ELEX 7860 : Wireless System Design
2022 Winter Term

Quiz 3
10:30 – 11:00
Friday, April 1, 2022
SW01-2590

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: _____

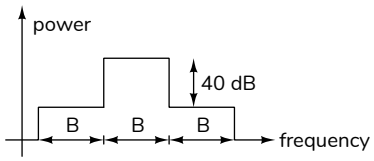
0

Question 1 — 3 marks

A transmitter outputs a random signal X that is either $+2$ V or -2 V with equal probabilities. The channel adds a random independent noise signal, N, that is -2 V 20% of the time and 2 V otherwise. The received signal is $Y = X + N$. Calculate the probability of each possible value of Y. Sketch the marginal probability density function $P_Y(y)$ and the joint probability density function $P_{XY}(x, y)$.

Question 2 — 2 marks

The specification for a transmitter requires that the transmitted signal power fall below the "mask" shown at right where B is the bandwidth of the signal at the input to the final amplifier. If the required output power is 25 dBm, what is this amplifier's minimum required output IP3?



Question 3 — 2 marks

A receiver has an LNA with a noise figure of 1.8 dB and a gain of 6 dB. This is followed by a mixer with a noise figure of 6 dB and a gain of 6 dB. This is followed by amplifier with a noise figure of 10 dB and a gain of 30 dB. What is the noise figure of the cascade of these three devices?

ELEX 7860 : Wireless System Design
2022 Winter Term

Quiz 3
10:30 – 11:00
Friday, April 1, 2022
SW01-2590

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: _____

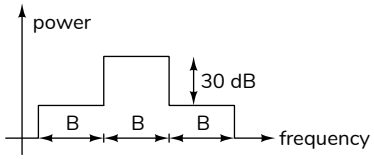
Signature: _____

Question 1 — 3 marks

A transmitter outputs a random signal X that is either $+1$ V or -1 V with equal probabilities. The channel adds a random independent noise signal, N, that is -1 V 10% of the time and 1 V otherwise. The received signal is $Y = X + N$. Calculate the probability of each possible value of Y. Sketch the marginal probability density function $P_Y(y)$ and the joint probability density function $P_{XY}(x, y)$.

Question 2 — 2 marks

The specification for a transmitter requires that the transmitted signal power fall below the "mask" shown at right where B is the bandwidth of the signal at the input to the final amplifier. If the required output power is 25 dBm, what is this amplifier's minimum required output IP3?



Question 3 — 2 marks

A receiver has an LNA with a noise figure of 1.8 dB and a gain of 6 dB. This is followed by a mixer with a noise figure of 6 dB and a gain of 3 dB. This is followed by amplifier with a noise figure of 10 dB and a gain of 30 dB. What is the noise figure of the cascade of these three devices?