

ELEX 3525 : Data Communications  
Term 201630

MID-TERM EXAMINATION  
8:30 – 10:20 AM  
October 17, 2016

*This exam has four (4) questions on five (5) pages. The marks for each question are as indicated. There are a total of 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:

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		3
2		4
3		3
4		3
Total		13

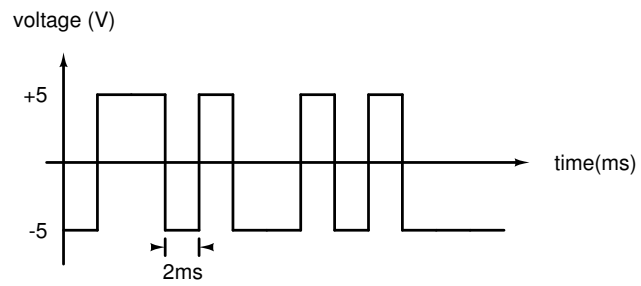
**Question 1** ( 3 marks)

A fax page is transmitted by sending the number of successive dots (pixels) of the same color. Each such 'run' has a different probability. If the probability of each run is as shown in the table below, what is the entropy of the source in bits per run?

Run length	Probability
0	0.4
1	0.3
2	0.2
3	0.1

**Question 2 ( 4 marks)**

The waveform below is used to transmit one byte (8 bits) over a serial interface.



- (a) What are the bit rate and baud rate?
- (b) What value was transmitted? Give your answer in hexadecimal.
- (c) What is the corresponding Unicode character assuming UTF-8 encoding was used?

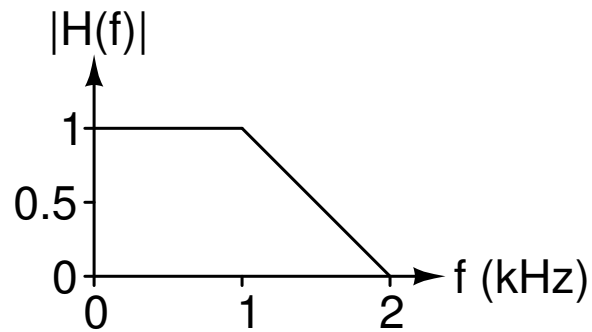
**Question 3 ( 3 marks)**

A transmission line for a high-power transmitter is made from two 12-gauge wires run in parallel. The two wires are separated by 10 cm of air.

Assuming the the characteristic impedance is the same as if the conductors were insulated with a solid dielectric, find the characteristic impedance.

**Question 4** ( 3 marks)

The following figure shows the magnitude of the frequency response of a channel,  $|H(f)|$ .



- (a) What type of channel is this (e.g. low-pass, high-pass, etc.)?
- (b) What is the  $-3$  dB bandwidth?
- (c) If a 100 mV signal with a frequency of 1.5 kHz is applied at the input, what is the signal level at the output? Give your answer in mV.

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This exam paper is for:

Exam 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	Mark	Max.
1		3
2		4
3		3
4		3
Total		13

**Question 1** ( 3 marks)

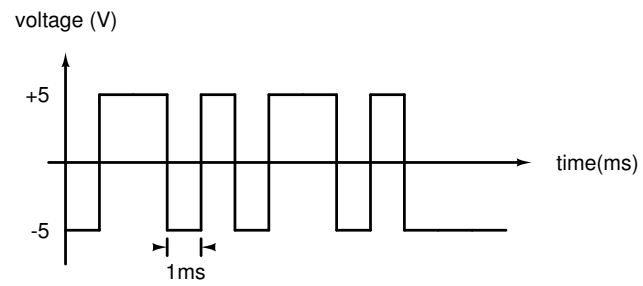
A fax page is transmitted by sending the number of successive dots (pixels) of the same color. Each such 'run' has a different probability. If the probability of each run is as shown in the table below, what is the entropy of the source in bits per run?

Run length	Probability
0	0.4
1	0.3
2	0.15
3	0.15



**Question 2 ( 4 marks)**

The waveform below is used to transmit one byte (8 bits) over a serial interface.



- (a) What are the bit rate and baud rate?
- (b) What value was transmitted? Give your answer in hexadecimal.
- (c) What is the corresponding Unicode character assuming UTF-8 encoding was used?

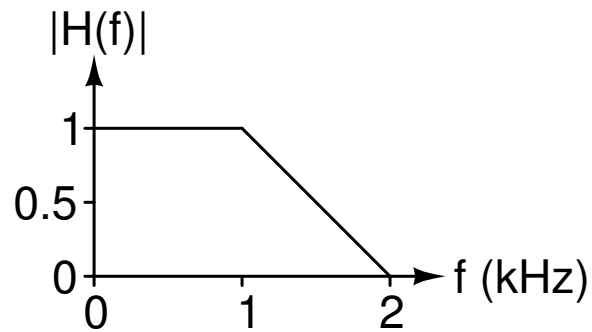
**Question 3 ( 3 marks)**

A transmission line for a high-power transmitter is made from two 14-gauge wires run in parallel. The two wires are separated by 8 cm of air.

Assuming the the characteristic impedance is the same as if the conductors were insulated with a solid dielectric, find the characteristic impedance.

**Question 4** ( 3 marks)

The following figure shows the magnitude of the frequency response of a channel,  $|H(f)|$ .



- What type of channel is this (e.g. low-pass, high-pass, etc.)?
- What is the  $-6$  dB bandwidth?
- If a 10 mV signal with a frequency of 1.5 kHz is applied at the input, what is the signal level at the output? Give your answer in mV.

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