ENGR101 Test 1
Practice Questions

Abstract

Test is worth 60 marks Core 65% Completion 15% Challenge 20%

1 Core

1.1 Binary

Convert the following unsigned binary numbers to decimal

- 1101 1111
- 0000 0100
- 1000 0000

Convert the following 2's complement signed binary numbers to decimal

- 1101 1111
- 0000 0100
- 1000 0000

Convert the following decimal numbers to both 2's complement and unsigned binary numbers (where possible). How many bits are required for each?

- 10
- -64
- 102
- -1025

1.2 Memory

1. How much memory is required to store 1000, 16 bit numbers?
2. Explain the difference (specifically giving reference to bytes or bits) between an 'int' variable and a 'char' and a 'long' variable in C.
3. What is ASCII?

1.3 LMC

Name each component of the LMC.

What will the output of the following LMC assembly code be when run on the LMC (if these input value was 64)?

```
INP
OUT
ADD b
OUT
STO 99
OUT
HLT
b DAT 5
```

For the above program what OpCodes will the memory addresses 0,2,4, 7 and 99 contain one the program has run?

1.4 Networking

List 3 benefits of layering in the construction of networks.

List all the layers of the OSI model and give an example of each.

What is the difference between an intranet and the internet?

2 Completion

2.1 ADC

What is the minimum resolution of a 4 bit ADC converter on a 12V signal?

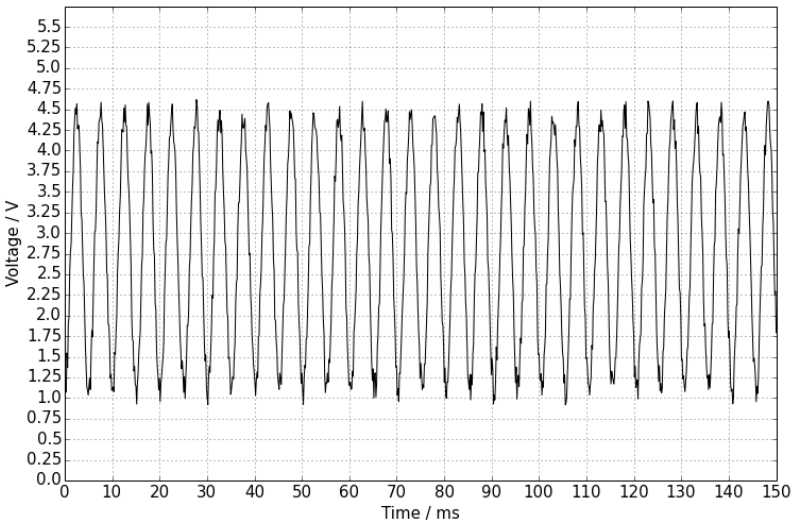

Figure 1: Noisy Analog Signal

For the signal above, which frequency would be most appropriate to use when sampling it and why?

- 1 Hz
- 50 Hz
- 200 Hz
- 1000 Hz

Are the signals above and below analog or digital?
What is the SNR of the two signals?

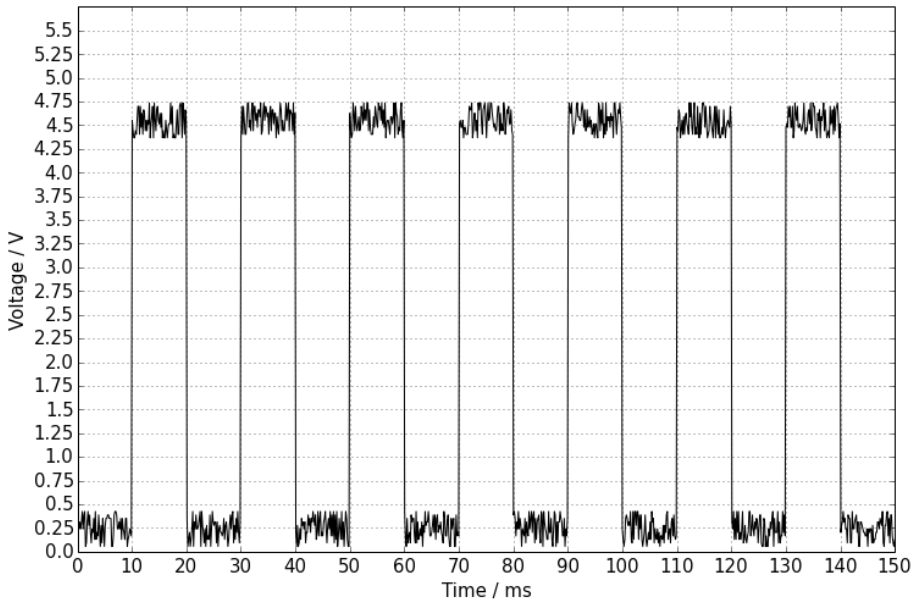

Figure 2: Signal

3 Challenge

3.1 Engineering Ethics

Congratulations! You have just developed an open source flight control software for multirotors (big quadcopters) which allows autonomous navigation and allows control of payloads of over 100kg to be flown autonomously. The accompanying hardware can be easily purchased from Ebay for less than US$100.

Give examples of an ethical and social implication of you releasing this software.

Hint: Watching this may help: `https://www.youtube.com/watch?v=K4NRJoCNHIs`