

INT478E: Network Architecture and Data Communications I Midterm Exam One

You have **50 minutes** for this exam. You must work quickly!

You must show your work.

Don't forget to include the units for numerical answers.

Indicate your answers by underlining them or by enclosing them in a box.

This exam is open book and open notes.

You may use a calculator.

Name: _____ (5 pts)

Useful Information:

$B = f_{\max} - f_{\min}$	10^{15}	peta	P
$M = L = 2^n$	10^{12}	tera	T
$R = rn$	10^9	giga	G
bit time = $1/R$	10^6	mega	M
	10^3	kilo	k
$T = 1/f$	10^0		
$X \text{ in dB} = 10 \log(X)$	10^{-1}	deci	d
$C = 2B \log_2(1 + S/N)$	10^{-2}	centi	c
$Y = A \sin(2\pi f + \phi)$	10^{-3}	mili	m
	10^{-6}	micro	μ
$SNR = 10 \log(S/N)$	10^{-9}	nano	n
$\log_n(x) = \log_{10}(x) / \log_{10}(n)$	10^{-12}	pico	p
	10^{-15}	femto	f

1. [2 pts. each] Describe/explain/identify the following:

a. Layer 2 of the TCP/IP model

b. The OSI's Presentation Layer

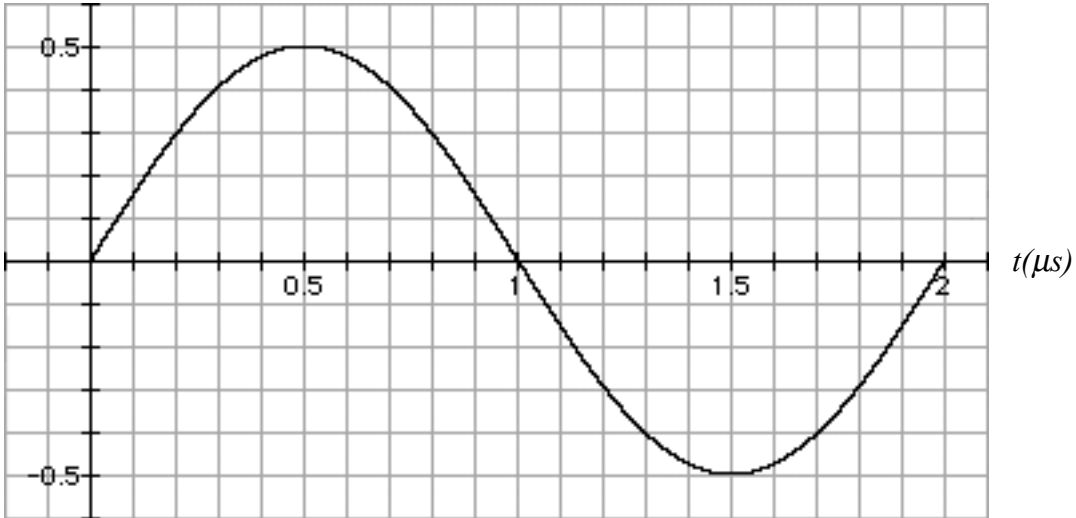
c. A symbol

d. Digital

e. Duty cycle

2. [10 pts] What advantages and disadvantages are there to using fiber instead of unshielded twisted pair?

The following diagram applies to question three.

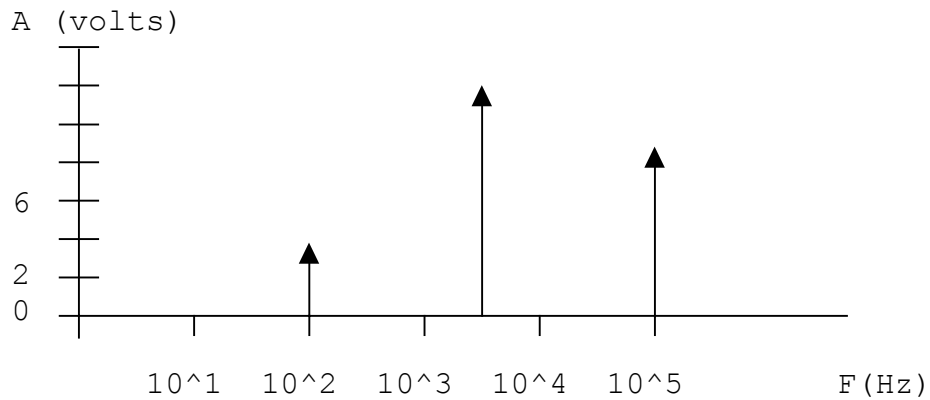


3. A) [3 pts] What is the frequency of the wave shown above?
 [2 pts] B) What is the period of this wave?

A)

B)

Questions 4 and 5 refer to the following diagram:



4. [5 pts] What is the bandwidth of the signals shown?

5. [5 pts] What is the frequency of the signal that has an amplitude of 12 volts? Give your answer in scientific notation.

The following information relates to questions 6, 7, and 8:
The bandwidth of a given coaxial cable is 2.406×10^7 Hz
and the signal to noise ratio is 25,356 to 1.

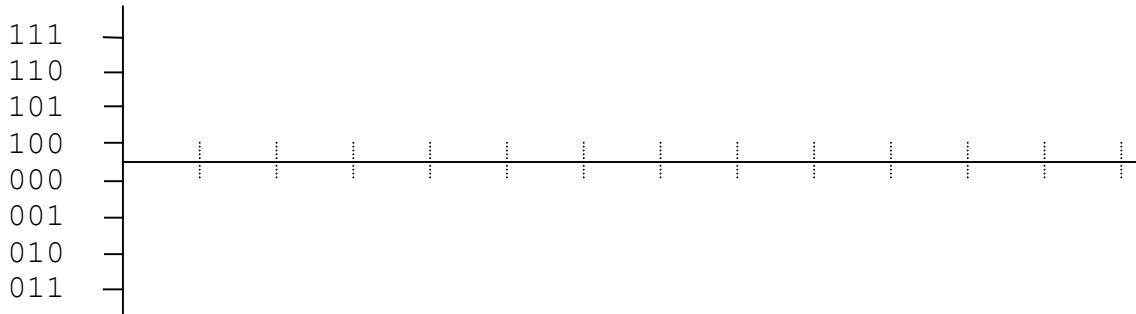
6. [5 pts] What is the signal to noise ratio in decibels?

7. [5 pts] If the signal power is 5.002 watts, what is the noise power? Give your answer in scientific notation.

8. [10 pts] What is the maximum data rate that could be sent on this cable without encountering a significant number of errors?

Use the following diagram with questions 9, 10 and 11 only.

Bits: 010 100 000 101 000 100 111 010 000 100 001 101 011



9. [5 pts] Draw in the multilevel signaling for the bits shown above the diagram.

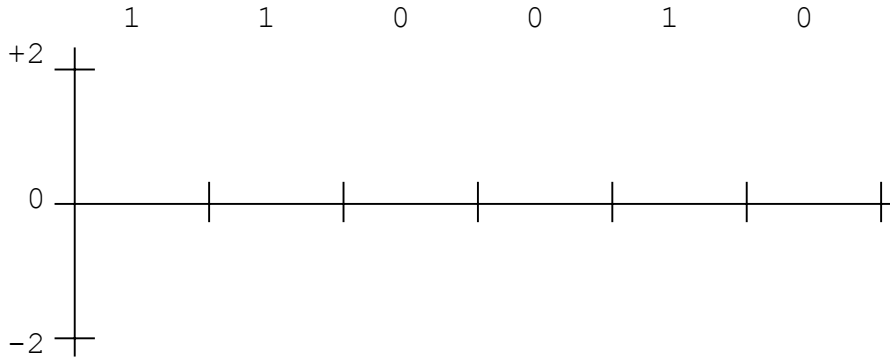
10. [5 pts] A) How many bits per symbol are used in this multilevel encoding scheme? B) How many unique symbols are there?

A)

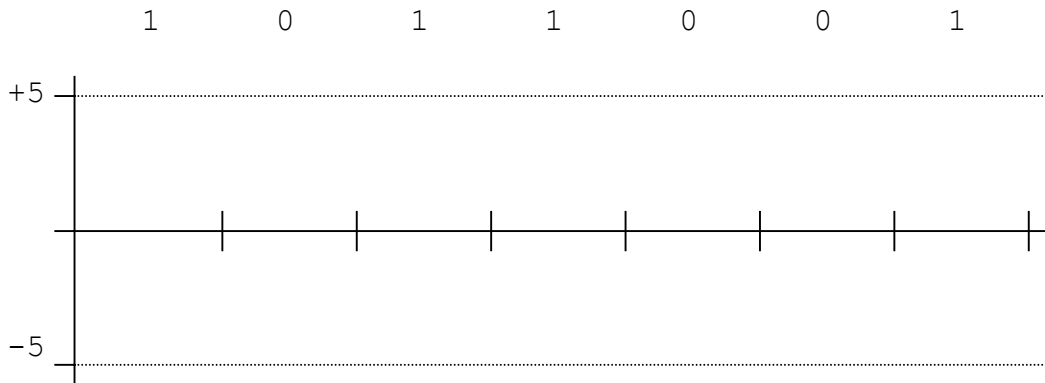
B)

11. [5 pts] If the symbol rate is 2400 symbols per second, what is the data rate for this system?

12. [5 pts] Show an ASK signal for the given bit stream using an amplitude of 2 to indicate a binary 1 and an amplitude of **zero** to indicate a binary zero. Use four cycles per bit for the frequency.



13. [5 pts] Sketch an AMI line code that uses a 25% duty cycle and varies from +5 to -5 volts for the following bits:



14. [5 pts] Use B6ZS substitution on the following bit stream and determine the +/- code that will be sent on the line:

1 0 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 1

15. [10 pts] You have a cable modem that transfers information at 2.005 Mbps. The bandwidth of the channel is 195.0 kHz. What is the minimum signal to noise ratio that would support this data rate?