?

(b) What is the probability that the SNR is too low for the system to operate if selection diversity is used?

(c) What is the probability that the SNR is too low for the system to operate if a single antenna (no diversity) were used and the SNR were the same as in (a)?

Normal CDF

z	P(x<z)
-4.0	3.17E-05
-3.8	7.23E-05
-3.6	1.59E-04
-3.4	3.37E-04
-3.2	6.87E-04
-3.0	1.35E-03
-2.8	2.56E-03
-2.6	4.66E-03
-2.4	8.20E-03
-2.2	1.39E-02
-2.0	0.023
-1.8	0.036
-1.6	0.055
-1.4	0.081
-1.2	0.115
-1.0	0.159
-0.8	0.212
-0.6	0.274
-0.4	0.345
-0.2	0.421
0.0	0.500

ELEX 7860 : Wireless System Design

2024 Winter Term

Quiz 2

11:30 – 13:20

Friday, February 02, 2024

SW01-3150

This exam has two (2) questions on two (2) pages. The marks for each question are as indicated. There are a total of ten (10) marks. Answer all questions. Write your answers and all rough work in this paper and nowhere else. Show your work. Underline or 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:

Kerpan, Shae A01224569

Each exam is equally difficult.

Answer your own exam.

Do not start until you are told to do so.

Name: _____

BCIT ID: _____

Signature: _____

10

Question 1 — 4 marks

You've determined that propagation in a rural area can be modelled by a power law path loss model with exponent of $n = -3$ and a shadow fading standard deviation of $\sigma = 5$ dB.

At a distance of 1 km the SNR is 30 dB.

(a) What is the average SNR at a distance of 3 km?

(b) At this distance, what is the probability that the SNR is less than 10 dB? *Hint: There is a table of the Gaussian CDF on the last page.*

Question 2 — 6 marks

A wireless communication system operates over a Rayleigh fading channel. The system requires an SNR of 10 dB to operate. The system has two receive antennas that experience independent fading. The average SNR on each antenna is 20 dB.

(a) What is the average SNR if maximal-ratio combining diversity is used?

(b) What is the probability that the SNR is too low for the system to operate if selection diversity is used?

(c) What is the probability that the SNR is too low for the system to operate if a single antenna (no diversity) were used and the SNR were the same as in (a)?

Normal CDF

z	P(x<z)
-4.0	3.17E-05
-3.8	7.23E-05
-3.6	1.59E-04
-3.4	3.37E-04
-3.2	6.87E-04
-3.0	1.35E-03
-2.8	2.56E-03
-2.6	4.66E-03
-2.4	8.20E-03
-2.2	1.39E-02
-2.0	0.023
-1.8	0.036
-1.6	0.055
-1.4	0.081
-1.2	0.115
-1.0	0.159
-0.8	0.212
-0.6	0.274
-0.4	0.345
-0.2	0.421
0.0	0.500

ELEX 7860 : Wireless System Design

2024 Winter Term

Quiz 2

11:30 – 13:20

Friday, February 02, 2024

SW01-3150

This exam has two (2) questions on two (2) pages. The marks for each question are as indicated. There are a total of ten (10) marks. Answer all questions. Write your answers and all rough work in this paper and nowhere else. Show your work. Underline or 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:

Lee, Eliot A01023263

Each exam is equally difficult.

Answer your own exam.

Do not start until you are told to do so.

Name: _____

BCIT ID: _____

Signature: _____

Question 1 — 4 marks

You've determined that propagation in a rural area can be modelled by a power law path loss model with exponent of $n = -3$ and a shadow fading standard deviation of $\sigma = 5$ dB.

At a distance of 1 km the SNR is 30 dB.

(a) What is the average SNR at a distance of 3 km?

(b) At this distance, what is the probability that the SNR is less than 10 dB? *Hint: There is a table of the Gaussian CDF on the last page.*

Question 2 — 6 marks

A wireless communication system operates over a Rayleigh fading channel. The system requires an SNR of 10 dB to operate. The system has two receive antennas that experience independent fading. The average SNR on each antenna is 20 dB.

(a) What is the average SNR if maximal-ratio combining diversity is used?

(b) What is the probability that the SNR is too low for the system to operate if selection diversity is used?

(c) What is the probability that the SNR is too low for the system to operate if a single antenna (no diversity) were used and the SNR were the same as in (a)?

Normal CDF

z	P(x<z)
-4.0	3.17E-05
-3.8	7.23E-05
-3.6	1.59E-04
-3.4	3.37E-04
-3.2	6.87E-04
-3.0	1.35E-03
-2.8	2.56E-03
-2.6	4.66E-03
-2.4	8.20E-03
-2.2	1.39E-02
-2.0	0.023
-1.8	0.036
-1.6	0.055
-1.4	0.081
-1.2	0.115
-1.0	0.159
-0.8	0.212
-0.6	0.274
-0.4	0.345
-0.2	0.421
0.0	0.500

ELEX 7860 : Wireless System Design

2024 Winter Term

Quiz 2

11:30 – 13:20

Friday, February 02, 2024

SW01-3150

This exam has two (2) questions on two (2) pages. The marks for each question are as indicated. There are a total of ten (10) marks. Answer all questions. Write your answers and all rough work in this paper and nowhere else. Show your work. Underline or 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:

Lee, Jaylin A01089757

Each exam is equally difficult.

Answer your own exam.

Do not start until you are told to do so.

Name: _____

BCIT ID: _____

Signature: _____

Question 1 — 4 marks

You've determined that propagation in a rural area can be modelled by a power law path loss model with exponent of $n = -3$ and a shadow fading standard deviation of $\sigma = 5$ dB.

At a distance of 1 km the SNR is 30 dB.

(a) What is the average SNR at a distance of 3 km?

(b) At this distance, what is the probability that the SNR is less than 10 dB? *Hint: There is a table of the Gaussian CDF on the last page.*

Question 2 — 6 marks

A wireless communication system operates over a Rayleigh fading channel. The system requires an SNR of 10 dB to operate. The system has two receive antennas that experience independent fading. The average SNR on each antenna is 20 dB.

(a) What is the average SNR if maximal-ratio combining diversity is used?

(b) What is the probability that the SNR is too low for the system to operate if selection diversity is used?

(c) What is the probability that the SNR is too low for the system to operate if a single antenna (no diversity) were used and the SNR were the same as in (a)?

Normal CDF

z	P(x<z)
-4.0	3.17E-05
-3.8	7.23E-05
-3.6	1.59E-04
-3.4	3.37E-04
-3.2	6.87E-04
-3.0	1.35E-03
-2.8	2.56E-03
-2.6	4.66E-03
-2.4	8.20E-03
-2.2	1.39E-02
-2.0	0.023
-1.8	0.036
-1.6	0.055
-1.4	0.081
-1.2	0.115
-1.0	0.159
-0.8	0.212
-0.6	0.274
-0.4	0.345
-0.2	0.421
0.0	0.500

ELEX 7860 : Wireless System Design

2024 Winter Term

Quiz 2

11:30 – 13:20

Friday, February 02, 2024

SW01-3150

This exam has two (2) questions on two (2) pages. The marks for each question are as indicated. There are a total of ten (10) marks. Answer all questions. Write your answers and all rough work in this paper and nowhere else. Show your work. Underline or 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:

Leung, Vincent A00762171

Each exam is equally difficult.

Answer your own exam.

Do not start until you are told to do so.

Name: _____

BCIT ID: _____

Signature: _____

Question 1 — 4 marks

You've determined that propagation in a rural area can be modelled by a power law path loss model with exponent of $n = -3$ and a shadow fading standard deviation of $\sigma = 5$ dB.

At a distance of 1 km the SNR is 30 dB.

(a) What is the average SNR at a distance of 3 km?

(b) At this distance, what is the probability that the SNR is less than 10 dB? *Hint: There is a table of the Gaussian CDF on the last page.*

Question 2 — 6 marks

A wireless communication system operates over a Rayleigh fading channel. The system requires an SNR of 10 dB to operate. The system has two receive antennas that experience independent fading. The average SNR on each antenna is 20 dB.

(a) What is the average SNR if maximal-ratio combining diversity is used?

(b) What is the probability that the SNR is too low for the system to operate if selection diversity is used?

(c) What is the probability that the SNR is too low for the system to operate if a single antenna (no diversity) were used and the SNR were the same as in (a)?

Normal CDF

z	P(x<z)
-4.0	3.17E-05
-3.8	7.23E-05
-3.6	1.59E-04
-3.4	3.37E-04
-3.2	6.87E-04
-3.0	1.35E-03
-2.8	2.56E-03
-2.6	4.66E-03
-2.4	8.20E-03
-2.2	1.39E-02
-2.0	0.023
-1.8	0.036
-1.6	0.055
-1.4	0.081
-1.2	0.115
-1.0	0.159
-0.8	0.212
-0.6	0.274
-0.4	0.345
-0.2	0.421
0.0	0.500

ELEX 7860 : Wireless System Design

2024 Winter Term

Quiz 2

11:30 – 13:20

Friday, February 02, 2024

SW01-3150

This exam has two (2) questions on two (2) pages. The marks for each question are as indicated. There are a total of ten (10) marks. Answer all questions. Write your answers and all rough work in this paper and nowhere else. Show your work. Underline or 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:

MacCarron, Kieran A01182411

Each exam is equally difficult.

Answer your own exam.

Do not start until you are told to do so.

Name: _____

BCIT ID: _____

Signature: _____

Question 1 — 4 marks

You've determined that propagation in a rural area can be modelled by a power law path loss model with exponent of $n = -3$ and a shadow fading standard deviation of $\sigma = 5$ dB.

At a distance of 1 km the SNR is 30 dB.

(a) What is the average SNR at a distance of 3 km?

(b) At this distance, what is the probability that the SNR is less than 10 dB? *Hint: There is a table of the Gaussian CDF on the last page.*

Question 2 — 6 marks

A wireless communication system operates over a Rayleigh fading channel. The system requires an SNR of 10 dB to operate. The system has two receive antennas that experience independent fading. The average SNR on each antenna is 20 dB.

(a) What is the average SNR if maximal-ratio combining diversity is used?

(b) What is the probability that the SNR is too low for the system to operate if selection diversity is used?

(c) What is the probability that the SNR is too low for the system to operate if a single antenna (no diversity) were used and the SNR were the same as in (a)?

Normal CDF

z	P(x<z)
-4.0	3.17E-05
-3.8	7.23E-05
-3.6	1.59E-04
-3.4	3.37E-04
-3.2	6.87E-04
-3.0	1.35E-03
-2.8	2.56E-03
-2.6	4.66E-03
-2.4	8.20E-03
-2.2	1.39E-02
-2.0	0.023
-1.8	0.036
-1.6	0.055
-1.4	0.081
-1.2	0.115
-1.0	0.159
-0.8	0.212
-0.6	0.274
-0.4	0.345
-0.2	0.421
0.0	0.500

ELEX 7860 : Wireless System Design

2024 Winter Term

Quiz 2

11:30 – 13:20

Friday, February 02, 2024

SW01-3150

This exam has two (2) questions on two (2) pages. The marks for each question are as indicated. There are a total of ten (10) marks. Answer all questions. Write your answers and all rough work in this paper and nowhere else. Show your work. Underline or 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:

Querengesser, Kurt A01169042

Each exam is equally difficult.

Answer your own exam.

Do not start until you are told to do so.

Name: _____

BCIT ID: _____

Signature: _____

15

Question 1 — 4 marks

You've determined that propagation in a rural area can be modelled by a power law path loss model with exponent of $n = -3$ and a shadow fading standard deviation of $\sigma = 5$ dB.

At a distance of 1 km the SNR is 30 dB.

(a) What is the average SNR at a distance of 3 km?

(b) At this distance, what is the probability that the SNR is less than 10 dB? *Hint: There is a table of the Gaussian CDF on the last page.*

Question 2 — 6 marks

A wireless communication system operates over a Rayleigh fading channel. The system requires an SNR of 10 dB to operate. The system has two receive antennas that experience independent fading. The average SNR on each antenna is 20 dB.

(a) What is the average SNR if maximal-ratio combining diversity is used?

(b) What is the probability that the SNR is too low for the system to operate if selection diversity is used?

(c) What is the probability that the SNR is too low for the system to operate if a single antenna (no diversity) were used and the SNR were the same as in (a)?

Normal CDF

z	P(x<z)
-4.0	3.17E-05
-3.8	7.23E-05
-3.6	1.59E-04
-3.4	3.37E-04
-3.2	6.87E-04
-3.0	1.35E-03
-2.8	2.56E-03
-2.6	4.66E-03
-2.4	8.20E-03
-2.2	1.39E-02
-2.0	0.023
-1.8	0.036
-1.6	0.055
-1.4	0.081
-1.2	0.115
-1.0	0.159
-0.8	0.212
-0.6	0.274
-0.4	0.345
-0.2	0.421
0.0	0.500

ELEX 7860 : Wireless System Design

2024 Winter Term

Quiz 2

11:30 – 13:20

Friday, February 02, 2024

SW01-3150

This exam has two (2) questions on two (2) pages. The marks for each question are as indicated. There are a total of ten (10) marks. Answer all questions. Write your answers and all rough work in this paper and nowhere else. Show your work. Underline or 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:

Serban, Felix A01013796

Each exam is equally difficult.

Answer your own exam.

Do not start until you are told to do so.

Name: _____

BCIT ID: _____

Signature: _____

Question 1 — 4 marks

You've determined that propagation in a rural area can be modelled by a power law path loss model with exponent of $n = -3$ and a shadow fading standard deviation of $\sigma = 5$ dB.

At a distance of 1 km the SNR is 30 dB.

(a) What is the average SNR at a distance of 3 km?

(b) At this distance, what is the probability that the SNR is less than 10 dB? *Hint: There is a table of the Gaussian CDF on the last page.*

Question 2 — 6 marks

A wireless communication system operates over a Rayleigh fading channel. The system requires an SNR of 10 dB to operate. The system has two receive antennas that experience independent fading. The average SNR on each antenna is 20 dB.

(a) What is the average SNR if maximal-ratio combining diversity is used?

(b) What is the probability that the SNR is too low for the system to operate if selection diversity is used?

(c) What is the probability that the SNR is too low for the system to operate if a single antenna (no diversity) were used and the SNR were the same as in (a)?

Normal CDF

z	P(x<z)
-4.0	3.17E-05
-3.8	7.23E-05
-3.6	1.59E-04
-3.4	3.37E-04
-3.2	6.87E-04
-3.0	1.35E-03
-2.8	2.56E-03
-2.6	4.66E-03
-2.4	8.20E-03
-2.2	1.39E-02
-2.0	0.023
-1.8	0.036
-1.6	0.055
-1.4	0.081
-1.2	0.115
-1.0	0.159
-0.8	0.212
-0.6	0.274
-0.4	0.345
-0.2	0.421
0.0	0.500

ELEX 7860 : Wireless System Design

2024 Winter Term

Quiz 2

11:30 – 13:20

Friday, February 02, 2024

SW01-3150

This exam has two (2) questions on two (2) pages. The marks for each question are as indicated. There are a total of ten (10) marks. Answer all questions. Write your answers and all rough work in this paper and nowhere else. Show your work. Underline or 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:

Sherban, Eddie A01071318

Each exam is equally difficult.

Answer your own exam.

Do not start until you are told to do so.

Name: _____

BCIT ID: _____

Signature: _____

Question 1 — 4 marks

You've determined that propagation in a rural area can be modelled by a power law path loss model with exponent of $n = -3$ and a shadow fading standard deviation of $\sigma = 5$ dB.

At a distance of 1 km the SNR is 30 dB.

(a) What is the average SNR at a distance of 3 km?

(b) At this distance, what is the probability that the SNR is less than 10 dB? *Hint: There is a table of the Gaussian CDF on the last page.*

Question 2 — 6 marks

A wireless communication system operates over a Rayleigh fading channel. The system requires an SNR of 10 dB to operate. The system has two receive antennas that experience independent fading. The average SNR on each antenna is 20 dB.

(a) What is the average SNR if maximal-ratio combining diversity is used?

(b) What is the probability that the SNR is too low for the system to operate if selection diversity is used?

(c) What is the probability that the SNR is too low for the system to operate if a single antenna (no diversity) were used and the SNR were the same as in (a)?

Normal CDF

z	P(x<z)
-4.0	3.17E-05
-3.8	7.23E-05
-3.6	1.59E-04
-3.4	3.37E-04
-3.2	6.87E-04
-3.0	1.35E-03
-2.8	2.56E-03
-2.6	4.66E-03
-2.4	8.20E-03
-2.2	1.39E-02
-2.0	0.023
-1.8	0.036
-1.6	0.055
-1.4	0.081
-1.2	0.115
-1.0	0.159
-0.8	0.212
-0.6	0.274
-0.4	0.345
-0.2	0.421
0.0	0.500

ELEX 7860 : Wireless System Design

2024 Winter Term

Quiz 2

11:30 – 13:20

Friday, February 02, 2024

SW01-3150

This exam has two (2) questions on two (2) pages. The marks for each question are as indicated. There are a total of ten (10) marks. Answer all questions. Write your answers and all rough work in this paper and nowhere else. Show your work. Underline or 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:

Sinnathamby, Jonathan A01256769

Each exam is equally difficult.

Answer your own exam.

Do not start until you are told to do so.

Name: _____

BCIT ID: _____

Signature: _____

Question 1 — 4 marks

You've determined that propagation in a rural area can be modelled by a power law path loss model with exponent of $n = -3$ and a shadow fading standard deviation of $\sigma = 5$ dB.

At a distance of 1 km the SNR is 30 dB.

(a) What is the average SNR at a distance of 3 km?

(b) At this distance, what is the probability that the SNR is less than 10 dB? *Hint: There is a table of the Gaussian CDF on the last page.*

Question 2 — 6 marks

A wireless communication system operates over a Rayleigh fading channel. The system requires an SNR of 10 dB to operate. The system has two receive antennas that experience independent fading. The average SNR on each antenna is 20 dB.

(a) What is the average SNR if maximal-ratio combining diversity is used?

(b) What is the probability that the SNR is too low for the system to operate if selection diversity is used?

(c) What is the probability that the SNR is too low for the system to operate if a single antenna (no diversity) were used and the SNR were the same as in (a)?

Normal CDF

z	P(x<z)
-4.0	3.17E-05
-3.8	7.23E-05
-3.6	1.59E-04
-3.4	3.37E-04
-3.2	6.87E-04
-3.0	1.35E-03
-2.8	2.56E-03
-2.6	4.66E-03
-2.4	8.20E-03
-2.2	1.39E-02
-2.0	0.023
-1.8	0.036
-1.6	0.055
-1.4	0.081
-1.2	0.115
-1.0	0.159
-0.8	0.212
-0.6	0.274
-0.4	0.345
-0.2	0.421
0.0	0.500

ELEX 7860 : Wireless System Design

2024 Winter Term

Quiz 2

11:30 – 13:20

Friday, February 02, 2024

SW01-3150

This exam has two (2) questions on two (2) pages. The marks for each question are as indicated. There are a total of ten (10) marks. Answer all questions. Write your answers and all rough work in this paper and nowhere else. Show your work. Underline or 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:

Tran, Martin A01228459

Each exam is equally difficult.

Answer your own exam.

Do not start until you are told to do so.

Name: _____

BCIT ID: _____

Signature: _____

Question 1 — 4 marks

You've determined that propagation in a rural area can be modelled by a power law path loss model with exponent of $n = -3$ and a shadow fading standard deviation of $\sigma = 5$ dB.

At a distance of 1 km the SNR is 30 dB.

(a) What is the average SNR at a distance of 3 km?

(b) At this distance, what is the probability that the SNR is less than 10 dB? *Hint: There is a table of the Gaussian CDF on the last page.*

Question 2 — 6 marks

A wireless communication system operates over a Rayleigh fading channel. The system requires an SNR of 10 dB to operate. The system has two receive antennas that experience independent fading. The average SNR on each antenna is 20 dB.

(a) What is the average SNR if maximal-ratio combining diversity is used?

(b) What is the probability that the SNR is too low for the system to operate if selection diversity is used?

(c) What is the probability that the SNR is too low for the system to operate if a single antenna (no diversity) were used and the SNR were the same as in (a)?

Normal CDF

z	P(x<z)
-4.0	3.17E-05
-3.8	7.23E-05
-3.6	1.59E-04
-3.4	3.37E-04
-3.2	6.87E-04
-3.0	1.35E-03
-2.8	2.56E-03
-2.6	4.66E-03
-2.4	8.20E-03
-2.2	1.39E-02
-2.0	0.023
-1.8	0.036
-1.6	0.055
-1.4	0.081
-1.2	0.115
-1.0	0.159
-0.8	0.212
-0.6	0.274
-0.4	0.345
-0.2	0.421
0.0	0.500