ITS 323 – Quiz 2 (CS)

First name: _____   Last name: _____
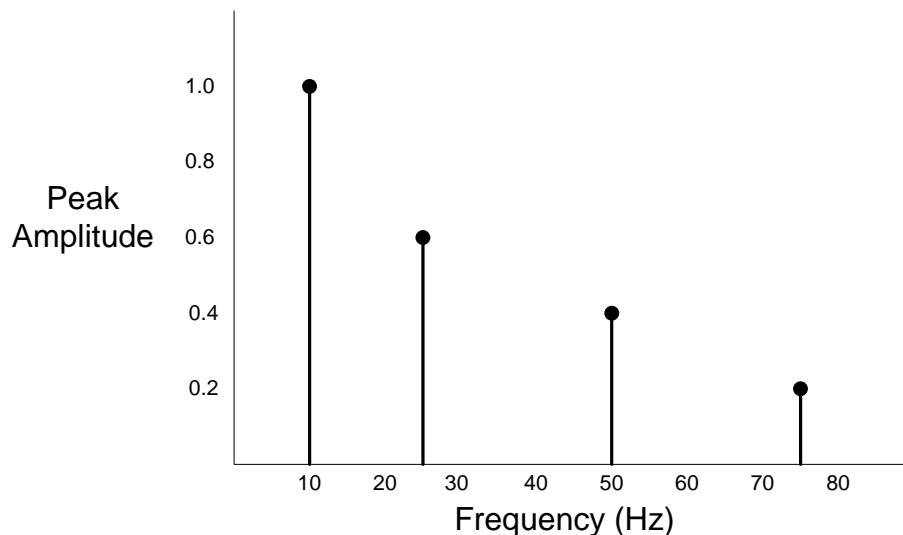
ID: _____   Total Marks: _____

<div align="right">out of 8.5</div>

Question 1 [1 mark]

a) What is the bandwidth of the signal shown in the figure below?

Answer: _____

b) How long does it take to send out a single character (8 bits), if the device sending rate is 1000 b/s?

Answer: _____

Question 2 [2 marks]

True or false (select the most appropriate answer):

a) The best method for encoding digital data onto a digital signal is to map 1's to a high voltage and map 0's to a low voltage.

T / F

b) According to the free space loss equation, an increase in transmit antenna gain will increase the amount of power lost between transmitter and receiver.

T / F

c) Providing higher quality shielding on copper cables (e.g. Shielded Twisted Pair, as opposed to Unshielded Twister Pair) increases the data rate and cost of the cable.

T / F

d) Satellite microwave transmission has a much larger delay than terrestrial microwave transmission because of the data rate on satellite links is typically less than terrestrial microwave.

T / F

Question 3 [3 marks]

Encoding scheme *A* maps the following signal levels into sequences of bits:

Signal Level (volts)	Bit sequence
+7	000
+5	001
+3	010
+1	011
-1	100
-3	101
-5	110
-7	111

a) For the encoding scheme *A*, what is the maximum data rate that can be achieved in a 1MHz noise-free channel?

b) If a second encoding scheme *B* mapped a signal level to a sequence of 5 bits, how many signal levels would be needed?

c) What is an advantage of encoding scheme *A*, compared to encoding scheme *B*?

Question 4 [2.5 marks]

Consider a channel with a 1MHz bandwidth and an SNR of 63.

a) What is the upper limit to the data rate that the channel can carry?

b) The result of part (a) is the upper limit. However, as a practical matter, better error performance will be achieved at a lower data rate. Assume we choose a data rate of 2/3 the maximum theoretical limit. How many signal levels are needed to achieve this data rate?