

ITS 323 – QUIZ 2

First name: _____ Last name: _____

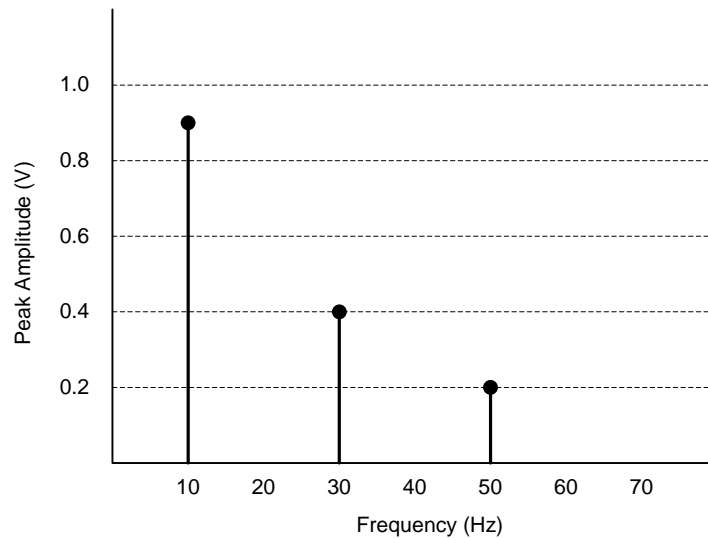
ID: _____

Total Marks: _____

out of 10

Question 1 [3 marks]

Below is a frequency domain plot of a communications signal $s(t)$.



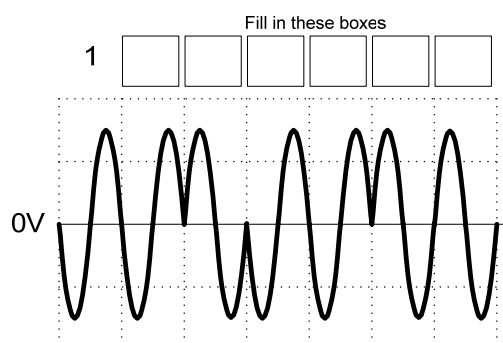
- a) What is the bandwidth of the signal $s(t)$? ($\frac{1}{2}$ mark) _____
- b) What is the frequency of the signal $s(t)$? ($\frac{1}{2}$ mark) _____
- c) Write a time domain equation for the signal $s(t)$? (1 mark)

$s(t) =$ _____

- d) If using signal $s(t)$, two bits of information can be sent in one period, what is the maximum data rate? (1 mark)
- _____

Question 2 [1.5 marks]

The following diagram shows part of a signal which modulates data using Binary Phase Shift Keying. The vertical dashed lines show the transitions between each bit. Complete the boxes to show the data transmitted.



Question 3 [1 mark]

Consider a communications link with a signal-to-noise ratio of 31. What bandwidth would be required to transmit at the maximum theoretical data rate of 1Mb/s?

Question 4 [2 marks]

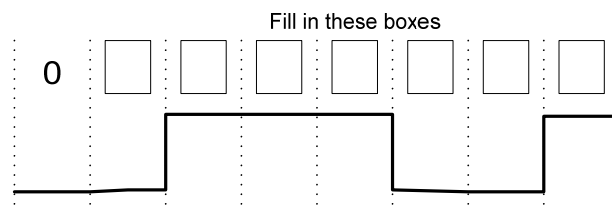
Assume you are using the free space loss equation to design a wireless link from one building to another (separated by 1km). The wireless receiver has a fixed receiver power threshold.

$$\frac{P_t}{P_r} = \frac{(4\pi d)^2}{G_t G_r \lambda^2} \text{ where } G = \frac{4\pi A}{\lambda^2}$$

After initial testing, although you have line-of-sight, you determine the received signal is too weak to communicate between buildings. List two approaches you can use to improve your design to a stronger link between buildings.

Question 5 [1.5 marks]

If the Non-Return-to-Zero Invert on ones (NRZI) encoding scheme is used, complete the bit pattern that the following signal represents. (That is, fill in the boxes).

**Question 6** [1 mark]

- a) A signal element takes $10\mu\text{s}$ to transmit. Each signal element encodes 3 bits of data. What is the data rate?

Answer: _____

- b) True or false: 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. True / False