ELEX 3525: Data Communications
2023 Fall Term

Quiz 3
11:30 – 12:20
Tuesday, November 28, 2023
SW01-3555

This exam has four (4) questions on two (2) pages. The marks for each question are as indicated. There are a total of nine (9) 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:

Sample 1 A00123456

Each exam is equally difficult.

Answer your own exam.

Do not start until you are told to do so.

Name: _____

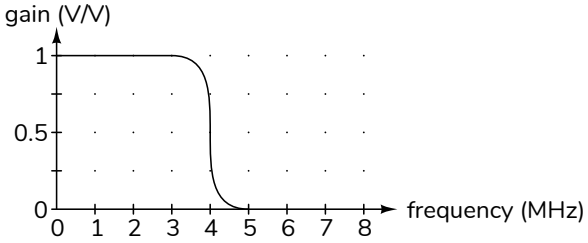
BCIT ID: _____

Signature: _____

0

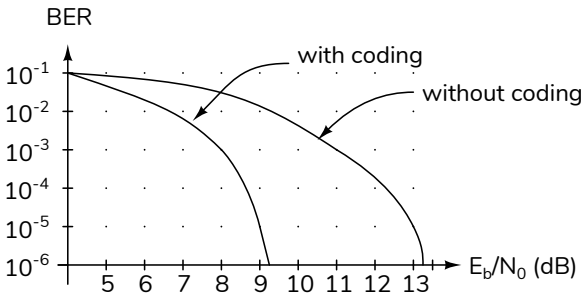
Question 1 — 3 marks

The transfer function of a channel is shown below. How many bits per second could be transmitted over this channel *without ISI*, if you used impulses of 16 different levels as the symbols? Show how you arrived at your answer.



Question 2 — 1 marks

The following graph shows the received BER as a function of E_b/N_0.



What is the coding gain at a BER of 1×10^{-5} ?

Question 3 — 2 marks

Is it *theoretically* possible to transmit 10 Mb/s of *information*, with almost no errors, over a channel that has a "brick-wall" frequency response with a bandwidth of 11 MHz and an SNR of 0 dB? Why or why not?

You may assume the noise is Gaussian (i.e., it is an AWGN channel).

Question 4 — 3 marks

An Ethernet frame starts and ends with the following bytes, shown in hexadecimal notation. Ellipsis (`...`) shows where there are additional bytes. The initial bytes of the preamble are not shown.

```
55 55 55 55 55 d5
01 02 03 04 05 06
0a 0b 0c 07 08 09
0d 0e 0f 10 11 12
```

```
...
16 17 19 12 14 15
```

Answer the following questions based on the frame contents shown above:

(a) What is the destination address?

(b) What is the OUI of the device that sent this frame?

(c) What are the values of the bytes that make up the CRC?

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This exam paper is for:

Sample 2 A00123456

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Do not start until you are told to do so.

Name: _____

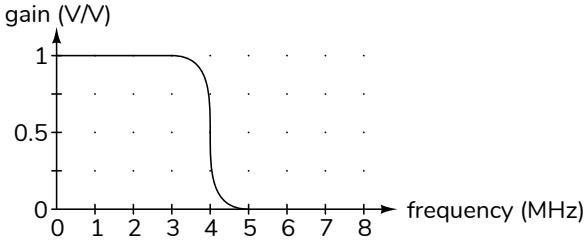
BCIT ID: _____

Signature: _____

255

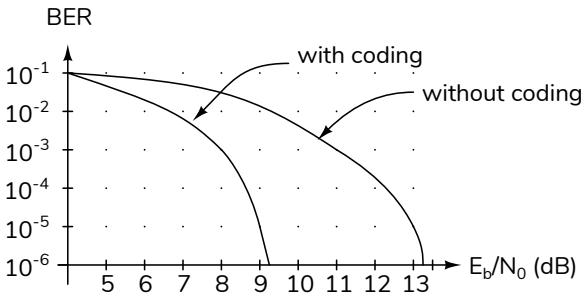
Question 1 — 3 marks

The transfer function of a channel is shown below. How many bits per second could be transmitted over this channel *without ISI*, if you used impulses of 8 different levels as the symbols? Show how you arrived at your answer.



Question 2 — 1 marks

The following graph shows the received BER as a function of E_b/N_0.



What is the coding gain at a BER of 1×10^{-3} ?

Question 3 — 2 marks

Is it *theoretically* possible to transmit 10 Mb/s of *information*, with almost no errors, over a channel that has a "brick-wall" frequency response with a bandwidth of 9 MHz and an SNR of 0 dB? Why or why not?

You may assume the noise is Gaussian (i.e., it is an AWGN channel).

Question 4 — 3 marks

An Ethernet frame starts and ends with the following bytes, shown in hexadecimal notation. Ellipsis (`...`) shows where there are additional bytes. The initial bytes of the preamble are not shown.

```
55 55 55 55 55 d5
07 08 09 0a 0b 0c
01 02 03 04 05 06
0d 0e 0f 10 11 12
```

...
12 14 15 16 17 19

Answer the following questions based on the frame contents shown above:

(a) What is the destination address?

(b) What is the OUI of the device that sent this frame?

(c) What are the values of the bytes that make up the CRC?