**CPEN 291 - Lab 2 Questions**

*Lab section: L2A Team (Bench) #: A-T20*

Answer the following questions. Submit the completed document (in word or pdf, one per team) to Canvas by the deadline.

Q1 – GUI Design Process: You are to design your own GUI using TKinter for the Lab 2 user interface. Describe clearly the process you used for the following design aspects. Please spend time to carefully answer each of them.

1. **Use of process**: Describe your approach to adapt and apply a general design process for the GUI design. What was your approach?
2. **Constraint identification**: Explain the constraints that you must consider in the design of the GUI.
3. **Solution generation**: Explain at least two possible varieties of GUI layout and additional features that you considered for the design of the GUI.
4. Use of process:

Using the examples given in class and links on the lecture notes, we first learned the most basic widgets (label, button, text entry).

1. Constraint identification:
2. Solution generation:

Q2 - spidev: The following code was used (slide 2-10) to calculate the final value of the data read from MCP3008 using spidev:

data = ((adc[1]& 3) << 8) +adc[2]

Can you explain, in plain English, what the above statement is doing?

Simply, it is combining 2 bits of interest from adc[1], with adc[2].

(adc[1]& 3) will give us the lower 2 bits of adc[1].

Shifting it 8 bits to the left then adding adc[2] will place adc[2] in the lower 8 bit of data.

Q3 - SPI: How many SPI chip selects does Raspberry Pi have? What are they called?

Raspberry Pi has 2 SPI chip selects, CE0 (GPIO 8) and CE1(GPIO 7).

Q4 – gpiozero MCP3008: Read the documentation for the gpiozero SPI devices. What is the default for the clock\_pin and for the select\_pin?

Clock\_pin defaults to GPIO11, and select\_pin defaults to GPIO8.

Q5 - Capacitor use: How can we make a more stable power supply voltage at the terminals of an electronic component? Use an RPi schematic (see lecture notes) as an example to explain such an application.

We can stabilize power supply by using bypass capacitors. Since a capacitor is short-circuit to “relative” high frequencies, it suppresses the signal we do not want, such as noise. In the RPi schematic, bypass capacitors are present so that the noise caused by other circuit element goes through the capacitor, reducing the effect of noise on the rest of the circuit.

Q6 - Datasheets: Read the LM35 datasheet (provided under references). The purpose here is to exercise reading datasheets. Answer the following questions: a) what is the maximum supply voltage (V)? b) what is the maximum output current (mA)? c) Our LM35 is LM35DZ/NOPB. What is its package type and what is the range of its operation temperature?

Maximum supply voltage is 35V.

Maximum output current is 10mA.

Package type for LM35DZ/NOPB is TO-92, and its operation temperature range is 0 -100 (℃).