

ELEX 3525 : Data Communications
Term 201710

MID-TERM EXAMINATION
11:30 AM – 1:20 PM
February 15, 2017

This exam has four (4) questions on five (5) pages. The marks for each question are as indicated. There are a total of 16 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		4
2		4
3		4
4		4
Total		16

Question 1 (4 marks)

The code chart for Gujarati (a language used in India) includes the following section:

	0A8	0A9
0		ઐ 0A90
1	ઁ 0A81	ૌ 0A91

- (a) What is the binary representation of the Unicode value (codepoint)?
- (b) How many bytes would be required to transmit the character shown on the top right that has the codepoint U+0A90 using the UTF-8 encoding?
- (c) What are the values of those bytes in hexadecimal?

Question 2 (4 marks)

Draw the waveform used to transmit the ASCII character '}' (a right brace) assuming a bit rate of 76.8 kbps, 7bits per character and even parity. Include one stop bit in the waveform.

Label the duration of one bit on the time axis (in microseconds) and the minimum transmit levels on the voltage axis (in Volts). *Hint: You can find an ASCII table on the last page of Lecture 1.*

Question 3 (4 marks)

You find some scrap coaxial cable and want to find out if you can use it to hook up your cable TV system which uses 72Ω coaxial cable.

You use a ruler to measure the inner and outer conductor diameters as 3.5 mm and 5 mm respectively.

You borrow an LCR meter and measure the capacitance and inductance of 1 m of your cable as 67 pF and $0.43 \mu\text{H}$ respectively.

- (a) What is the dielectric constant ϵ_r ?
- (b) What is the characteristic impedance of the cable?

Hint: the velocity of light is $c = 3 \times 10^8 \text{ m/s}$.

Question 4 (4 marks)

A communication system is affected by additive Gaussian noise. This system makes an error whenever noise voltage *exceeds* +50 mV. You measure the noise and find that it has a zero mean ($\mu = 0$) and an RMS voltage of $\sigma = 25$ mVrms.

- (a) What is the normalized error threshold level?
- (b) What is the error rate?

Hint: You can use a calculator or the graph on the last page of Lecture 4.

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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		4
2		4
3		4
4		4
Total		16

Question 1 (4 marks)

The code chart for Gujarati (a language used in India) includes the following section:

	0A8	0A9
0		ઐ 0A90
1	ઁ 0A81	ઔ 0A91

- (a) What is the binary representation of the Unicode value (codepoint)?
- (b) How many bytes would be required to transmit the character shown on the bottom right that has the codepoint U+0A91 using the UTF-8 encoding?
- (c) What are the values of those bytes in hexadecimal?

Question 2 (4 marks)

Draw the waveform used to transmit the ASCII character '{' (a left brace) assuming a bit rate of 38.4 kbps, 8bits per character and even parity. Include one stop bit in the waveform.

Label the duration of one bit on the time axis (in microseconds) and the minimum transmit levels on the voltage axis (in Volts). *Hint: You can find an ASCII table on the last page of Lecture 1.*

Question 3 (4 marks)

You find some scrap coaxial cable and want to find out if you can use it to hook up your cable TV system which uses 72Ω coaxial cable.

You use a ruler to measure the inner and outer conductor diameters as 3.5 mm and 5 mm respectively.

You borrow an LCR meter and measure the capacitance and inductance of 1 m of your cable as 67 pF and $0.43 \mu\text{H}$ respectively.

- (a) What is the dielectric constant ϵ_r ?
- (b) What is the characteristic impedance of the cable?

Hint: the velocity of light is $c = 3 \times 10^8 \text{ m/s}$.

Question 4 (4 marks)

A communication system is affected by additive Gaussian noise. This system makes an error whenever noise voltage *exceeds* +100 mV. You measure the noise and find that it has a zero mean ($\mu = 0$) and an RMS voltage of $\sigma = 50$ mVrms.

- (a) What is the normalized error threshold level?
- (b) What is the error rate?

Hint: You can use a calculator or the graph on the last page of Lecture 4.

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